

# SENSORS FOR THE FACTORY AUTOMATION

Overview Standard Sensors







## Pepperl+Fuchs – Unbeatable for quality and choice

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We are a leading manufacturer of industrial sensors and sensor systems making us specialists in these fields; therefore providing you with an extensive product selection and specific solutions to fit all of your needs

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### SENSING YOUR NEEDS

The core area of expertise of the Factory Automation division is non-contact sensing, which is an essential requirement for efficient production processes. We offer one of the largest ranges of industrial sensors in the world, providing comprehensive coverage for a very wide range of applications. Products in the area of identification and fieldbus technology complete our offering for any kind of factory automation process.

### PROTECTING YOUR PROCESS

Today, the Process Automation division of the Pepperl+Fuchs Group is the undisputed market leader in all three World markets – America, Europe and Asia – when it comes to components for intrinsic safe explosion protection.

# PEPPERL+FUCHS – YOUR COMPETENT PARTNER FOR SENSORS IN FACTORY AUTOMATION

As a worldwide leading manufacturer of industrial sensor technology and sensor systems, we specialize in the field of Factory Automation with an extensive range of products that are easily adapted to specific applications. Certification in accordance with ISO 9001 ensures that our products meet the highest quality demands.

Our sales offices are located in all industrial markets around the world, making us the ideal partner for global players in factory automation. With competent contacts we offer a first class service around the clock, worldwide. Our local staff have a solid product and application knowledge and can adapt ideally to your requirements.

#### Target markets:

- Machine and Plant Engineering
- Automotive Industry
- Mobile Equipment
- Renewable Energy
- Material Handling
- Print and Paper Industry
- Packaging Industry
- Process Equipment
- Doors, Gates and Elevators

Our service team is available to answer your questions about factory automation:

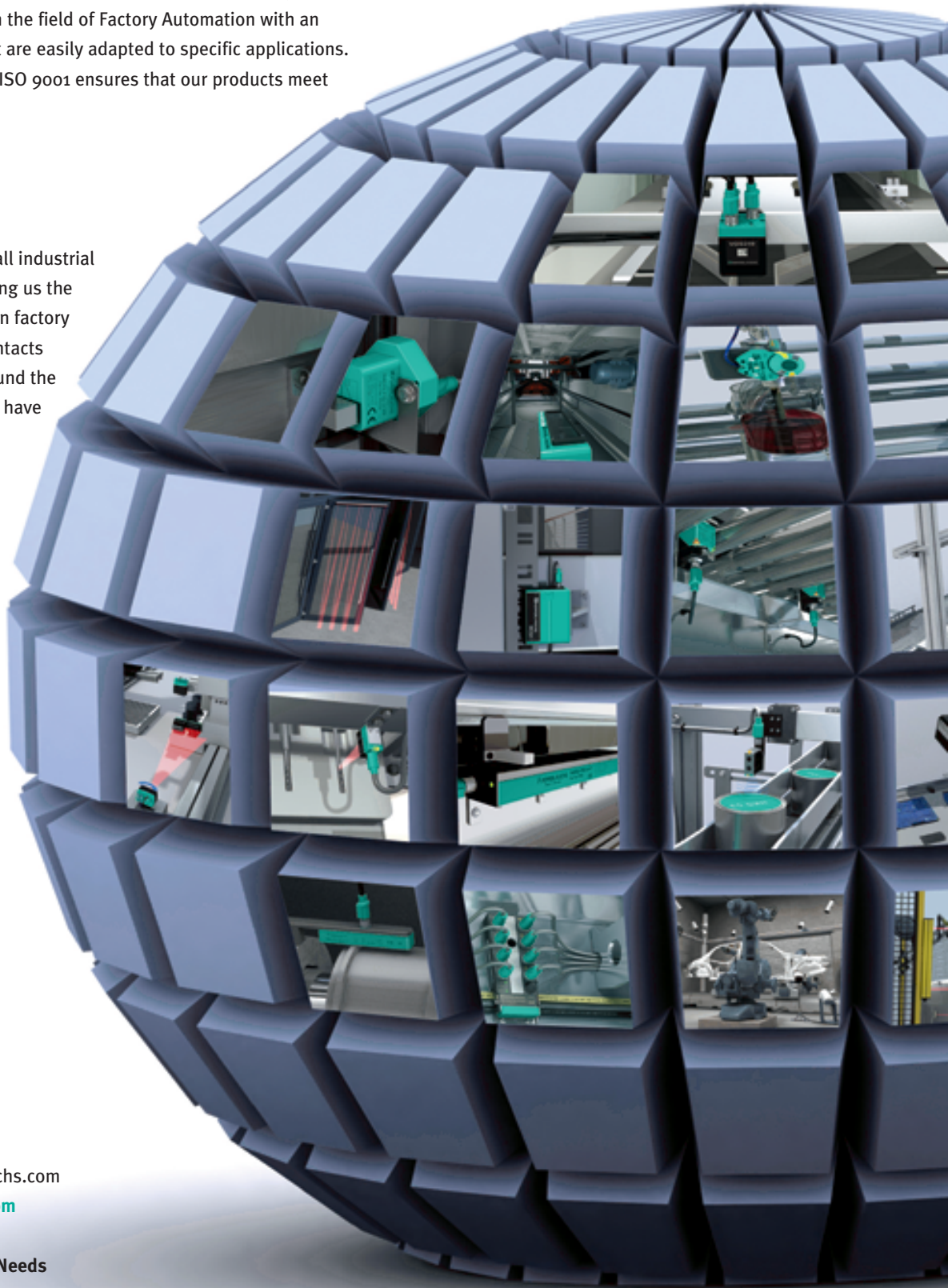
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**Pepperl+Fuchs – Sensing Your Needs**



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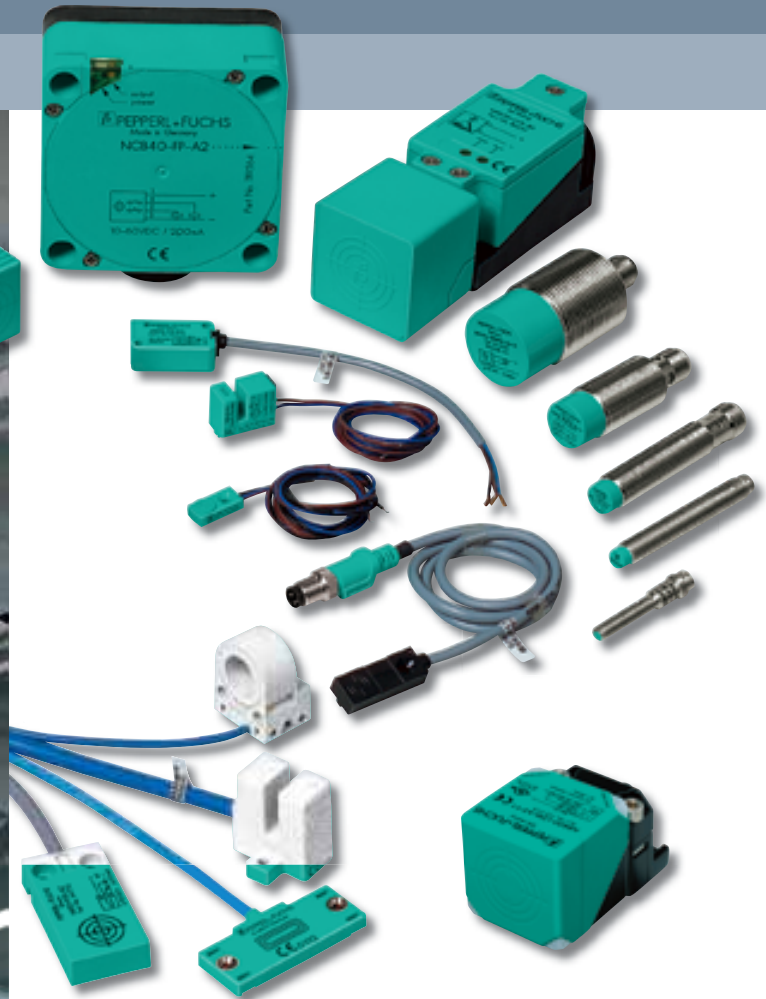
**9**

# INDUCTIVE SENSORS



Inductive sensors are the right technical and commercial solution for the reliable, non-contact detection of metallic objects for ranges up to 100 mm.

With Pepperl+Fuchs sensors you opt for quality and service! Pepperl+Fuchs has been producing inductive proximity switches for industrial applications since 1958 making us a pioneer in this field. Our creativity and decades of experience have enabled us to build a world-renowned reputation with this important product line. Our inductive sensors are used extensively throughout automation technology. The combinations of designs, electrical outputs, and mounting options are almost inexhaustible.

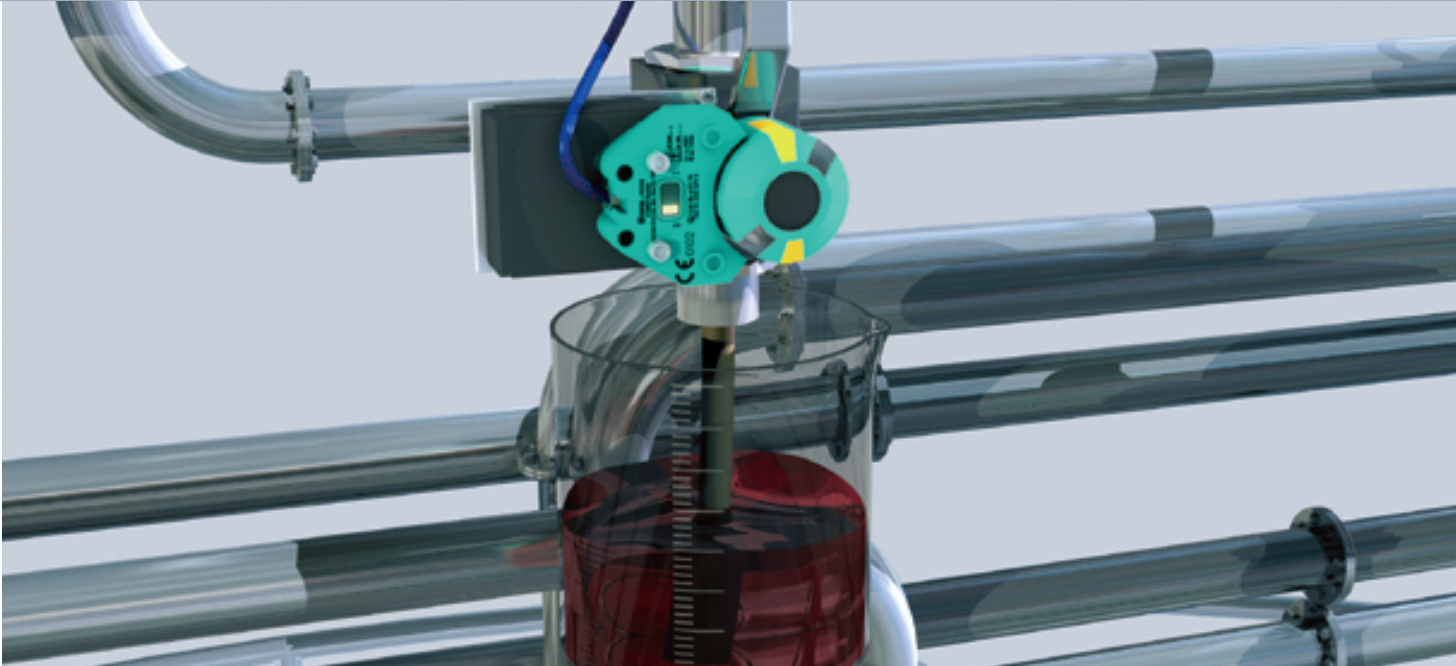


## INDUCTIVE SENSORS

### AT A GLANCE

- Housing made of brass, stainless steel and plastic
- Reverse polarity protected or tolerant connections
- Short-circuit and overload resistant outputs
- LED indication
- M8, M12 quick disconnect or terminal connections
- Sensors with cable connectors from PVC, PUR or silicon
- Output in 2/3/4 wire DC, AC, NAMUR and AS-Interface versions
- Analog output signal 0 or 4 ... 20 mA
- Integrated speed monitor with up to 100 Hz
- Pressurized sensors for up to 500 bar
- Approved for gas and dust Ex zones
- Built-in mechanical stop and screw connector
- Stainless steel sensing face
- Reduction factor 1
- Protection category up to IP69k (under water and steam jet resistant)
- Weld-immune design with PTFE-coated surface
- Full distance sensing of ferrous and non-ferrous materials
- Safety function
- Extended temperature range: from -40 °C to +250 °C

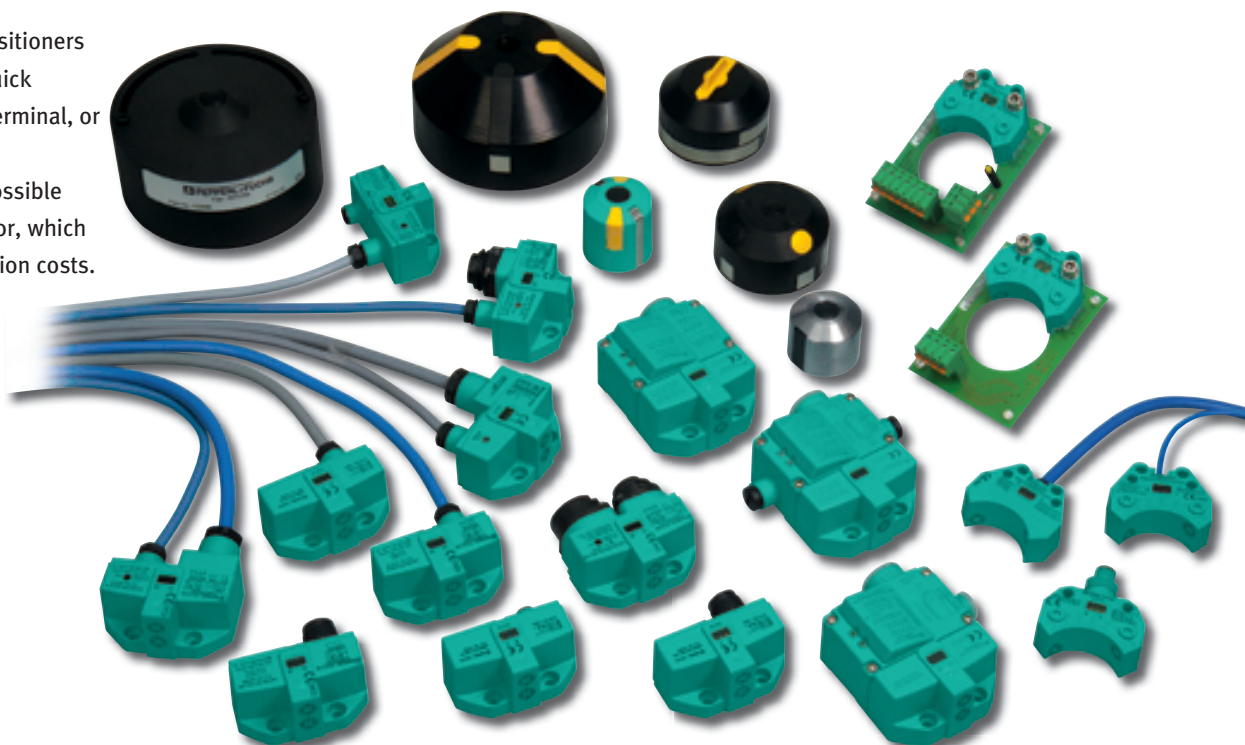
# SENSORS FOR VALVE POSITIONERS



Sensors for valve positioners are used for monitoring valves and actuators. Position sensors from Pepperl+Fuchs combine a “dual sensor”:

two devices in one housing. They minimize space requirements, are easy to install, and models are available for virtually every position monitoring application. Based on decades of experience Pepperl+Fuchs provides a vast range of sensors and actuators approved as NAMUR versions for explosive environments. Solutions for installation within the “classic box” as well as sensors for “direct mounting” on the actuator are both available.

Sensors for valve positioners are available with quick disconnect, spring terminal, or cable connections. Valve actuation is possible directly via the sensor, which reduces the installation costs.



## SENSORS FOR VALVE POSITIONERS

### AT A GLANCE

- Direct mounting
- Installation in the box
- Circuit board for installation in the box
- Direct AS-Interface connection
- Simple and fast installation
- Integrated valve actuation

# CAPACITIVE SENSORS MAGNETIC FIELD SENSORS



## CAPACITIVE SENSORS

### AT A GLANCE

- Cylindrical housing made of plastic or stainless steel (M12, M18, M30)
- Super-flat designs with a height of only 5 mm
- Operating distance of up to 40 mm operating distance for rectangular design 80 mm x 80 mm x 40 mm
- Approvals for Ex zones

In addition to metallic objects, capacitive sensors detect a large variety of other materials. They are used for level detection or flow monitoring.



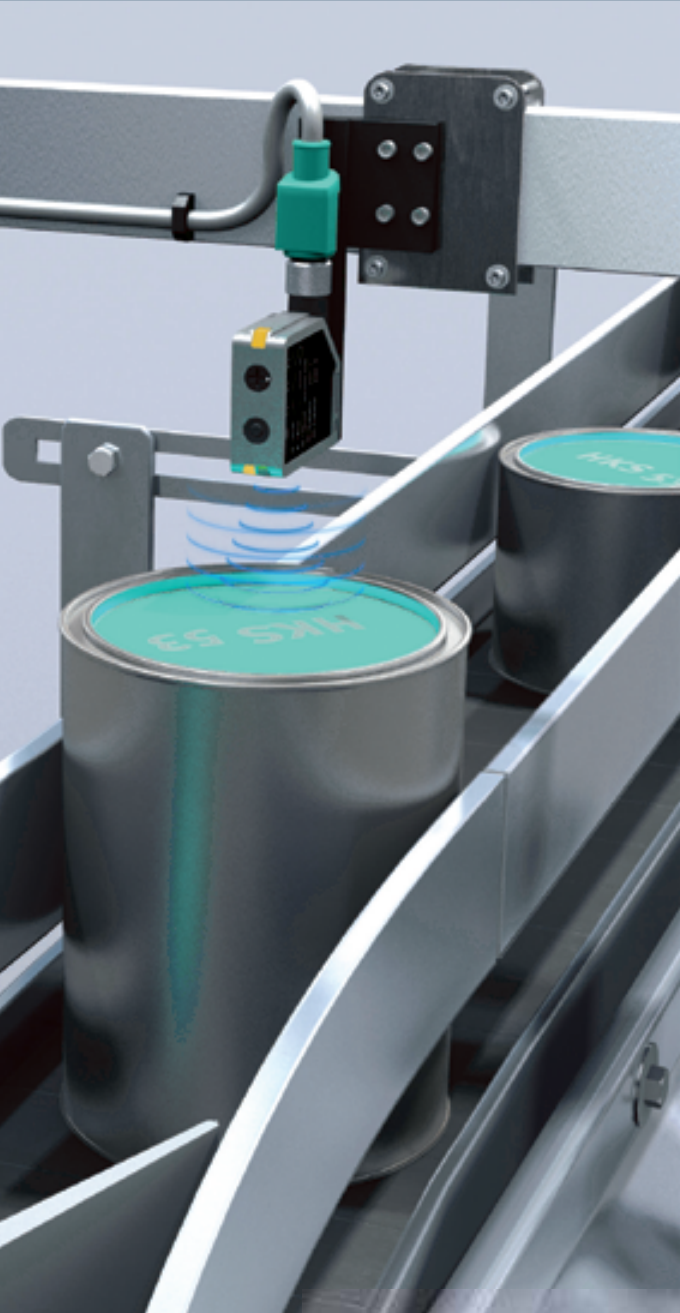
## MAGNETIC FIELD SENSORS

Our magnetic field sensor selection consists of the M12 housing style for traditional magnetic detection applications. Our range also includes a non-contact solution with protection category IP67 for detecting the position of pistons in steel cylinders. Magnets for cylinder applications are also available from Pepperl+Fuchs.





# ULTRASONIC SENSORS



Ultrasonic sensors present the ideal solution for non-contact position and distance measurement in all industrial areas where environmental conditions such as dust, smoke or steam may affect the sensors. Objects consisting of a variety of materials can be detected within millimeters regardless of color or surface. Ultrasonic sensors have proven their reliability and precision especially in the wood and furniture industry, the construction materials industry, farming equipment, construction equipment and in level control applications. However, ultrasonic technology is not used exclusively in rough industrial environments. Ultrasonic sensors have also shown their strength in the packaging industry, where a wide number of objects need to be detected ranging from small to large, transparent to colorful.

Pepperl+Fuchs' ultrasonic sensors include twelve different mechanical designs for thru-beam, direct detection and retro-reflective modes. Customer-specific solutions – tailored to the specific needs of the application – underscore our technological expertise which is characterized by the following features:

## ULTRASONIC SENSORS

### AT A GLANCE

- For fast and simple installation – devices with Teach-In function
- Software that simplifies programming – service program ULTRA 2003 (for devices with RS232 interfaces)
- Temperature compensation – compensates for deviations in sound velocity due to temperature fluctuations
- Synchronizaton input – to prevent cross-talk interference when installing two sensors in close proximity
- Sensors with digital and analog outputs



# PHOTOELECTRIC SENSORS



Recognition, detection, positioning, classification, counting, notification and monitoring: These processes are typically handled by non-contact photoelectric sensors.

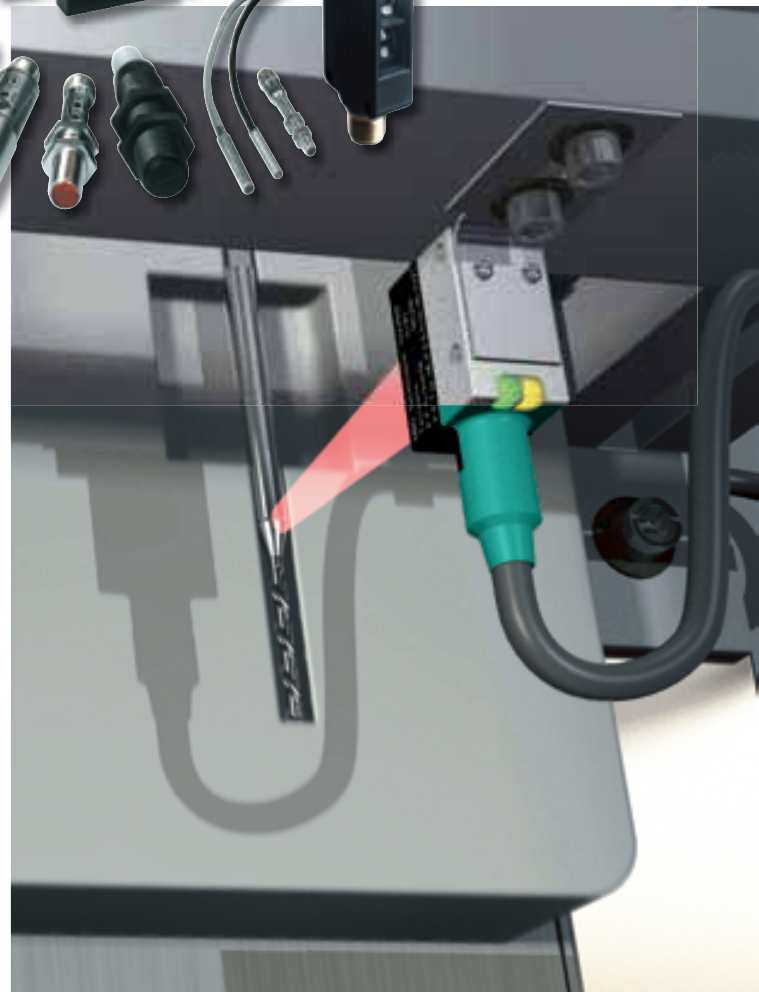
Applications range from the automotive industry, mechanical engineering, and assembly automation, through warehousing and conveyor systems and packaging applications, to the printing and paper industries.

With the VISOLUX brand, Pepperl+Fuchs offers one of the largest lines of photoelectric sensors on the market. We guarantee that you will find the right sensor for your automation applications.

## PHOTOELECTRIC SENSORS

### AT A GLANCE

- Different principles of operation:
  - Thru-beam photoelectric sensors
  - Retro-reflective photoelectric sensors
  - Diffuse photoelectric sensors, or with background suppression
  - Fiber optic sensors
  - Contrast and color sensors
  - Slot photoelectric sensors
  - Light grids
- Powerful performance characteristics and device functionality
- Different designs and sizes



Our new generation of photoelectric sensors offer the added features of VISO+. They are cost effective, efficient, and reliable, even under critical conditions.

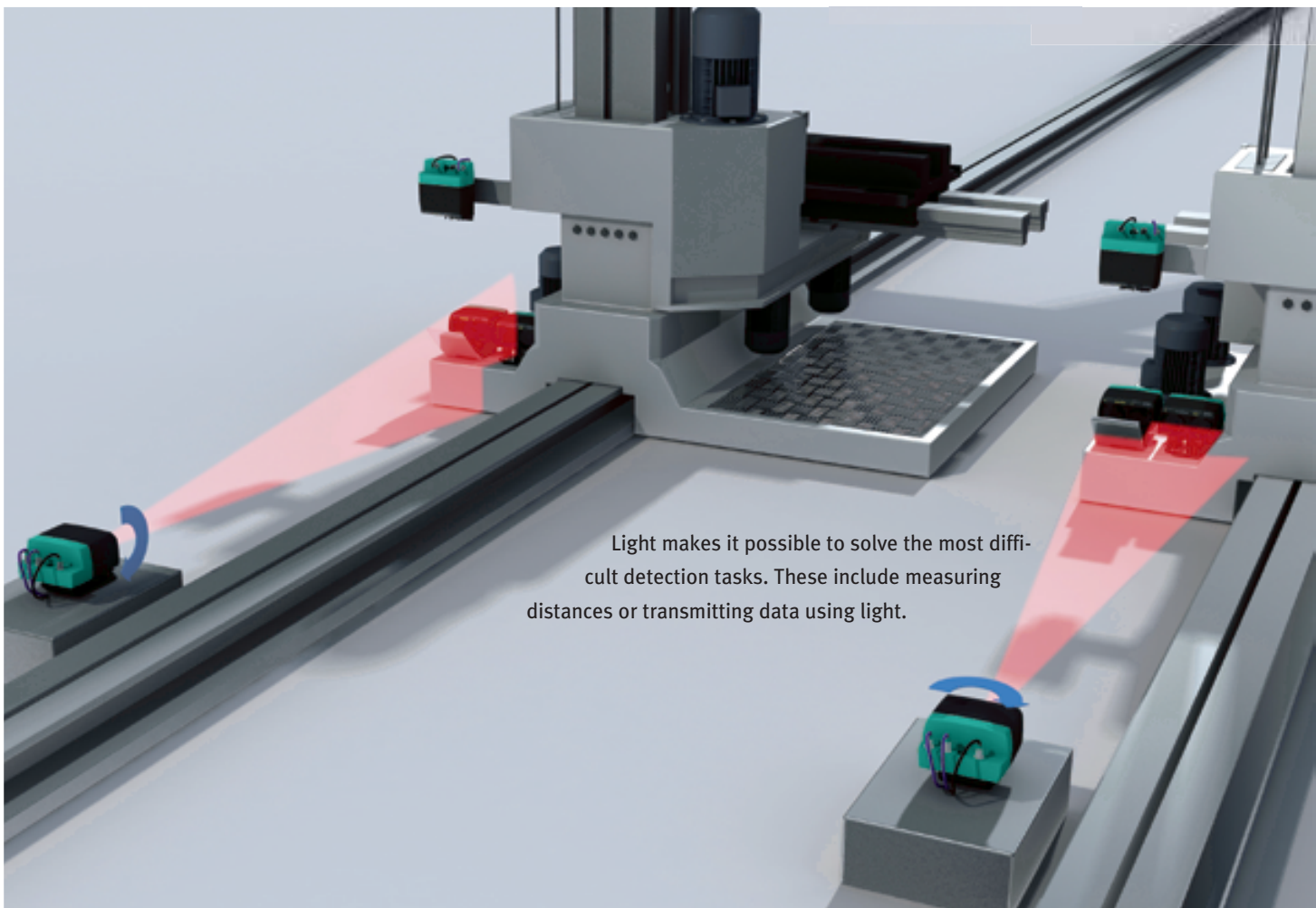
# VISO+

- Especially bright, highly visible indicators
- LED green for POWER-ON
- Modern output stages such as push-pull or AS-Interface 2.1
- Resistance to HF external light
- Protection against cross-talk interference

# DISTANCE MEASUREMENT DEVICES OPTICAL DATA COUPLERS

## DISTANCE MEASUREMENT DEVICES

Electronic distance measurement devices work with laser light or high-power LED transmitters and fulfill nearly any requirements. For example, automatic storage and retrieval units and transporters can be positioned to the millimeter, precisely and accurately, even over large distances. Range measurement relative to a moving vehicle is also possible.



Light makes it possible to solve the most difficult detection tasks. These include measuring distances or transmitting data using light.

## OPTICAL DATA COUPLERS

Optical data couplers are used for wireless data transmission using light for bidirectional communication to automatic storage and retrieval units, aisle conveyors, Automatic Guided Vehicles (AGVs), or crane positioning. We have the right solution whether it be for fast data exchange via an 8 bit parallel port, serial interface, INTERBUS or for the PROFIBUS DP!



# ROTARY ENCODERS

Rotary encoders are necessary in all applications involving the determination of such values as rotation rate, speed, acceleration and course. Primary applications for these sensors are found in mechanical engineering, the conveyor industry, material handling and the packaging industry. Pepperl+Fuchs is proud to offer a complete line of incremental and absolute rotary encoders for virtually every industry application. Of course, we are also your partner for pressure-resistant, intrinsically safe or bus-enabled rotary encoders.

## INCREMENTAL ENCODERS

Incremental encoders produce a specific number of electrical signals per shaft rotation. The speed of movement is determined by counting these signals for a specific time period. The count represents a measurement of the exceeded angle or the travelled distance by adding the signals beyond a certain reference point. Simply connect a counter or a PLC input card for measurement. Customers may choose a suitable incremental rotary encoder from our extensive product line, which includes many different series of encoders.

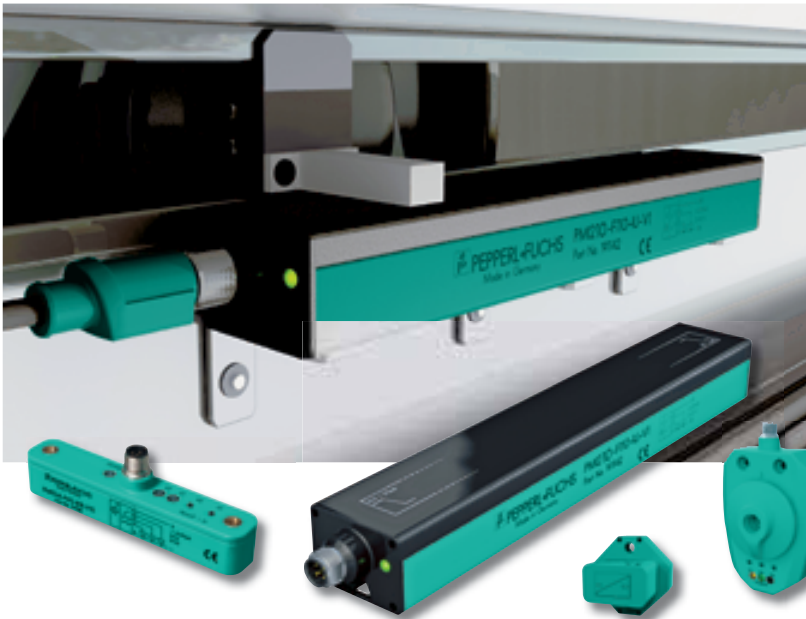
## ABSOLUTE VALUE ROTARY ENCODER

Absolute value rotary encoders produce a definite, coded numerical value for each shaft position. Absolute value rotary encoders perform counter functions so that subsequent electronics do not have to, thereby eliminating the need for expensive couplers. Reference runs on start-up are unnecessary, since the current position value is available at any time. Rotary encoders from Pepperl+Fuchs offer a large variety of interfaces: Parallel interface, SSI, AS-Interface, PROFIBUS DP, CAN-Open, DeviceNet, Ethernet TCP/IP, Powerlink. Mechanical designs: the application area determines the mechanical design. Pepperl+Fuchs offers a wide portfolio of different mechanical designs, from hollow shaft to blind hole shaft to solid shaft. The individual shafts and housing diameters are available in industry-standard sizes.



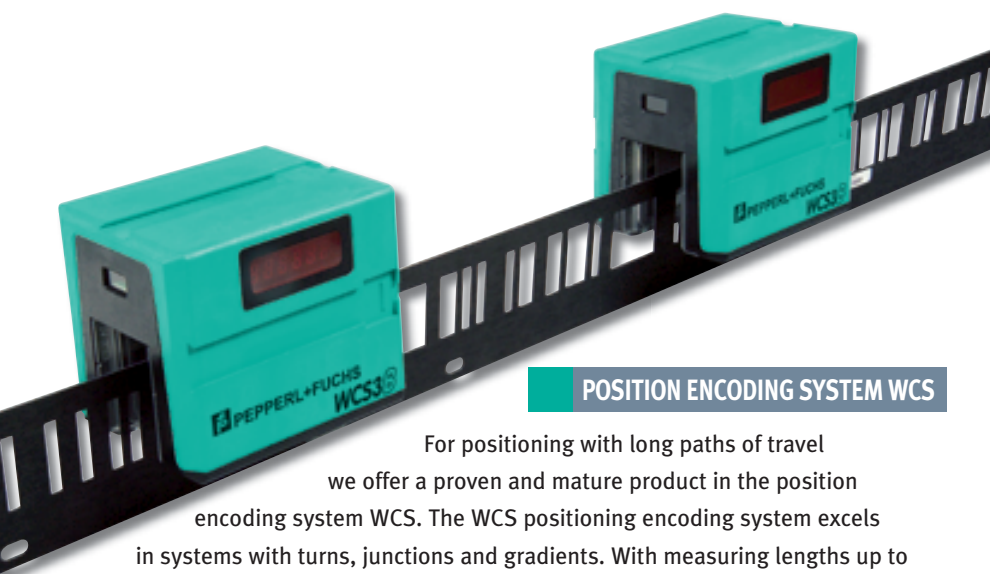
# POSITIONING SYSTEMS

Precise position detection plays a key role in many industrial processes. Depending on the application, this might include determining the position of linear movement units, such as work specimens or tool carriers, verifying angles in part-turn valve actuators, or monitoring of the position of a car on a suspended rail system in warehousing and conveying operations. Pepperl+Fuchs offers non-contact sensors and sensor systems for industrial use for all these applications.



## INDUCTIVE POSITIONING SYSTEMS

Different positioning systems are available to determine precise linear and rotary movements. This inductive position measurement system can get very dirty and still work properly. The measuring distances cover a range from a few millimeters to several meters or an angular range of 360°. In addition to the standard analog output for displaying the calculated position, configurable switching outputs are available. This permits certain process-relevant positions to be processed immediately, continuously, and accurately relative to the sensor face.

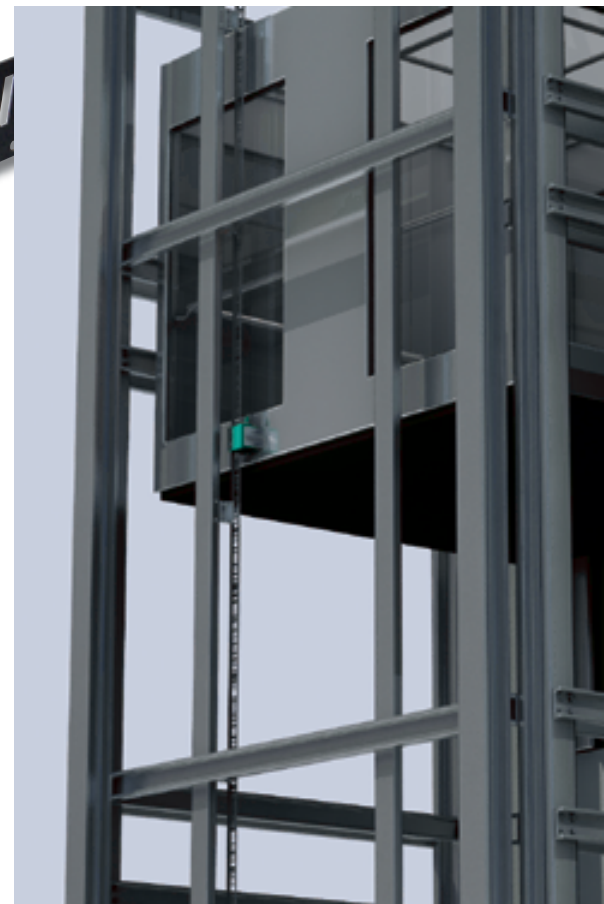


## POSITION ENCODING SYSTEM WCS

For positioning with long paths of travel we offer a proven and mature product in the position encoding system WCS. The WCS positioning encoding system excels in systems with turns, junctions and gradients. With measuring lengths up to 327 meters it is suited for position detection in:

- Warehousing and conveying systems
- Studio technology
- Crane positioning
- Galvanization stations
- Elevators

and for the identification of cars in conveying systems with the synchronized positioning of these cars at fraction-of-a-millimeter precision.



# PULSE EVALUATION DEVICES

When it comes to signal and pulse analysis, Pepperl+Fuchs offers you a broad choice of products.



## COUNTERS, TACHOMETERS, TIMERS

- Display: LED and LCD
- Up to 2 presets with relay or transistor output
- Scalable display values
- Up to 100 kHz frequencies
- Auxiliary power for sensors and rotary encoders
- Designs: 24 x 48, 48 x 48 and 96 x 48 (in mm)

## DISPLAY DEVICES

- Bright LED display (easily readable at 10 m)
- Scalable over up to 24 mounting points
- 14-bit resolution
- Up to 2 preset values
- Storage of min/max value

## SPEED MONITOR

- For example, for checking the motor speed
- As a standstill monitor with an adjustable cutoff frequency via DIP switch

## CURRENT FREQUENCY CONVERTER

- As a measured value transformer of a frequency on current/voltage

## SIGNAL CONVERTER

- For NAMUR sensors on semiconductor output (npn, pnp)
- For wire sensors with semiconductor output on relay output

# ACCESSORIES

Accessories to mount and connect sensors provide a potential for savings during installation and adjustment. In addition, diagnostic and commissioning tools save a great deal of time and effort – not only during first commissioning, but also during service! Pepperl+Fuchs offers you a comprehensive selection of electrical and mechanical accessories for your sensor system solution:



## ACCESSORIES

### AT A GLANCE

- A variety of quick disconnect connectors:
  - M12 (3 pin, 4 pin, 5 pin, 8 pin) or M8 (3 pin, 4 pin)
  - Straight or angled jacks or connectors
  - Various cable lengths, 1 m, 2 m, 3 m, 5 m or 10 m
  - PVC, PUR, halogen-free, shielded
- Mounting aids for rectangular sensors and safety light grids
- Mounting flanges for cylindrical sensors
- Passive distributor with M12 mounting stations for sensors and actuators
- Protective hose connections
- Matching accessories for each individual product, such as reflectors for retro-reflective sensors or the appropriate connection technology for AS-Interfaces
- Sensor tester

### ARE YOU LOOKING FOR SOMETHING DEFINITE?

**Our service team is ready to answer your questions about Factory Automation:**

**Phone: +49 621/776-4411**

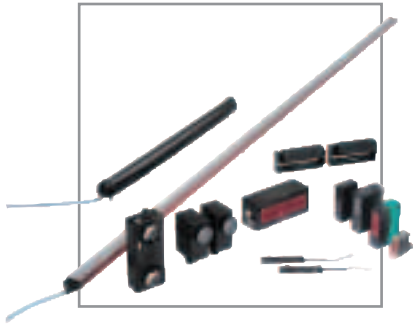
**Fax: +49 621/776-27-1111**

**E-Mail: [fa-info@de.pepperl-fuchs.com](mailto:fa-info@de.pepperl-fuchs.com)**

**Internet: [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)**



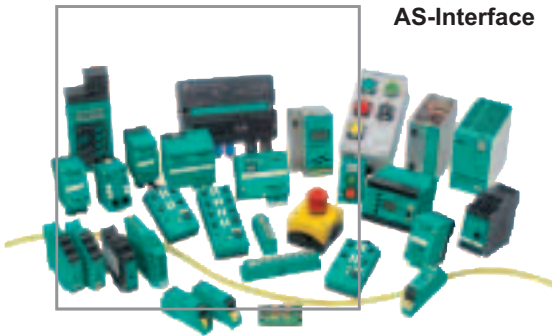
In addition to the sensors described in this catalog for Factory Automation, we can also offer you sensors and sensor systems from our extensive range of products for the following areas:



Sensors for  
Doors, gates and elevators



Photoelectric  
safety sensors



AS-Interface

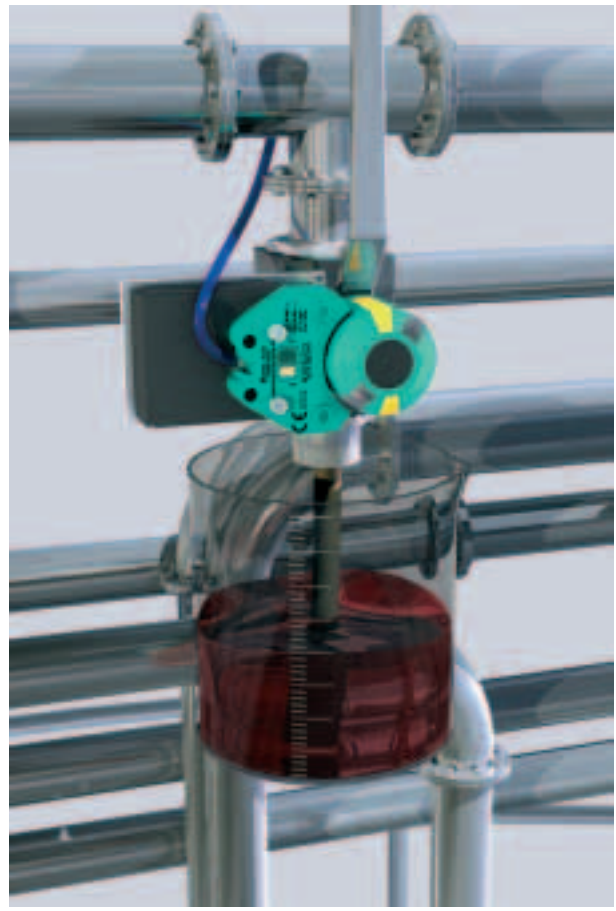


Identification systems



# Sensors for factory automation

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## Inductive sensors

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### Sensors with increased sealing properties







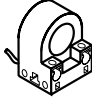
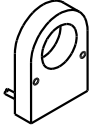
For special applications, e.g. in car wash installations, the sealing properties of standard sensors might not always be adequate under special environmental conditions.

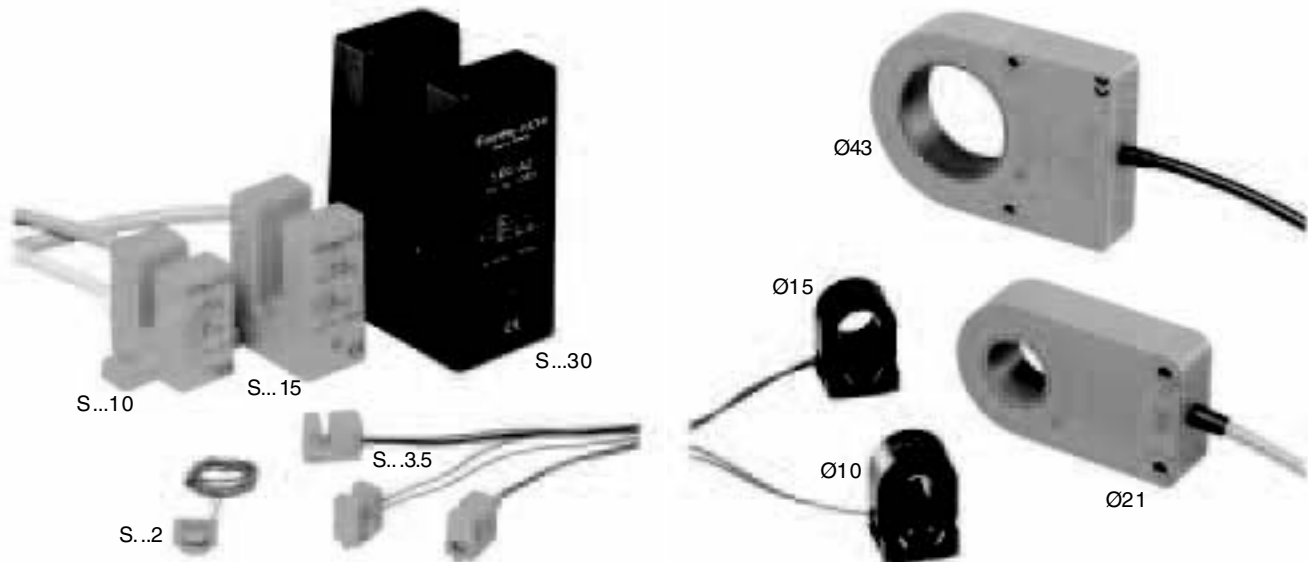
For such applications Pepperl+Fuchs has a wide range of sensors with IP rating IP68/ IP69k.

You will find these sensors in the series -12GK, -12GM, -18GK, -30GK, -L2, -L2M, *VariKont*, -FP, -11 and -22.

1 Slotted and ring-shaped design

Inductive Sensors

Housing		2 mm	3.5 mm	5 mm	10 mm	15 mm	30 mm	10/15 mm		21/43 mm	
											
Dimensions	Length [mm]	8	19.5	15	44	48	84	25		45	70
	Width [mm]	8	10	10	55	30	51	20		20	20
	Height [mm]	12	17	17	45	60	110	32,5		80	100
Slot width	[mm]	2	3.5	5	10	15	30				
Inside diameter	[mm]							10	15	21	43
Output	NAMUR	249 251	254 255	256	258	261	263	264	265	267	269
	Safety function	251	255								
	Two wires DC	248 250									
	Three wires DC		252 253		257	259				266	268
	Four wires DC		252			259	262				
	Two wires AC					260	262				
Connections	Cable	●	●	●	●	●	●	●	●	●	●



Date of issue 2008-04-04

Cylindrical designs


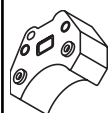
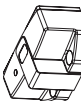
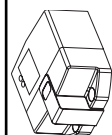

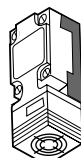
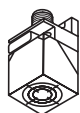

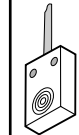
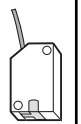
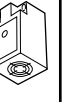
3 mm	4 mm	4.5 mm	5 mm	6.5 mm	8 mm	11 mm	12 mm	14 mm	18 mm	PG21	22 mm	30 mm	40 mm	50 mm	Housing
22	25	20	... 25	... 60	... 50	31	... 70	31	... 75	... 105	35	... 115	95	40	Length [mm]
3	4	4,5	M5	6.5	M8	11	M12	M14	M18	PG21	22	M30	40	50	Ø [mm]
0.6	1	0.8	0.8, 1.5	1.5, 2	1.5, 2, 3	2	2, 4, 6	2	2, 3, 5, 8, 12	6	6	5, 10, 15, 22			flush [mm]
				3	2, 3, 6	5	4, 6, 10	5	8, 12, 20	10	10	15, 25, 40	20	25	not flush [mm]
		153	153	153	154	155	156ff	155	158ff	160	160	161ff	163	163	NAMUR
						185	186		187		188	189			Safety function
					51, 56		64, 70		77, 82			87, 92			Two wires DC
44	44,		45	46ff	48ff 52ff		57ff 66ff		72ff 79ff			84ff 89ff		94	Three wires DC
					49ff 53		59ff 67ff		73ff 79ff			84ff 89ff	93		Four wires DC
					51		65, 71		78, 83			88	93	94	Two wires AC
							210		211			211			analog output
							214		214			214			AS interface
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Cable
				•	•		•		•			•	•		Connector
												•	•		Terminals
					130		130		131			131			Weld-proof
				138	139		140		141			142			R 1
					146		147		148			149			"Metal Face"
	172		172		173		174ff		176ff			178ff			3G, 3D
									192			193ff			Ext. Temperature range
							202		203ff						Pressure-resistant



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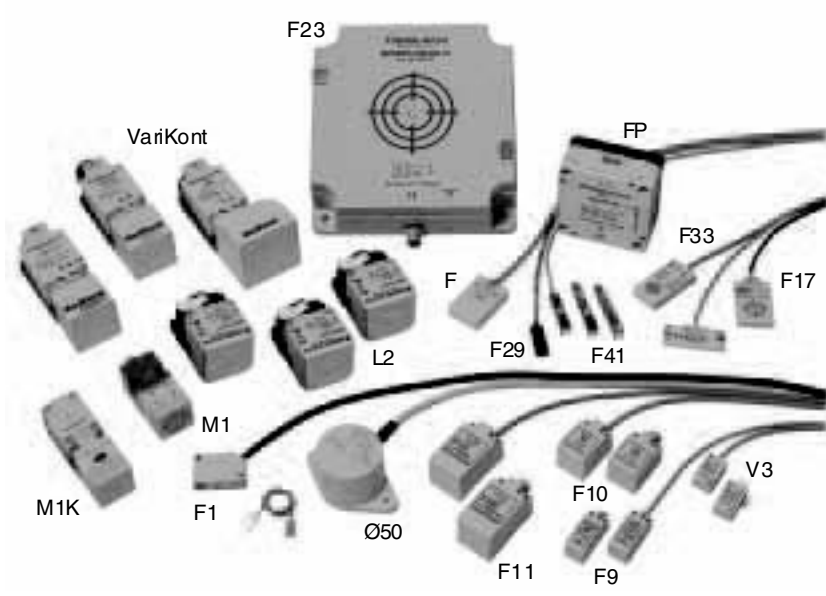
1 Cubic designs

Inductive Sensors

Housing		V3	F25	F31	F31K	M1	M1K	L2 L3(K)	VariKont	F	F1	F9
												
Dimensions	Length [mm]	27,8	52	65	65	72	91	67/86	118	45	40	38,5
	Width [mm]	16	52/61	36	77,5	30	30	40	40/55	30	26	16
	Height [mm]	10,2	20	33,5	35,5	30	30	40	40/55	12	12	16,5
Operating distance	flush [mm]	2, 3						15, 20	6, 15, 20	6	2, 4	5, 6
	not flush [mm]		2 x 3	2 x 3	2 x 3	15	15	30, 40	15, 20, 30, 40		8	
Output	NAMUR	164	225ff	238ff	240		166	167	168ff	165		
	Safety function		226									
	Two wires DC	98	222	230ff, 233	232			113	115ff			
	Three wires DC	97				109	109ff	111ff	115ff	105	102ff	100
	Four wires DC		220ff	227ff				111ff	114ff	105	102ff	
	Two wires AC								116ff			
	Three wires AC											
	Two wires AC/DC			229					116ff		104	
	Analog output						212					
	AS interface			240				216	217	215		
Connections	Cable	●	●	●				●		●	●	●
	Connector	●	●	●		●		●	●	●	●	●
	Terminals		●		●		●		●			
Special properties	Weld-proof							133ff	135			
	R 1							143				
	3G, 3D	180	223	233ff	235ff			181	182			
	Ext. Temperature range								195ff			

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F10	F11	F17	F29	F29A	F33	F33M	F41(A)	FP	F23	F79	Housing
38,5	52,5	50	27	27	50	50	40/55	80	177	16	Length [mm]
25	30	30	10	10	25	25	8	80	177	8	Width [mm]
25,5	30,5	7	7,2	10,7	10	10	8	40	60,5	4,7	Height [mm]
10		10	2		5	1,5, 5	1,5	40, 50		1,5	flush [mm]
15	15		4	4				50, 75	100		not flush [mm]
								171			NAMUR
								190			Safety function
								125f			Two wires DC
101	108	106		132	107	107	99		128	95	Three wires DC
			96		107	107		124f			Four wires DC
								125f			Two wires AC
											Three wires AC
											Two wires AC/DC
								212			Analog output
								218			AS interface
•	•	•	•	•	•	•	•			•	Cable
•	•						•	•	•		Connector
								•			Terminals
				132				136			Weld-proof
								144			R 1
								183			3G, 2D
								197			Ext. Temperature range



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The selection should be based on a decision about the suitable sensor principle. This results from the material of the object to be detected.

If the object is made from metal the inductive sensor is recommended.

If the object is made from plastic, paper, or it is a liquid (oil or water based), granulate or powder, then the capacitive sensor is recommended.

If the object can hold a magnet, then the magnetic field sensor is suitable.

More information about the physical action of these different sensor types can be found at the start of the respective chapter.

In 4 steps you will find the optimal sensor for your application:

**Step 1**

**Housing design**

**Step 2**

**Operating distance**

**Step 3**

**Electrical data and connections**

**Step 4**

**General specifications**

**Step 1**

**Housing design**

## Housing material

The standard housing materials are:

- stainless steel V2A,
- nickel-plated or Teflon coated brass,
- Crastin® (PBT)
- Rytor® (PPS)
- Polyamide (PA)

Crastin® is a semi-crystalline Polybutylenterephthalate (PBT) reinforced with glass fiber. It has excellent dimensional stability, is abrasion-proof, resistant to heat and cold, and withstands hydrocarbons (e.g. Trichlorethylen), acids (e.g. 28% sulphuric acid), sea water, 70 °C hot water, etc.

For temperatures of up to 150 °C Pepperl+Fuchs GmbH uses Rytor®, a crystalline Polyphenylene sulfide (PPS), which is dimensionally stable up to 200 °C. The electronics are vacuum-sealed in cast resin.

## Cable material

- PVC (Polyvinyl chloride):  
Standard quality for the electrical industry, conditionally resistant to all oils and grease, high abrasion resistance.
- PUR (Polyurethane):  
Resistant to all oils and grease, resistant to solvents, does not embrittle, high abrasion resistance.
- Silicone:  
Ideal for high and low temperatures (-50 °C to +180 °C), moderate abrasion resistance, moderate resistance to oils, grease, solvents.

	Temperature range for	
	PVC lines	PUR lines
subject to movement	-5 ... 70 °C	-5 ... 70 °C
not subject to movement	-30 ... 80 °C	-30 ... 100 °C



## Cuboid sensors



This housing shape introduced by Pepperl+Fuchs GmbH under the trade names VariKont and VariKont M features the assembly hole arrangement defined in the European standard EN 60947 (design IC30 and IC40). This arrangement is the same as for mechanical position end switches. The VariKont consists of a stable housing base (PBT or metal) that is screwed to the installation surface and contains the terminal connections. The VariKont M component is sealed with a neoprene seal against the housing base and holds the coded plug connection. The top component contains the switching amplifier. The sensor head can be placed in 5 directions, i.e. the active surface can face forward, to the right, left, top or down.

The types VariKont and VariKont M differ mainly in their dimensions. In addition to the terminal connections this product line is also available with V1 plug connector. The VariKont family has been extended by a new member, the VariKont L. This no longer has a terminal compartment and is therefore extremely compact. It can also be mounted using a single screwdriver. The active surface can be adjusted in 15° steps on two levels. The connection is via cable or V1 plug connector.

Type	Dimensions (front face) mm	Adjustments (head)
VariKont	40 x 40 or 55 x 55	Pivotable by 90° at a time
VariKont M	30 x 30	Pivotable by 90° at a time plus in 15° steps
VariKont L	40 x 40	Pivotable by 90° at a time plus in 15° steps

## Area sensors (FP)



These block-shaped proximity switches have a large front face area (80 mm x 80 mm) and therefore a large switching distance. They consist of two parts. The base contains the terminal compartment, the top the connection pins and the sensor element plus the electronics vacuum-sealed in cast resin. The top is always made from PBT, the base optionally from PBT or cast metal. They conform to the assembly hole arrangement defined in European standard EN 60947 (design ID80).

## Cylindrical sensors



They have their active zone on the front face in an axial direction. They are available in diameters of 3 mm (unthreaded) or 4 mm (threaded) up to 30 mm (threaded) or 40 mm smooth (with terminal housing).

## 1 Slotted inductive sensors

These have a U-shaped housing from PBT. The electromagnetic alternating field is generated between two coils opposing each other in the sides of the "U". The switching function is triggered if the object (metallic switch vane) enters the area between the coils.



## Ring-shaped inductive sensors

These proximity switches are shaped as a ring. The electromagnetic alternating field is focused inside the ring. The switching function is triggered if a metallic object enters the ring.

The housing material is made from PBT.



## Screw-on sensors

These small proximity switches are screwed onto the surface provided. There are designs with the active zone facing up or forward.

The housing is normally from PBT.



Pepperl+Fuchs GmbH produces, amongst others:

Housing	Dimensions (W x H x D), mm
F1	26 x 12 x 40
F9	16 x 16,5 x 38,5
F10	25 x 25,5 x 38,5
F11	30 x 30,5 x 52,5
F17	50 x 30 x 7
F29	27 x 10 x 7,2
F33	50 x 25 x 10
F33M	50 x 50 x 7,2
F79	16 x 8 x 4,7

## Inductive positioning systems PMI...

Based on the high precision evaluation of several coil systems, the inductive distance measuring systems F90, F110 and F112 can determine exact positions along linear paths of movement. The inductive distance measuring system PMI360D has been optimized for the continuous angle measurement at part-turn valve actuators and valves. The inductive distance measuring systems can be found in **chapter 7 from page 597**.



Step  
2

## Operating distance

The switching distance is the most important characteristic of a proximity switch. It depends mainly on the sensor diameter (coil or capacitor). The dimensions and material composition of the actuator and the ambient temperature also play a part. For magnetic proximity switches the orientation and field strength of the magnet used must further be taken into account.

## Definition of the switching distance

EN 60947-5-2 defines the switching distance for all types of proximity switches with the exception of slotted and ring-shaped designs.

There are two options for operating a proximity switch:

- by axial approximation
- by radial approximation

The following definitions apply initially only to axial operation.

Nominal switching distance  $s_n$ 

The nominal switching distance (according to EN 60947-2-5 the "design switching distance") is a conventional value for defining the switching distance. It does not take account of manufacturing tolerances or changes due to external effects such as voltage and temperature.

## Standard measuring plate

The following switching distances are calculated using a standard measuring plate. This is square in shape, has a thickness of 1 mm and consists of steel, e.g. type FE 360 (ST37) with a machined surface.

It either has a lateral length of

- 1 x the internal circular diameter of the active surface, or
- $3 \times s_n$ .

The larger value always applies. For capacitive proximity switches the standard measuring plate must be grounded.

## Example 1:

proximity switch M18  
switching distance 5 mm  
 $3 \times$  switching distance = 15 mm < diameter

Therefore the actuator must be  $18 \times 18 \times 1$  mm in size

## Example 2:

proximity switch M18  
switching distance 8 mm  
 $3 \times$  switching distance = 24 mm diameter

Therefore the actuator must be  $24 \times 24 \times 1$  mm in size

## This standard measuring plate represents the optimum actuator element for operation!

A reduction in the dimensions or change in the material composition reduces the switching distance!

Real switching distance  $s_r$ 

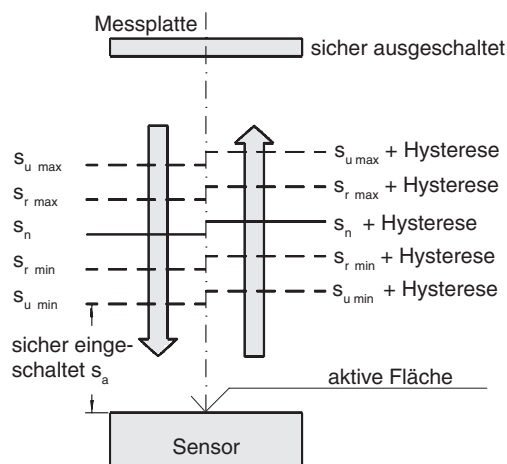
The switching distance of an *individual* proximity switch measured at an ambient temperature of  $23 \pm 5^\circ\text{C}$  with a voltage within the operating voltage range and with specified installation conditions:

$$0.9 \cdot s_n \leq s_r \leq 1.1 \cdot s_n$$

Useful switching distance  $s_u$ 

The switching distance of an *individual* proximity switch measured in an ambient temperature range between  $-25^\circ\text{C}$  and  $+70^\circ\text{C}$  with a supply voltage between 85 % and 110 % of the nominal operating voltage:

$$0.9 \cdot s_r \leq s_u \leq 1.1 \cdot s_r$$

Safe switching distance  $s_a$ 

Distance from the active surface at which the triggering of the proximity switch is guaranteed under defined conditions:

$$0 \leq s_a \leq 0.81 \cdot s_n$$

## Repeat accuracy R

Change of the real switching distance  $s_r$  measured over a period of eight hours at a housing temperature of  $(23 \pm 5)^\circ\text{C}$ , at any relative humidity, and with a supply voltage  $U_e \pm 5\%$  or any voltage  $\pm 5\%$  within the nominal operating voltage range:

$$R \leq 0.1 \cdot s_r$$

## Hysteresis H

The distance between the switching points when the measuring plate approaches and moves away from the proximity switch. It is specified relative to the real switching distance  $s_r$ , measured at an ambient temperature of  $(23 \pm 5)^\circ\text{C}$  and the nominal operating voltage:

$$H \leq 0.2 \cdot s_r$$

## Safely switched off

A proximity switch is safely switched off if the distance of the measuring plate to the active surface is at least three times the nominal switching distance  $s_n$ .

## 1 Lateral approximation

So far only the axial approximation of the standard plate has been covered. If the plate is instead moved laterally into the active zone, a different switching distance  $s$  results dependent on the axial distance. This relationship is described by the trigger graph.

### Effects on the switching distance

The material composition of the attenuation element play an important role besides its dimensions. This is described by the **reduction factor**. The reduction factor indicates by which factor the switching distance is reduced for different materials compared to steel FE 360 (St37) for inductive proximity switches, and compared to a grounded plate for capacitive proximity switches. The smaller the reduction factor the smaller the switching distance for the specific material. Because this reduction factor for the inductive proximity switch depends, amongst other things, on the housing and shielding material, it may vary between types. Therefore, the value specified in the respective data sheet is relevant.

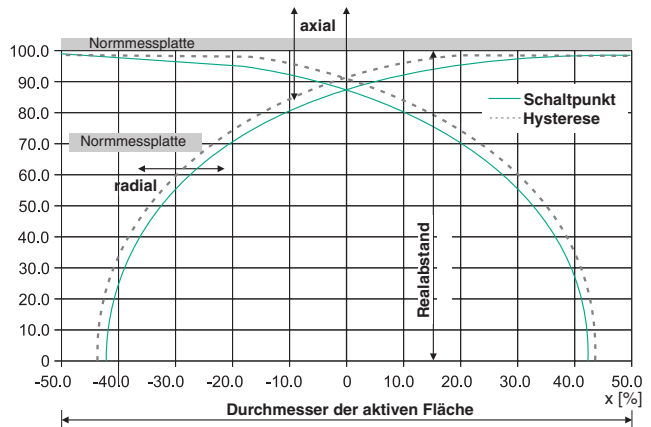
For the inductive proximity switch the quotient conductivity/permeability of the attenuation element is the characteristic value for the reduction factor. Here are some typical values for the reduction factor:

Material	Reduction factor
Structural steel	1
Aluminum foil	1
Stainless steel	0.85
Aluminum	0.4
Brass	0.4
Copper	0.3

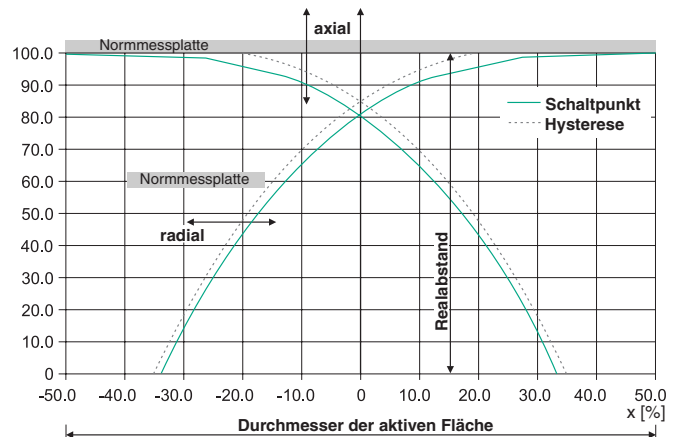
For the capacitive proximity switch the relative permeability is the characteristic value for the reduction factor. Here are some typical values for the reduction factor:

Material	Reduction factor
Grounded plate	1
Water	1
Alcohol	0.75
Ceramics	0.6
Glass	0.5
PVC	0.45
Ice	0.3
Oil	0.28

## Trigger graphs for proximity switches



Standardized trigger graph for capacitive proximity switches



Standardized trigger graph for inductive proximity switches

## Installation condition

### Cylindrical proximity switches

Devices with the same diameter may have different switching distances. The following table shows typical examples:

Diameter [mm]	Switching distance		
	flush	not flush	increased switching distance
6.5	1.5	2	-
8	1.5	2	3
12	2	4	6
18	5	8	12
30	10	15	22

### Proximity switches that are installed non-flush

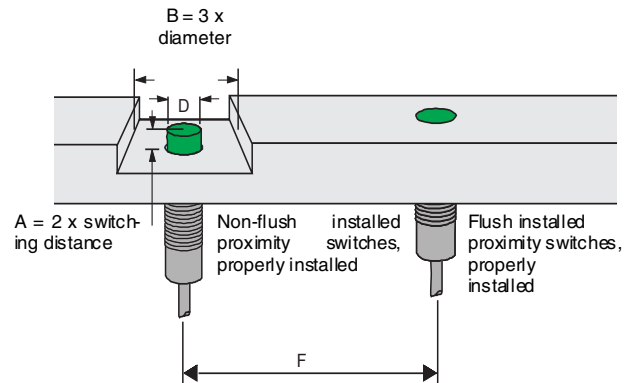
The largest possible switching distance (relative to the diameter) is achieved by proximity switches that are installed non-flush. As already hinted earlier the inductive proximity switch utilizes coils for generating the electromagnetic field. To achieve a particular direction of the field these coils are wound in an encapsulated core. Nonetheless, some of this field will radiate sideways. A lateral effect can also be noticed in capacitive proximity switches.

To avoid these products with a large range to be already attenuated by the environment, a clear space must be created around the sensor element complying with the minimum values in the following table.

Type	Dimensions [mm]				
	A		B		F
ind.	$2 \times S_n$		$3 \times D$		flush $F = D$ not flush $F = 3 \times D$
cap.	Plastic	Metal	Plastic	Metal	
CJ1	5	15	15	30	60
CJ4	20	35	80	120	60
CJ2	15	50	30	60	100
CJ6	40	50	80	160	100

### Proximity switches that are installed flush

Flush installed inductive and capacitive proximity switches can be used without clearance ( $A = 0$ ). An advantage is that they are thus mechanically better protected and less sensitive to erroneous effects than non-flush installed types. The required reduction of the lateral field is achieved by a special internal shielding. This is at the expense of the range; these proximity switches only achieve approx. 60% of the switching distance of designs for non-flush installation.

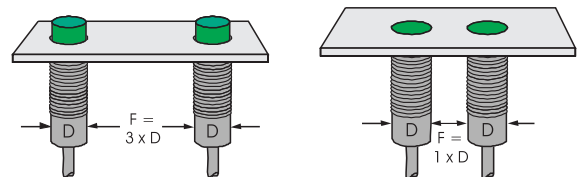


The switching behavior of magnetic field sensors is practically not affected by the installation conditions as long as the surrounding material is not magnetizable.

### Mutual interference

The minimum distances  $F$  specified in the table above must be kept to prevent any mutual interference. If these distances cause problems with the application, then proximity switches with offset frequencies are available upon request. These can then be installed directly adjacent.

If in doubt please enquire.



Non-flush installed proximity sensors,  $F$  must be 3 times the housing diameter

Flush installed proximity sensors,  $F$  must be equivalent to the housing diameter

**Cuboid proximity switches (Varikont)**

(active surface facing forward)

Type	Installation	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	B	Y	X	
		A = any		A = any					
	Dimensions [mm]	X	Y	Y	Y	B	Y	X	
NJ15+U1+...	flush	≥ 0	≥ 0	≥ 0		45	≥ 50	≥ 0	
NCB15+U1...	flush	≥ 0	≥ 0	≥ 0		45	≥ 60	≥ 0	
NJ20+U1...(AC)	not flush	≥ 20	-	-		60	≥ 60	≥ 5	
NJ20+U1...(DC)	flush	≥ 0	≥ 0	≥ 0		60	≥ 40	≥ 0	
NCN20+U1+...	not flush	≥ 25	-	-		60	≥ 120	≥ 10	
NJ30+U1+...	not flush	≥ 35	-	-		90	≥ 120	≥ 20	
NCN30+U1+...	not flush	≥ 30	-	-		90	≥ 100	≥ 20	
NJ40+U1+... (head 55 x 55 mm)	not flush	-	-	-		120	≥ 160	≥ 25	
NCN40+U1+...(AC) (head 55 x 55 mm)	not flush	-	-	-		120	≥ 240	≥ 25	
NCN40+U1+...(DC) (head 40 x 40 mm)	not flush	-	-	-		120	≥ 160	≥ 25	

(active surface facing up)

Type	Installation	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	X	Y	X	Y
		A ≤ 40		A ≤ 40		A ≤ 40		A ≤ 40	
	Dimensions [mm]	X <td>Y <td>Y <td>Y <td>X</td> <td>Y</td> <td>X</td> <td>Y</td> </td></td></td>	Y <td>Y <td>Y <td>X</td> <td>Y</td> <td>X</td> <td>Y</td> </td></td>	Y <td>Y <td>X</td> <td>Y</td> <td>X</td> <td>Y</td> </td>	Y <td>X</td> <td>Y</td> <td>X</td> <td>Y</td>	X	Y	X	Y
NJ15+U1+...	flush	≥ 0	≥ 0	≥ 0		≥ 0	≥ 0	≥ 0	≥ 0
NCB15+U1...	flush	≥ 0	≥ 0	≥ 0		≥ 0	≥ 0	≥ 0	≥ 0
NJ20+U1...(AC)	not flush	≥ 0	-	-		≥ 30	≥ 5	≥ 30	≥ 5
						≥ 40	≥ 0	≥ 40	≥ 0
NJ20+U1...(DC)	flush	≥ 0	≥ 0	≥ 5		≥ 0	≥ 0	≥ 0	≥ 0
NCN20+U1+...	not flush	≥ 0	≥ 10	≥ 20		≥ 0	≥ 10	≥ 0	≥ 20
NJ30+U1+...	not flush	≥ 15	-	-		≥ 40	≥ 15	≥ 40	≥ 20
NCN30+U1+...	not flush	≥ 0	-	-		≥ 30	≥ 5	≥ 30	≥ 10
						≥ 40	≥ 0	≥ 40	≥ 5
NJ40+U1+... (head 55 x 55 mm)	not flush	≥ 0	-	-		≥ 45	≥ 0	≥ 55	≥ 0
NCN40+U1+...(AC) (head 55 x 55 mm)	not flush	≥ 0	-	-		≥ 50	≥ 0	≥ 55	≥ 0
NCN40+U1+...(DC) (head 40 x 40 mm)	not flush	≥ 30	-	-		≥ 40	≥ 15	≥ 40	≥ 20

In individual cases deviations are possible due to exemplary dispersion

<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>
≥ 0	≥ 0	≥ 0	≥ 0	≥ 50
≥ 0	≥ 0	≥ 0	≥ 0	≥ 80
≥ 10	≥ 5	≥ 10	≥ 15	≥ 60
≥ 20	≥ 0	≥ 20	≥ 0	
≥ 0	≥ 0	≥ 0	≥ 0	≥ 50
≥ 20	≥ 0	≥ 20	≥ 0	≥ 120
≥ 30	≥ 0	≥ 30	≥ 10	≥ 160
≥ 40	≥ 0	≥ 40	≥ 0	
≥ 30	≥ 10	≥ 40	≥ 0	≥ 100
≥ 40	≥ 0			
≥ 30	≥ 0	≥ 30	≥ 20	≥ 180
≥ 40	≥ 0	≥ 40	≥ 0	
≥ 30	≥ 0	≥ 40	≥ 0	≥ 300
≥ 30	≥ 10	≥ 30	≥ 15	≥ 300
≥ 40	≥ 0	≥ 40	≥ 0	

(active surface to the side)

	<b>Type</b>
<b>X</b>	
≥ 0	NJ15+U1+...
≥ 0	NCB15+U1...
≥ 20	NJ20+U1...(AC)
≥ 0	NJ20+U1...(DC)
≥ 25	NCN20+U1+...
≥ 30	NJ30+U1+...
≥ 30	NCN30+U1+...
≥ 45	NJ40+U1+... (head 55 x 55 mm)
≥ 45	NCN40+U1+...(AC) (head 55 x 55 mm)
-	NCN40+U1+...(DC) (head 40 x 40 mm)

				<b>Type</b>	
<b>Y</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
≥ 0	≥ 5	≥ 0	≥ 0	≥ 0	≥ 5
≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0
-	-	≥ 30	≥ 5	≥ 30	≥ 5
-	-	≥ 40	≥ 0	≥ 40	≥ 0
≥ 0	≥ 5	≥ 0	≥ 0	≥ 0	≥ 5
≥ 10	≥ 20	≥ 0	≥ 10	≥ 0	≥ 20
-	-	≥ 40	≥ 15	≥ 40	≥ 20
-	-	≥ 30	≥ 5	≥ 30	≥ 10
-	-	≥ 40	≥ 0	≥ 40	≥ 5
-	-	≥ 50	≥ 0	≥ 55	≥ 5
-	-	≥ 50	≥ 0	≥ 55	≥ 5
-	-	≥ 40	≥ 15	≥ 40	≥ 20

### 1 Cuboid proximity switches (Varikont L)

(active surface facing forward)

Type	Installation	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	B	Y	X	
				A = any	A = any				
Dimensions [mm]		X	Y	Y	Y	B	Y	X	
NBB20-L2...	flush	≥ 0	≥ 0	≥ 0		60	≥ 80	≥ 0	
NBN30-L2...	not flush	≥ 35	-	-		90	≥ 160	≥ 20	
NBN40-L2...	not flush	40	-	-		120	≥ 160	≥ 20	

(active surface facing up)

Type	Installation	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	X	Y	X	Y
				A ≤ 40	A ≤ 40	A ≤ 40	A ≤ 40		
Dimensions [mm]		X	Y	Y	Y	X	Y	X	Y
NBB20-L2...	flush	≥ 0	≥ 0	≥ 0		≥ 0	≥ 0	≥ 0	≥ 0
NBN30-L2...	not flush	≥ 25	-	-		≥ 30	≥ 20	≥ 30	≥ 30
						≥ 40	≥ 10	≥ 40	≥ 20
NBN40-L2...	not flush	≥ 0	≥ 28	≥ 35		≥ 0	≥ 28	≥ 0	≥ 35

### Area switches (FP)

Type	Installation	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	B	Y	Y	
				A ≤ 40	A ≤ 40				
Dimensions [mm]		X	Y	Y	Y	B	Y	Y	
NCB40-FP..	flush	≥ 0	≥ 0	≥ 0		120	≥ 225	≥ 0	
NCN50-FP..	not flush	≥ 25	≥ 20	≥ 30		150	≥ 450	≥ 45	
NCB50-FP..	flush	≥ 5	≥ 0	≥ 0		150	≥ 120	≥ 10	
NJ40-FP..	not flush	≥ 40	≥ 0	≥ 0		120	≥ 150	≥ 20	
NJ50-FP..	not flush	≥ 40	≥ 20	≥ 0		150	≥ 240	≥ 45	
NRB50-FP..	flush	≥ 5	≥ 0	≥ 0		150	≥ 120	≥ 10	
NBN75-FP..	not flush	≥ 20	≥ 40	≥ 40		200	≥ 480	≥ 45	

In individual cases deviations are possible due to exemplary dispersion



A = any		A = any		
X	Y	X	Y	X
≥ 0	≥ 0	≥ 0	≥ 0	≥ 70
≥ 30	≥ 10	≥ 30	≥ 10	≥ 140
≥ 40	≥ 0	≥ 40	≥ 0	
≥ 30	≥ 10	≥ 30	≥ 15	≥ 300
≥ 40	≥ 0	≥ 40	≥ 0	

(active surface to the side)

	Type
X	
≥ 0	NBB20-L2...
-	NBN30-L2...
-	NBN40-L2...

				Type	
A = any		A = any			
Y	Y	X	Y	X	Y
≥ 5	≥ 10	≥ 0	≥ 5	≥ 0	≥ 10
-	-	≥ 30	≥ 20	≥ 30	≥ 30
		≥ 40	≥ 10	≥ 40	≥ 20
≥ 36	≥ 42	≥ 0	≥ 36	≥ 0	≥ 42
					NBB20-L2...
					NBN30-L2...
					NBN40-L2...

	Type
X	
≥ 290	NCB40-FP...
≥ 530	NCN50-FP...
≥ 240	NCB50-FP...
≥ 400	NJ40-FP...
≥ 500	NJ50-FP...
≥ 250	NRB50-FP...
≥ 560	NRN75-FP...

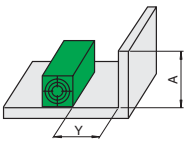
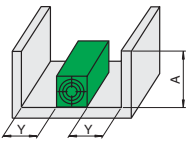
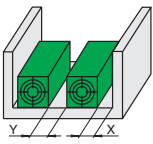
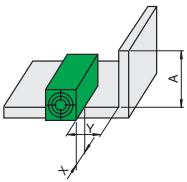
**Mutual interference**

To prevent the mutual interference between two similar sensors the minimum distances specified in these tables must be kept. For applications where these distances cannot be maintained proximity switches with offset frequencies are available upon request. These can then be installed directly adjacent.

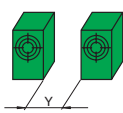
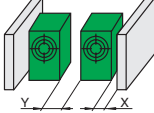
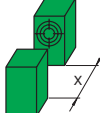
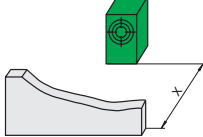
Please talk to our product specialist.

1 Cuboid proximity switches (other series)

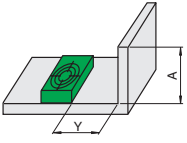
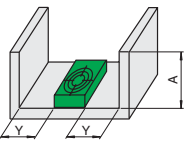
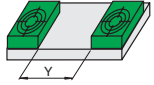
Series -F9, -F10, -F11

Type	Installation									
		A	Y	A	Y	Y	X	A	Y	X
NBB5-F9...	flush	no effect	≥ 0	no effect	≥ 0	≥ 34	≥ 0	no effect	≥ 0	≥ 0
NBN10-F10..	not flush	-	-	-	-	-	-	no effect	≥ 0	≥ 1
NBN15-F11..	not flush	-	-	-	-	-	-	no effect	≥ 0	≥ 7

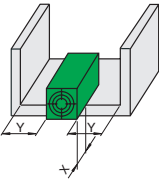
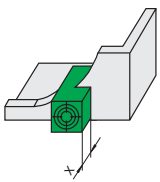
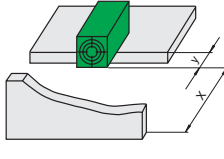
Series -F1 and -V3

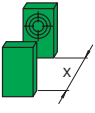
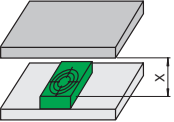
Type	Installation									
		X	Y	X	X	X	X			
NBB2-F1...	flush	≥ 0	≥ 0	≥ 0	≥ 15	≥ 6				
NBB4-F1...	flush	≥ 0	≥ 0	≥ 0	≥ 20	≥ 12				
NBB2-V3...	flush	≥ 2	≥ 2	≥ 0	≥ 15	≥ 6				
NBB3-V3...	flush	≥ 10	≥ 11	≥ 0	≥ 23	≥ 9				

Series -F, -F41, -F29, -F79, -F17, -F33

Type	Installation							
		A	Y	A	Y	Y		
NJ6-F...	flush	≤ 12	≥ 0	≤ 12	≥ 0	≥ 0		
NBB1,5-F41...	flush	≤ 8	≥ 0	≤ 8	≥ 0	≥ 0		
NBN4-F29...	not flush	≤ 5	≥ 0	≤ 2	≥ 0	≥ 13		
NBB1,5-F79...	flush	≤ 5	≥ 0	≤ 5	≥ 0	≥ 0		
NCB10-F17..	flush	≤ 7	≥ 0	≤ 7	≥ 0	k. A.		
NBB5-F33...	flush	≤ 10	≥ 0	≤ 10	≥ 0	≥ 0		

In individual cases deviations are possible due to exemplary dispersion

						Type
A	Y	X	X	X	Y	
no effect	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 10$	$\geq 0$	NBB5-F9...
no effect	$\geq 0$	$\geq 5$	$\geq 5,5$	$\geq 30$	$\geq 1$	NBN10-F10...
no effect	$\geq 0$	$\geq 12$	$\geq 17$	$\geq 45$	$\geq 7$	NBN15-F11...

		Type
X	X	
$\geq 63$	$\geq 18$	NJ6-F...
$\geq 13$	$\geq 5$	NBB1,5-F41...
$\geq 25$	$\geq 12$	NBN4-F29...
$\geq 11$	$\geq 5$	NBB1,5-F79...
k. A.	$\geq 30$	NCB10-F17...
$\geq 40$	$\geq 15$	NBB5-F33...

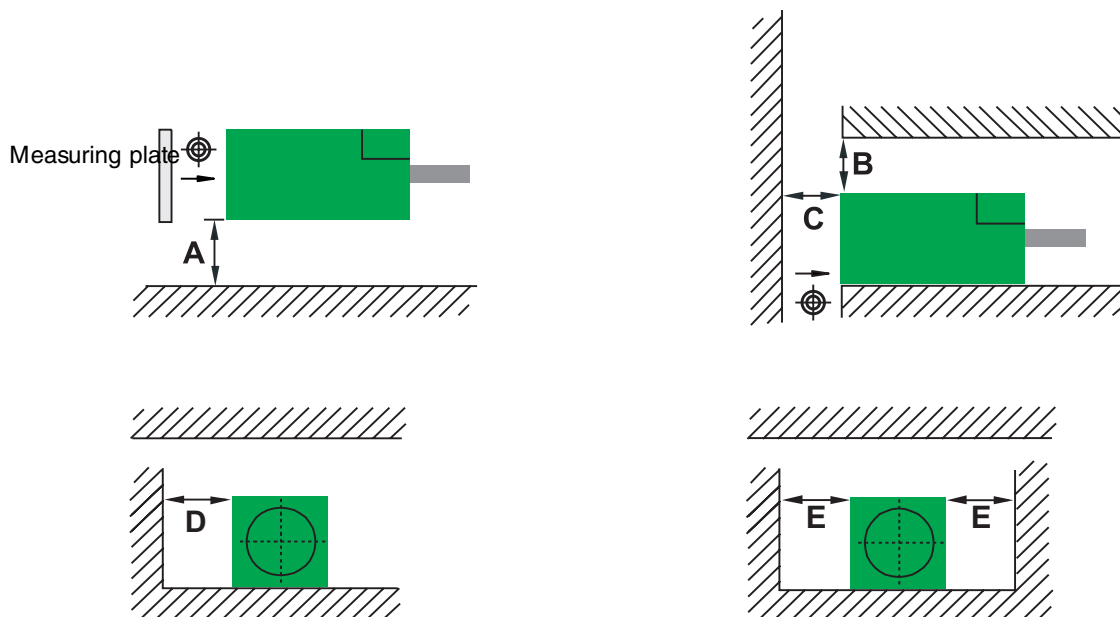
1 Inductive Sensors Screw-on proximity switches

Inductive Sensors

Type	Installation	Distance [mm]						
		A	B	C	D	E	F	G
NJ2-F1-	flush	0	0	6	0	0	12	16
NBB2-V3-	flush	0	0	6	0	0	0	10
NJ4-F1	not flush	0	12	12	18	24	24	32
NBB5-F9-...	flush	0	0	15	0	0	16	20
NBN5-F7-...	not flush	0	0	15	0	0	17	20
NJ6-F-...	flush	0	0	18	0	0	22	25
NBB7-F10-...	flush	0	0	20	0	0	25	30
NBN10-F10-...	not flush	0	0	30	0	5	25	40
NCB10-F17-...	flush	7,5	0	30	0	0	40	40
NBN15-F11-...	not flush	0	0	45	0	10	30	60

**Note:**

Not flush installed proximity switches must not be surrounded by metal on all sides.

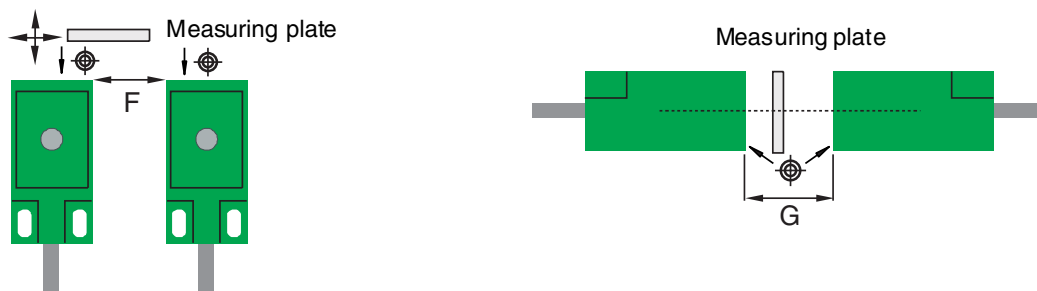


**Mutual interference**

To prevent the mutual interference between two similar sensors the minimum distances specified in these tables must be kept.

For applications where these distances cannot be maintained proximity switches with offset frequencies are available upon request. These can then be installed directly adjacent.

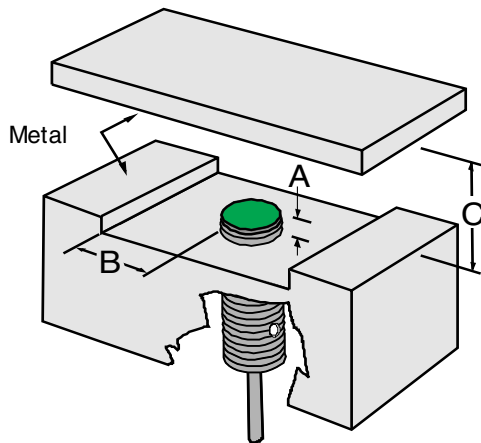
Please talk to our product specialist.



## Proximity switches with increased switching distance

These sensors with extremely increased switching distance cannot be installed fully flush in metal. They are described as semi-flush installed.

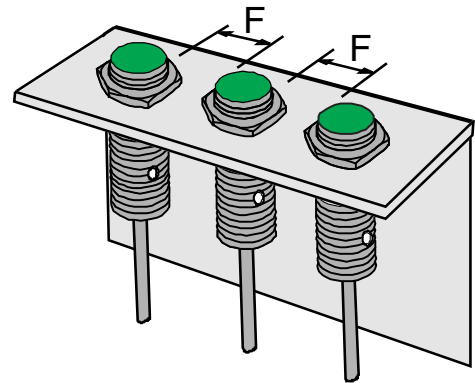
Type	Distance [mm]				
	A (steel, nonferrous heavy metal)	A (stainless steel)	B	C	F
NEB 3-8...	1,0	0	3	9	8
NEB 6-12...	2,0	1,0	6	18	18
NEB 12-18..	4,0	1,5	12	36	26
NEB 22-30..	6,0	1,5	22	66	50
NEN 6-8...	8	8	8	18	20
NEN 10-12..	12	12	12	30	30
NEN 20-18..	22	22	22	60	60
NEN 40-30..	40	40	40	120	120



## Mutual interference

To prevent the mutual interference between two similar sensors the minimum distances specified in these tables must be kept. For applications where these distances cannot be maintained proximity switches with offset frequencies are available upon request. These can then be installed directly adjacent.

Please talk to our product specialist.



Step  
3

## Electrical data and connections

Pepperl+Fuchs GmbH supplies proximity switches that can be operated with AC and/or DC supply voltages.

The following list provides an exemplary overview.

**DC voltage proximity switches, two-core wire, type Z**

These are operated with the load in series. Most of them are tolerant to pole reversal (function independent of connection polarity) and mostly short-circuit proof, others are safe against pole reversal (function only with correct polarity, otherwise the proximity switch remains at a high resistance) and short-circuit proof. In the closed state only a low residual current flows for functional reasons. In the open state a small voltage drop occurs above the switch. They are supplied as

- NO switches (Z/Z0, Z3, Z4),
- NC switches (Z1, Z5),
- programmable by wiring (Z2).

**DC voltage proximity switches, three-core wire, type E**

These sensors have separate connections for the power supply and the load. They are protected against overload, short circuit and pole reversal. The residual current is negligible. They are supplied as

- NO switches, minus-switching (E or E0),
- NC switches, minus-switching (E1),
- NO switches, plus-switching (E2),
- NC switches, plus-switching (E3),
- NO/NC switches changeable, minus-switching (E4)
- NO/NC switches changeable, plus-switching (E5).
- NO switches, two channel (E8),

**DC voltage proximity switches, four-core wire, type A**

These proximity switches correspond to the E types but are equipped with one NC and one NO output:

- NC and NO switches, minus-switching (A or A0).
- NC and NO switches, plus-switching (A2)

**AC voltage proximity switches, two-core wire, type W**

These are operated with the load in series. In the closed state a small residual current flows for functional reasons and in there is a voltage drop at the conductive switch. They are supplied as

- NC switches (WÖ),
- NO switches (WS),
- NC or NO switches (W)  
(programmable by wiring).

**Universal voltage proximity switches, two-core wire, type U**

These are operated with the load in series. They can be connected both to DC and AC voltage supplies. They are protected against overload and short circuit. In the closed state a small residual current flows for functional reasons and in there is a voltage drop at the conductive switch. They are supplied as

- NC switches (UÖ),
- NO switches (US),
- NC or NO switches (U) (programmable by wiring).

**NAMUR proximity switches, two-core wire, N**

NAMUR proximity sensors (Normenarbeitsgemeinschaft für Mess- und Regelungstechnik der chemischen Industrie) in accordance with EN 60947-5-6 (VDE 0660 part 212) are two-core wire sensors with a constant or non-constant distance/current characteristic. They are supplied as

- NC switches (N/NO),
- NO switches (1N),
- NC switches two channel (N4).

NAMUR sensors are connected to external switching amplifiers that convert the current change into a binary output signal. Pepperl+Fuchs GmbH offers a multitude of switching amplifiers for Ex and non-Ex applications.

**Safety proximity sensors, two-core wire, SN**

These proximity sensors correspond to the N types but have a particular behavior: during a malfunction of the system sensor/evaluation unit/connection cable the output of the evaluation unit automatically assumes the safe "OFF" state.

The proximity sensors are available in the following versions

- NC switches (SN) and
- NO switches (S1N).

**AS interface proximity switches**

This type of proximity switch is connected directly to the AS interface bus. The communication capability of these devices permits an extended functionality:

- Pre-failure indication
- Line monitoring
- Oscillator monitoring
- Parameterization (NO/NC)
- Switch on/off delay

## Parallel and series connection

Proximity switches can be connected parallel or in series to implement functions such as AND, OR, NAND and NOR. The following must be taken into account:

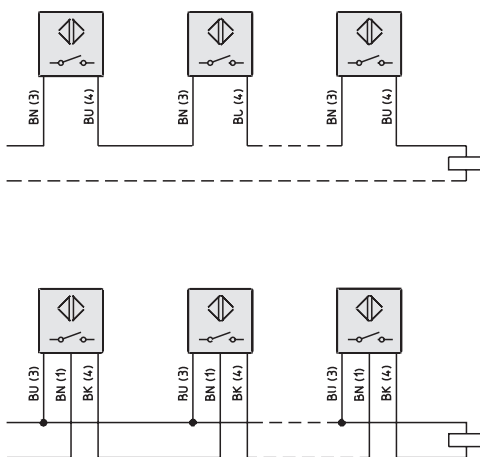
### Series connection of proximity switches

Proximity switches in two and three-core wire technology can be connected in series with the exception of NAMUR proximity switches (EN 60947-5-6).

The maximum number of proximity switches switchable in a series application depends on the following parameters:

- functional voltage drop at the proximity switch
- required operating voltage by the load
- applied supply voltage

The integrated standby delay can increase the response time in three-core wire proximity switches.



## Parallel connection of proximity switches

The parallel connection of two-core wire proximity switches, with the exception of NAMUR proximity switches (EN 60947-5-6), is generally possible, but is not recommended. This is mainly due to two reasons:

1. When switching on a proximity switch the voltage drops at the other proximity switches. This can cause an insufficient supply and faulty signals.
2. The sum of all residual currents of the proximity switches flows through the load. This can prevent the load from being switched off and limits the maximum number of proximity switches in two-core wire technology connected in parallel:

$$\text{Number}_{\text{max.}} = \text{holding current of the load}_{\text{min.}} / \text{residual current per switch}_{\text{max.}}$$

Example:

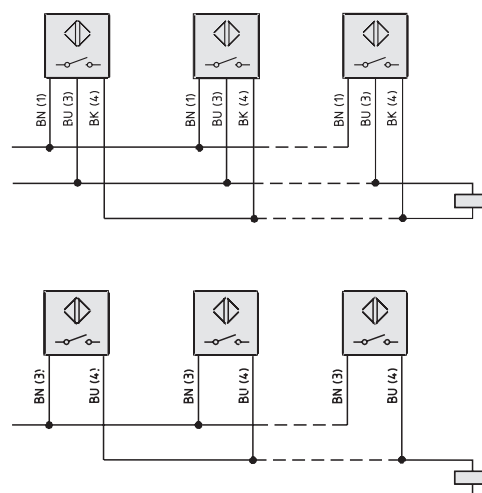
min. holding current of the load = 10 mA

Max. residual current per switch = 1.8 mA

Number<sub>max.</sub> = 10 mA / 1.8 mA = 5.55

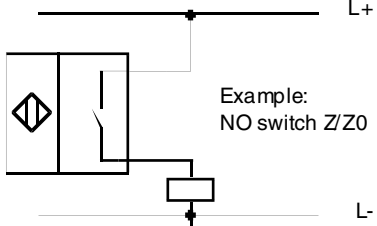
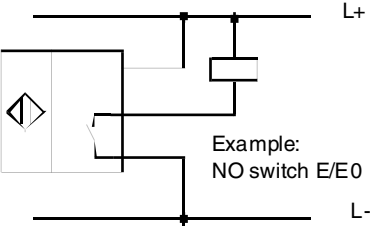
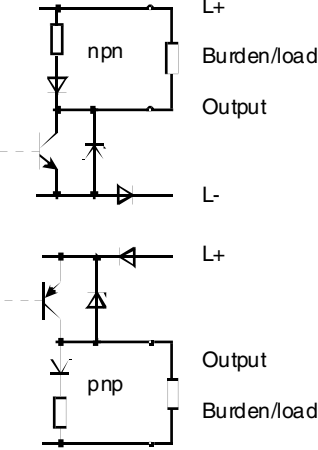
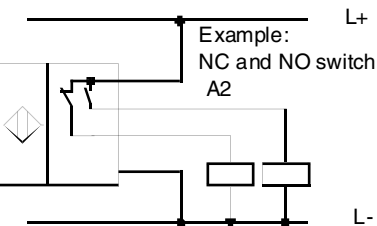
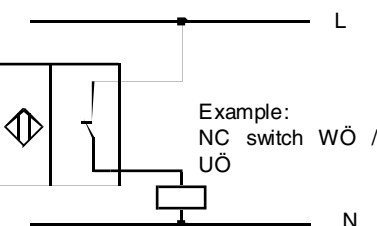
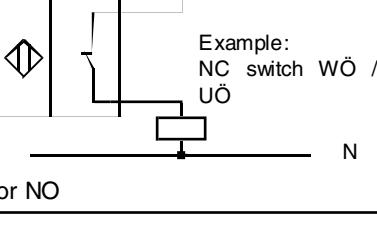
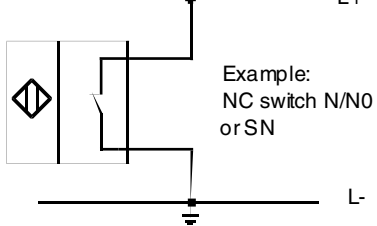
Max. 5 switches can be connected in parallel.

In three-core wire switches the parallel connection is normally non-critical.



## Combined connection of mechanical and electronic switches

For proximity switches in three-core wire technology the parallel connection with mechanical switches is unproblematic. In all other cases the standby delay of the proximity switch always increases the response time. When connecting two-core wire proximity switches in parallel together with mechanical switches, the load may briefly be deactivated.

Electrical design	Code	Standard symbol	Principle connection / technical data
DC voltage 10 V ... 60 V	Two-core wire Z/Z0, Z1, Z2, Z3, Z4, Z5 pole reversal protected standard short circuit proof	 Example: NO switch Z/Z0 NO or NC	Basic series: 5 V/4 mA ... 100 mA Standard series: 4 V/2 mA ... 200 mA Residual current: 0.7 mA/0.5 mA
Basic series 10 V ... 30 V 100 mA Standard series 10 V ... 60 V 200 mA	Three-core wire E/E0, E1, E2, E3, E5, E8 short circuit proof pole reversal protected	 Example: NO switch E/E0 NO or NC	 Data as type A/A2
	Four-core wire A A2 short circuit proof pole reversal protected	 Example: NC and NO switch A2 NC and NO	Voltage drop: 2.5 V Residual current: 0.3 mA Operating current: 0 mA ... 200 mA Idle current: 20 mA
AC voltage 20 V ... 250 V	WS WÖ W W4	NC and NO  Example: NC switch WÖ / UÖ NC or NO	Voltage drop "on": 6 V Residual current: 1 mA Operating current: 5 mA ... 500 mA
Universal voltage 20 V ... 250 VAC 45 Hz ... 65 Hz 30 V ... 300 VDC	US UÖ	 Example: NC switch WÖ / UÖ NC or NO	Voltage drop "on": 5 V Residual current: 1.5 mA Operating current: 5 mA ... 500 mA
DC voltage 8 V DC	NAMUR N 1N SN S1N EN 60947-5-6	 Example: NC switch N/NO or SN NC or NO	Nominal voltage 8 V Output current < 1 mA actuated > 3 mA not actuated



## Wire colors and connector allocation (EN 60947-5-2)

Type	Function	Connection	Wire color	Pin number <sup>2)</sup>	Connector
2 AC connections AC	N.O. contact		any color <sup>1)</sup> except yellow/ green or yellow	3 4	
	NC contact			1 2	
2 DC connections, polarity relevant	N.O. contact	+ -	brown (BN) blue (BU)	1 4	
	NC contact	+ -	brown (BN) blue (BU)	1 2	
3 DC connections polarity relevant	N.O. contact	+ - Output	brown (BN) blue (BU) black (BK)	1 3 4	
	NC contact	+ - Output	brown (BN) blue (BU) black (BK)	1 3 2	

<sup>1)</sup> It is recommended for both wires to have the same color.

<sup>2)</sup> The Pin number (except proximity switches for AC and with 3-pin 8 mm connectors) must match the pin numbers of the device connectors.

Switches that are not shockproof require a protective ground connection for voltages above 50 V AC and 120 V DC.

Wire colors and connector allocation (EN 60947-5-2)

Type	Function	Connection	Wire color	Pin number	Connector
4 DC connections polarity relevant	Changer (NC, NO)	+ - N.O. contact -Output NC contact -Output	brown (BN) blue (BU) black (BK) white (WH)	1 3 4 2	
2 DC connections and NAMUR polarity relevant	N.O. con- tact and NC contact	channel 1+ channel 1- channel 2+ channel 2- valve + valve -	brown (BN) blue (BU) white (WH) black (BK) red (RD) yellow (YE)	1 3 2 4 5 6	
3 DC connections polarity relevant	N.O. con- tact and NC contact	supply + supply - output chan- nel 1 output chan- nel 2	brown (BN) blue (BU) black (BK) white (WH)	1 3 4 2	

Step  
4

## General specifications

The **Idle current**  $I_0$  indicates the own current consumption of the proximity switch. It is measured without a load.

The **Operating current**  $I_L$  (design operating current  $I_e$  according to EN 60947-5-2) indicates the maximum load current for permanent operation.

The **Short-time current**  $I_K$  is the current that may temporarily arise during switching on without damaging the proximity switch.

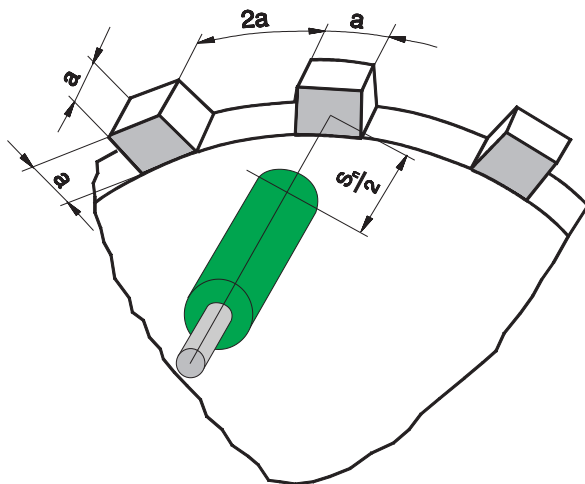
The **Residual current**  $I_R$  is the current flowing over the load with the proximity switch closed.

The **Operating voltage**  $U_B$  is indicated by the maximum and minimum values of the supply voltage. In this range the safe operation of the proximity switch is guaranteed. In the case of NAMUR proximity sensors, the nominal voltage is indicated.

The **Voltage drop**  $U_d$  is measured above the conducting proximity switch or output.

The **Switching frequency**  $f$  is the maximum number of changes from the attenuated to the non-attenuated state in Hertz (Hz), cf. figure according to EN 60947-5-2.

The size  $a$  is the larger value of the diameter or edge length and the 3-fold nominal switching distance (see page 25).



Measuring vane for determining the maximum switching frequency.

The **Harmonic voltage** is the alternating voltage superimposed on the operating voltage (peak to peak) and is specified in percent of the arithmetic mean value. Pepperl+Fuchs proximity switches conform to EN DIN 60947-5-2 with a max. residual ripple value of 10 %.

#### Permitted interference voltage

Temporary voltage peaks on the supply lines can destroy unprotected proximity switches. A transient protection for all sensors of Pepperl+Fuchs GmbH suppresses interference pulses in accordance with EN 60947-5-2.

The **Standby delay**  $t_v$  is the time required for the proximity switch to become operational after the operating voltage is applied. Pepperl+Fuchs proximity switches conform to EN DIN 60947-5-2 with max. 300 ms.

#### Switch-on pulse suppression

This function, which is a feature of most sensors, suppresses false output signals after applying of the operating voltage within the time period  $t_v$ .

#### Short circuit protection

With the pulsing short circuit protection which most Pepperl+Fuchs GmbH proximity switches feature, the output is periodically blocked and released again after the current limit has been exceeded, until the short circuit has been rectified.

The permitted **Ambient temperature** is the temperature range within which the proximity switch operates properly. The conditions for the Pepperl+Fuchs GmbH standard series are:

-25 °C ... +70 °C or 248 K ... 343 K.

For special designs the conditions are:

-25 °C ... +100 °C or 248 K ... 373 K

-40 °C ... +150 °C or 233 K ... 423 K

0 °C ... +200 °C or 273 K ... 473 K

0 °C ... +250 °C or 273 K ... 523 K

#### IP rating

Pepperl+Fuchs GmbH proximity switches are protected according to IP65, IP67 or IP68 (EN 60529), dependent on requirements (see page 724).

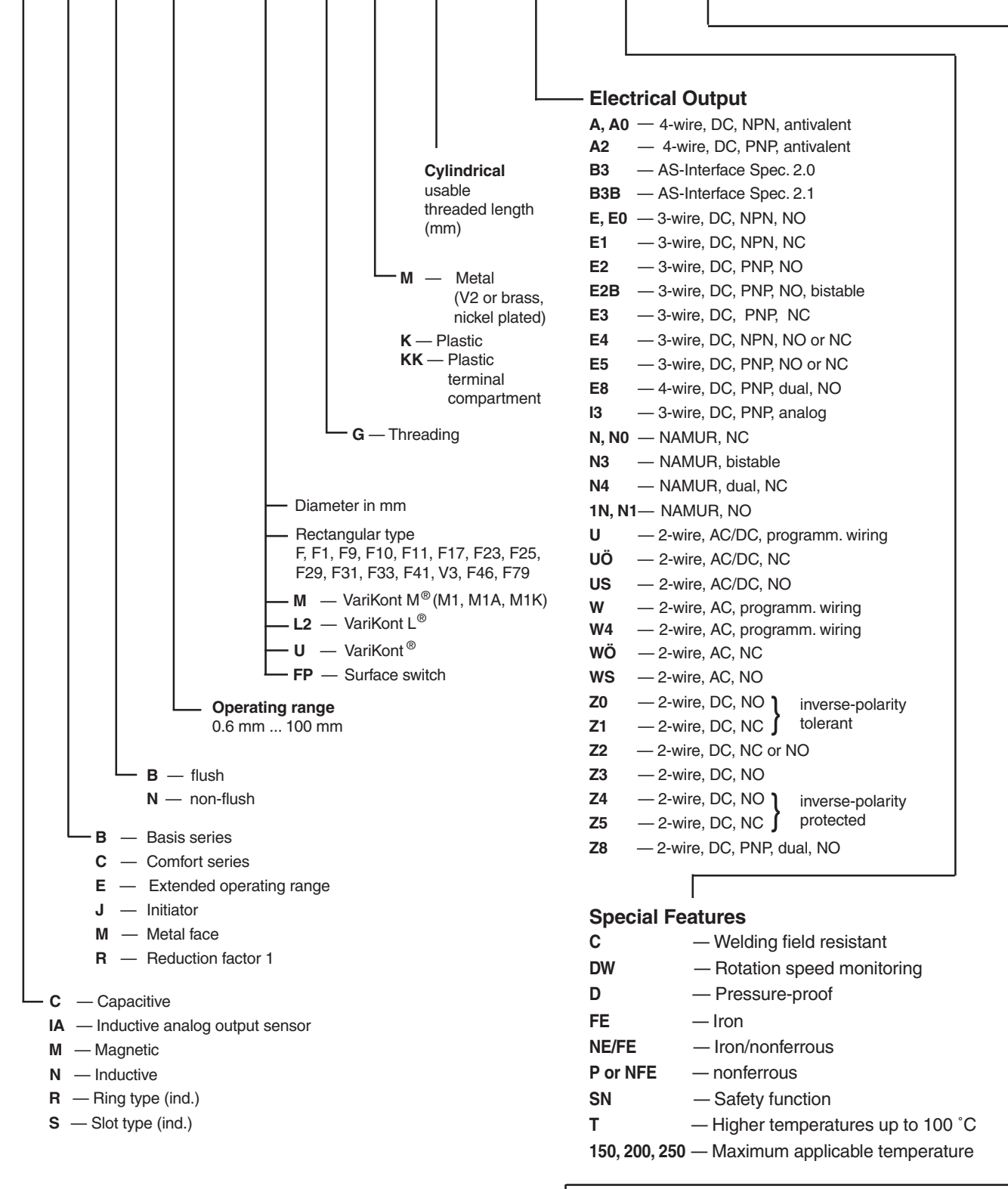
#### Permitted impact and vibration loads

The impact resistance test is carried out at 30 times the acceleration due to gravity and for a duration of 11 ms. The vibration resistance test is carried out at a resonance frequency between 10 and 55 Hz and at an amplitude of 1 mm (IEC 60068-2-6).

#### Permitted tightening torques [Nm]

	Stainless steel	Brass	PBT	PPS
M5 x 0.5	3,0	-	-	-
M8 x 1	10,0	3,0	-	-
M12 x 1	15,0	10,0	0,75	-
M18 x 1	30,0	30,0	1,5	5
M30 x 1.5	30,0	30,0	3,0	10

# N B B 10<sup>1)</sup> - 30 G M 50 - E2 - C - V1



- N** — Inductive
- B** — Basis series
- B** — flush
- 10<sup>1)</sup>** — Operating range 0.6 mm ... 100 mm
- 30** — Diameter in mm
- G** — Threading
- M** — Metal (V2 or brass, nickel plated)
- 50** — Rectangular type F, F1, F9, F10, F11, F17, F23, F25, F29, F31, F33, F41, V3, F46, F79
- E2** — Electrical Output
- C** — Comfort series
- V1** — Connection Elements

- Cylindrical**  
usable threaded length (mm)
- M** — Metal (V2 or brass, nickel plated)
- K** — Plastic
- KK** — Plastic terminal compartment
- G** — Threading
- M** — VariKont M<sup>®</sup> (M1, M1A, M1K)
- L2** — VariKont L<sup>®</sup>
- U** — VariKont<sup>®</sup>
- FP** — Surface switch

- Electrical Output**
- A, A0** — 4-wire, DC, NPN, antivalent
  - A2** — 4-wire, DC, PNP, antivalent
  - B3** — AS-Interface Spec. 2.0
  - B3B** — AS-Interface Spec. 2.1
  - E, E0** — 3-wire, DC, NPN, NO
  - E1** — 3-wire, DC, NPN, NC
  - E2** — 3-wire, DC, PNP, NO
  - E2B** — 3-wire, DC, PNP, NO, bistable
  - E3** — 3-wire, DC, PNP, NC
  - E4** — 3-wire, DC, NPN, NO or NC
  - E5** — 3-wire, DC, PNP, NO or NC
  - E8** — 4-wire, DC, PNP, dual, NO
  - I3** — 3-wire, DC, PNP, analog
  - N, N0** — NAMUR, NC
  - N3** — NAMUR, bistable
  - N4** — NAMUR, dual, NC
  - 1N, N1** — NAMUR, NO
  - U** — 2-wire, AC/DC, programm. wiring
  - UÖ** — 2-wire, AC/DC, NC
  - US** — 2-wire, AC/DC, NO
  - W** — 2-wire, AC, programm. wiring
  - W4** — 2-wire, AC, programm. wiring
  - WÖ** — 2-wire, AC, NC
  - WS** — 2-wire, AC, NO
  - Z0** — 2-wire, DC, NO } inverse-polarity tolerant
  - Z1** — 2-wire, DC, NC }
  - Z2** — 2-wire, DC, NC or NO
  - Z3** — 2-wire, DC, NO
  - Z4** — 2-wire, DC, NO } inverse-polarity protected
  - Z5** — 2-wire, DC, NC }
  - Z8** — 2-wire, DC, PNP, dual, NO

- Special Features**
- C** — Welding field resistant
  - DW** — Rotation speed monitoring
  - D** — Pressure-proof
  - FE** — Iron
  - NE/FE** — Iron/nonferrous
  - P or NFE** — nonferrous
  - SN** — Safety function
  - T** — Higher temperatures up to 100 °C
  - 150, 200, 250** — Maximum applicable temperature

- Connection Elements**
- V1** — M12 x 1 device connector for DC proximity switches
  - V3** — M8 device connector for DC proximity switches
  - V5** — Faston connector
  - V13** — M12 x 1 device connector for AC proximity switches
  - V16** — Rd24 x 1/8 device connector for dual sensors in F31 housing
  - V18** — M18 x 1 device connector for valve connection (F31 housing)

<sup>1)</sup> The switching distance followed by a P (e. g. 20P) indicates a selective switching behavior of the sensor. The switching distance relates to alum

## Functional description for the inductive sensor

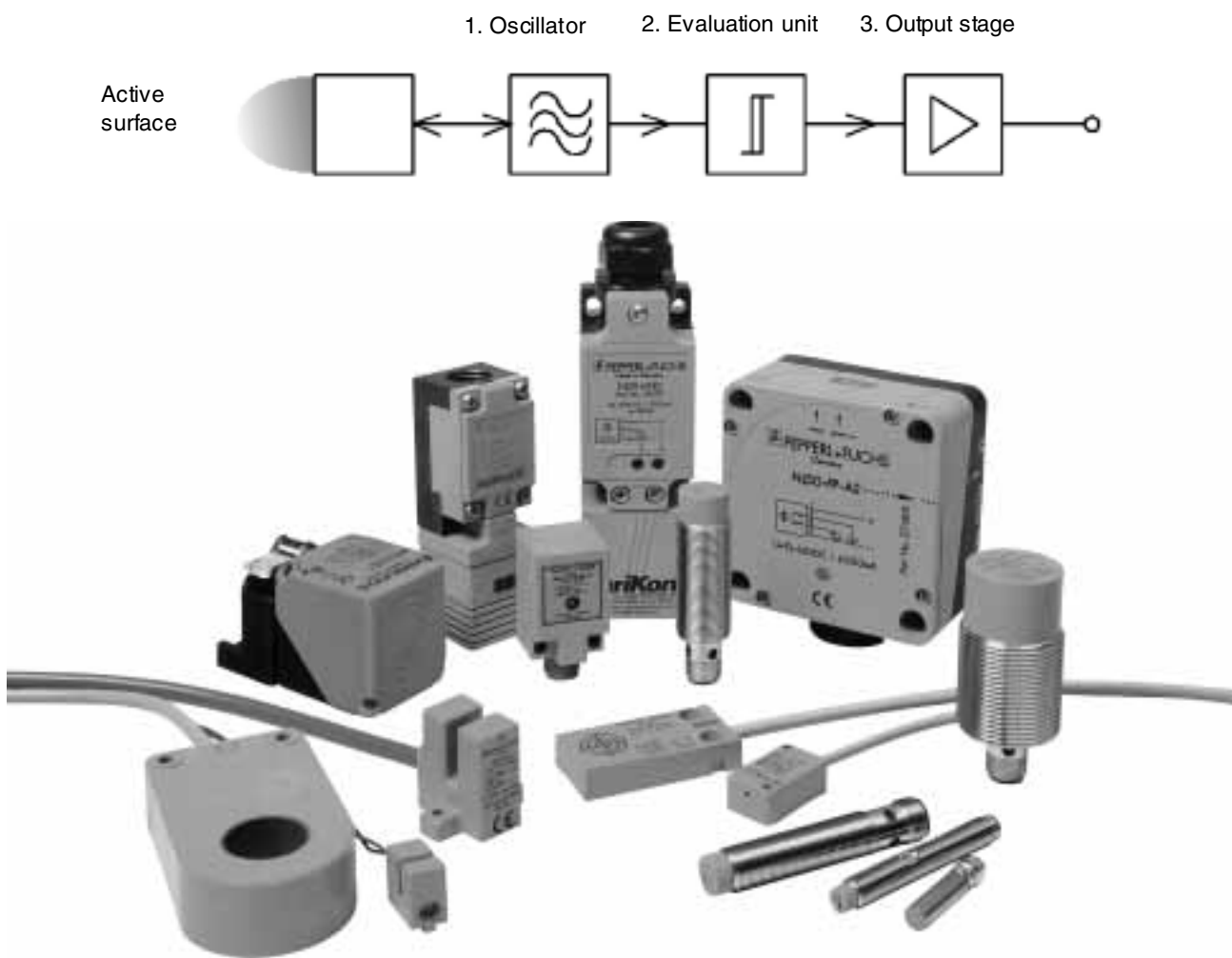
An inductive sensor consists mainly of three functional groups:

1. Oscillator
2. Trigger circuit
3. Output switching device

As soon as a supply voltage is applied, the oscillator begins to oscillate and takes on a defined current.

The electromagnetic field produced by the oscillator coil is oriented by a ferrite core. The effective field of the sensor is thereby focused through the active face of the sensor.

If a target made of an electrically conductive material is positioned near the active face, eddy currents are induced within this target. The resulting power loss leads to a reduction in the quality factor of the resonant circuit and the oscillator amplitude consequently falls. This is evaluated by the relayed trigger circuit, which activates the output switching device once a certain amplitude is reached. Since the quality factor of the resonant circuit and hence also the oscillator amplitude are dependent on the distance of the conductive target from the active face of the sensor, an output signal is obtained whenever this distance falls below a certain value (that of the sensing range).



1.1

Inductive sensors, standard, cylindrical designs

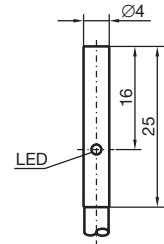
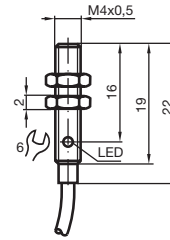


- **Comfort series**
- **0.6 mm embeddable**  
NJ0,6...
- **Basic series**
- **0.8 mm embeddable**  
NBB0,8
- **1 mm embeddable**  
NBB1...



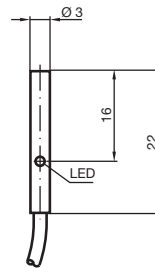
NJ0,6-4GM22-E  
NJ0,6-4GM22-E2  
NBB1-4GM22-E2

NBB08-4M25-E0  
NBB08-4M25-E1  
NBB08-4M25-E2  
NBB08-4M25-E3



NJ0,6-3-22-E2  
NJ0,6-3-22-E

		NJ0,6-3-22-E	NJ0,6-3-22-E2	NJ0,6-4GM22-E	NJ0,6-4GM22-E2	NBB0,8-4M25-E0	NBB0,8-4M25-E1	NBB0,8-4M25-E2	NBB0,8-4M25-E3	NBB1-4GM22-E2
Rated operating distance	0.6 mm	◆	◆	◆	◆					
	0.8 mm					◆	◆	◆	◆	
	1 mm									◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function						◆			
	NPN Make function	◆	◆			◆				
	PNP Break function							◆	◆	
	PNP Make function									◆
Assured operating distance	0 ... 0.486 mm	◆	◆	◆	◆					
	0 ... 0.648 mm					◆	◆	◆	◆	
	0 ... 0.81 mm									◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆					◆
	≤ 12 mA					◆				
	≤ 15 mA							◆	◆	
Switching frequency	0 ... 3000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆					◆
	≤ 3 V					◆	◆	◆	◆	
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	2 m, PUR cable	◆	◆	◆	◆					◆
	2 m, PVC cable					◆	◆	◆	◆	
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆

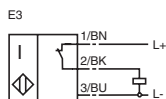
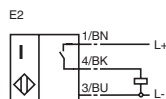
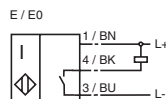
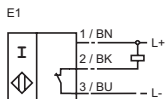


NBB0,8-4M25-E1

NJ06-3-22-E  
NJ06-4GM22-E  
NBB08-4M25-E0

NJ0,6-3-22-E2  
NJ0,6-4GM22-E2  
NBB0,8-4M25-E1  
NBB1-4GM22-E2

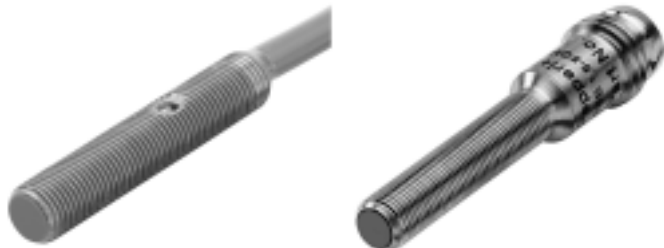
NBB0,8-4M25-E3



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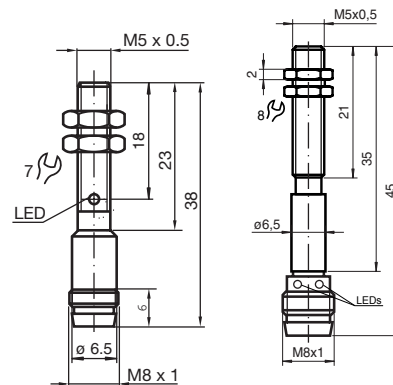


- **Basic series**
- **0.8 mm embeddable**  
NBB0,8
- **1.5 mm embeddable**  
NBB1,5...



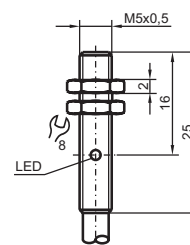
NBB1,5-5GM25-E2-V3  
NBB1,5-5GM25-E3-V3

NBB0,8-5GM25-E0-V3  
NBB0,8-5GM25-E1-V3  
NBB0,8-5GM25-E2-V3



NBB0,8-5GM25-E0  
NBB0,8-5GM25-E1  
NBB0,8-5GM25-E2  
NBB0,8-5GM25-E3

		NBB0,8-5GM25-E0	NBB0,8-5GM25-E0-V3	NBB0,8-5GM25-E1	NBB0,8-5GM25-E1-V3	NBB0,8-5GM25-E2	NBB0,8-5GM25-E2-V3	NBB0,8-5GM25-E3	NBB1,5-5GM25-E2-V3	NBB1,5-5GM25-E3-V3
Rated operating distance	0.8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1.5 mm								◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function			◆	◆					
	NPN Make function	◆	◆							
	PNP Break function					◆	◆			
	PNP Make function							◆	◆	◆
Assured operating distance	0 ... 0.648 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1.215 mm								◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA								◆	◆
	≤ 12 mA	◆	◆	◆	◆					
	≤ 15 mA					◆	◆	◆		
Switching frequency	0 ... 3000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V								◆	◆
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆		
Operating current	0 ... 100 mA	◆	◆							
	0 ... 200 mA					◆	◆	◆	◆	◆
	0.1 ... 100 mA			◆	◆	◆	◆	◆		
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector			◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆		
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆



NBB1,5-5GM25-E3-V3

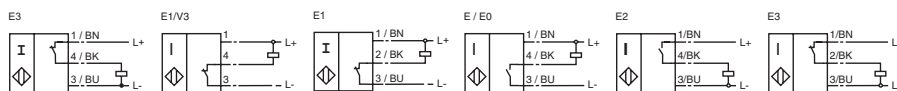
NBB0,8-5GM25-E1-V3

NBB0,8-5GM25-E1

NBB0,8-5GM25-E0  
NBB0,8-5GM25-E0-V3

NBB0,8-5GM25-E2  
NBB0,8-5GM25-E2-V3  
NBB1,5-5GM25-E2-V3

NBB0,8-5GM25-E3



Date of edition: 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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1.1

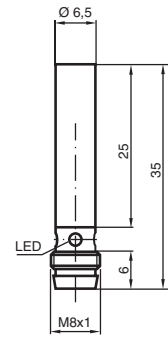
Inductive sensors, standard, cylindrical designs

- Basic series
- Increased operating distance
- 2 mm embeddable



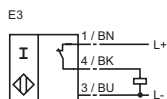
NBB2-6,5M30-E0  
NBB2-6,5M30-E2

NBB2-6,5M25-E0-V3  
NBB2-6,5M25-E1-V3  
NBB2-6,5M25-E2-V3  
NBB2-6,5M25-E3-V3

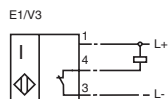


		NBB 2-6,5M25-E0-V3	NBB 2-6,5M25-E1-V3	NBB 2-6,5M25-E2-V3	NBB 2-6,5M25-E3-V3	NBB2-6,5M30-E0	NBB2-6,5M30-E2
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function		◆				
	NPN Make function	◆				◆	
	PNP Break function				◆		
	PNP Make function			◆			◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V			◆	◆	◆	◆
	5 ... 30 V	◆	◆				
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 3000 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection		◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.5 V	◆	◆				
	≤ 3 V			◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow					◆	◆
Ambient temperature	Multicolor-LED, yellow	◆	◆	◆	◆		
	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V3 connector	◆	◆	◆	◆		
	2 m, PVC cable					◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆

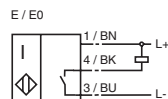
NBB2-6,5M25-E3-V3



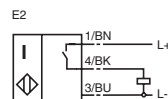
NBB2-6,5M25-E1-V3



NBB2-6,5M25-E0V3  
NBB2-6,5M30-E0



NBB2-6,5M25-E2-V3  
NBB2-6,5M30-E2

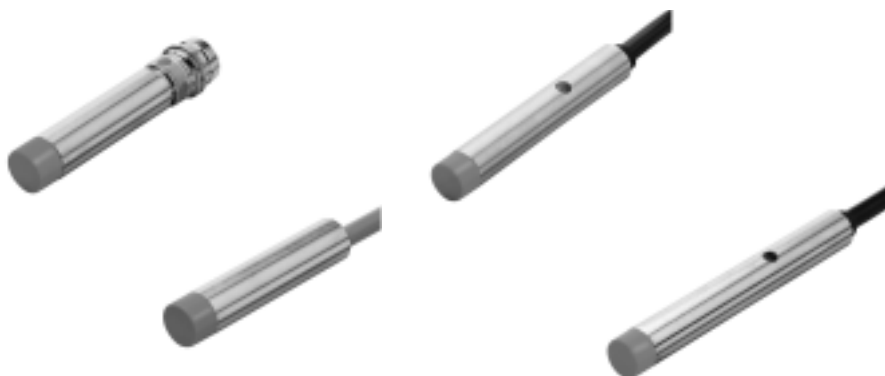


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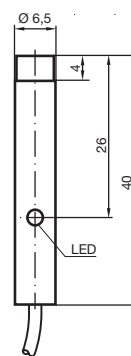




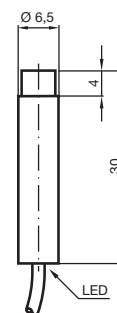
- **Basic series**
- **3 mm not embeddable**  
NBN3...
- **Comfort series**
- **2 mm not embeddable**  
NJ2...



NJ2-6,5-40-E2

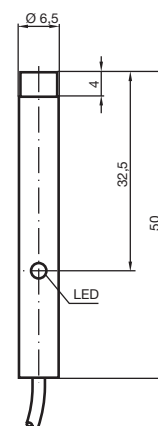
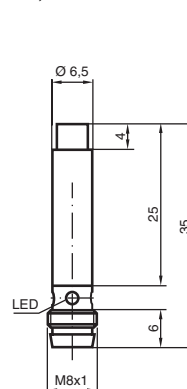


NBN3-65M80-E0  
NBN3-65M80-E2



NBN3-6,5M25-E0-V3  
NBN3-6,5M25-E1-V3  
NBN3-6,5M25-E2-V3  
NBN3-6,5M25-E3-V3

NJ2-6,5-50-E



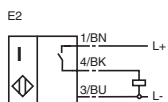
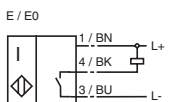
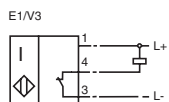
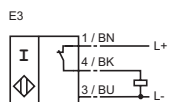
		NJ2-6,5-40-E2	NJ2-6,5-50-E	NBN3-6,5M25-E0-V3	NBN3-6,5M25-E1-V3	NBN3-6,5M25-E2-V3	NBN3-6,5M25-E3-V3	NBN3-6,5M30-E0	NBN3-6,5M30-E2
Rated operating distance	2 mm	◆	◆						
	3 mm			◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching elementfunction	NPN Break function					◆			
	NPN Make function		◆	◆				◆	
	PNP Break function						◆		
	PNP Make function	◆							◆
Assured operating distance	0 ... 1.62 mm	◆	◆						
	0 ... 2.43 mm			◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V			◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆						
No-load supply current	5 ... 30 V			◆	◆				
	≤ 10 mA					◆	◆		
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆		◆	◆	◆	◆	◆	◆
	0 ... 3000 Hz		◆						
	0 ... 400 Hz	◆		◆	◆	◆	◆	◆	◆
Reverse polarity protection	yes	◆	◆	◆	◆	◆	◆	◆	◆
	no								
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤	3 V	2.6 V	2.5 V	1.5 V	3 V	3 V	3 V	3 V
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆					◆	◆
	Multihole-LED, yellow			◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector			◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆						
	2 m, PVC cable							◆	◆
Housing material	Stainless steel	◆	◆						
	brass, nickel-plated			◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

NBN3-6,5M25-E3-V3

NBN3-6,5M25-E1-V3

NBN3-6,5M25-E0-V3  
NBN3-6,5M30-E0  
NJ2-6,5-50-E

NBN3-6,5M25-E2-V3  
NBN3-6,5M30-E2  
NJ2-6,5-40-E2



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1.1

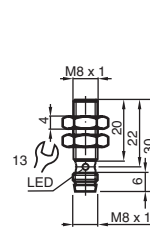
Inductive sensors, standard, cylindrical designs



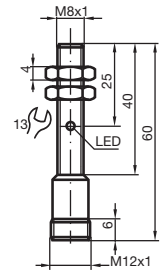
- **Basic series**
- **1.5 mm embeddable**  
NBB1,5...
- **Comfort series**
- **1.5 mm embeddable**  
NJ1,5...



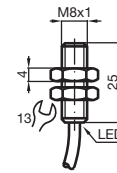
NBB1,5-8GM20-E2-V3



NJ1,5-8GM10-E2-V1



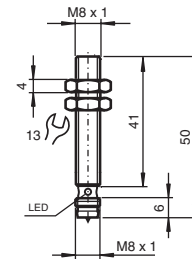
NBB1,5-8GM25-E0



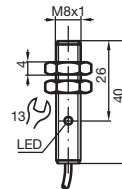
		NBB1,5-8GM20-E2-V3	NBB1,5-8GM25-E0	NJ1,5-8GM40-E-V1	NJ1,5-8GM40-E2	NBB1,5-8GM40-E0-V1	NBB1,5-8GM40-E0-V3	NJ1,5-8GM40-E2-V1	NBB1,5-8GM40-E2-V1	NBB1,5-8GM40-E2-V3
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 2000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 3000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 5000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤	2 V	2 V	2,6 V	3 V	3 V	1,5 V	3 V	3 V	1,5 V
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBB1,5-8GM40-E0-V3

NBB1,5-8GM40-E2-V3

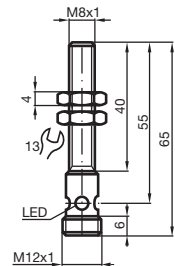


NJ1,5-8GM10-E2



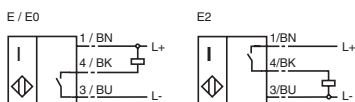
NBB1,5-8GM40-E0-V1

NBB1,5-8GM40-E2-V1



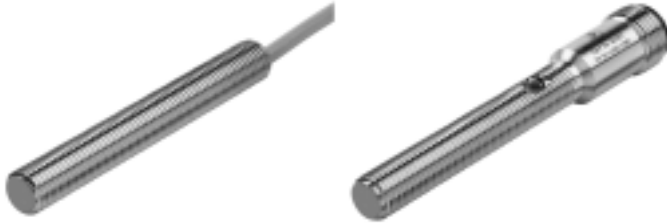
NBB1,5-8GM25-E0  
NBB1,5-8GM40-E0-V1  
NBB1,5-8GM40-E0-V3  
NJ1,5-8GM10-E-V1

NBB1,5-8GM20-E2-V3  
NBB1,5-8GM10-E2-V1  
NBB1,5-8GM10-E2-V3  
NJ1,5-8GM10-E2  
NJ1,5-8GM10-E2-V1

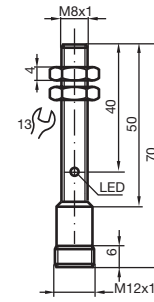


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

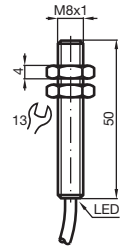
- Basic series
- 1.5 mm embeddable



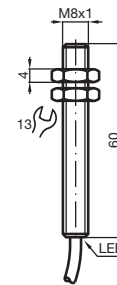
NBB1,5-8GM50-A0-V1  
NBB1,5-8GM50-A2-V1



NBB1,5-8GM50-E0  
NBB1,5-8GM50-E2

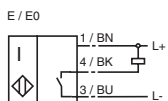


NBB1,5-8GM60-A0  
NBB1,5-8GM60-A2

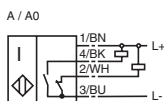


		NBB 1,5-8GM50-A0-V1	NBB1,5-8GM50-E0	NBB1,5-8GM50-E2	NBB 1,5-8GM50-A2-V1	NBB1,5-8GM60-A0	NBB1,5-8GM60-A2
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	4-wire	◆	◆	◆	◆	◆	◆
	NPN Antivalent	◆			◆	◆	◆
	NPN Make function		◆				
	PNP Antivalent				◆	◆	◆
	PNP Make function			◆		◆	
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆
	≤ 20 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
Housing material	2 m, PVC cable		◆	◆		◆	◆
	brass	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆			◆	◆	
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆

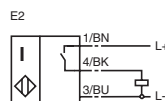
NBB1,5-8GM50-E0



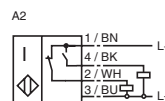
NBB1,5-8GM50-A0-V1  
NBB1,5-8GM50-A0



NBB1,5-8GM50-E2



NBB1,5-8GM60-A2-V1  
NBB1,5-8GM60-A2



Date of edition: 2008-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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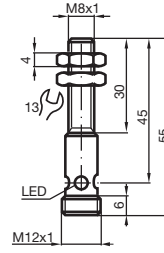
1.1

Inductive sensors, standard, cylindrical designs

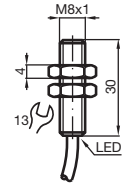
- Basic series
- 2 mm embeddable



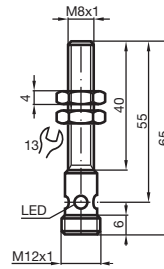
NBB2-8GM30-A0-V1  
NBB2-8GM30-A2-V1  
NBB2-8GM30-E2-V1



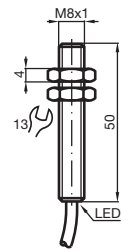
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NBB2-8GM30-E2



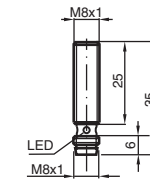
NBB2-8GM40-E0-V1  
NBB2-8GM40-E2-V1



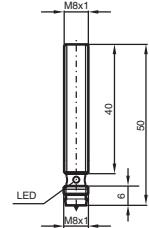
NBB2-8GM50-E0  
NBB2-8GM50-E2



NBB2-8GM25-E0-V3  
NBB2-8GM25-E1-V3  
NBB2-8GM25-E2-V3  
NBB2-8GM25-E3-V3



NBB2-8GM40-E2-V3



		NBB2-8GM25-E0-V3	NBB2-8GM25-E1-V3	NBB2-8GM25-E2-V3	NBB2-8GM25-E3-V3	NBB2-8GM30-A0-V1	NBB2-8GM30-A2-V1	NBB2-8GM30-E0	NBB2-8GM30-E2	NBB2-8GM30-E0-V1	NBB2-8GM30-E2-V1	NBB2-8GM40-E0-V1	NBB2-8GM40-E2-V1	NBB2-8GM40-E2-V3	NBB2-8GM50-E0	NBB2-8GM50-E2
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire						◆									
Switching element function	NPN Antivalent						◆									
	NPN Break function		◆													
	NPN Make function			◆												
	PNP Antivalent							◆								
	PNP Break function								◆							
	PNP Make function									◆						
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 30 V		◆													
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Current consumption	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1500 Hz															
	0 ... 3000 Hz															
Reverse polarity protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	no															
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤	2.5 V	1.5 V	3 V	3 V	2.5 V	2.5 V	3 V	3 V	3 V	3 V	3 V	3 V	3 V	3 V	3 V
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow															
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector															
	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable															
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBB2-8GM25-E3-V3

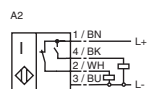
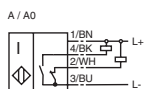
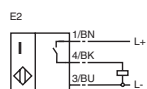
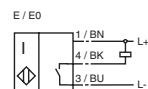
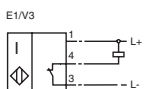
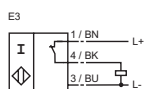
NBB2-8GM25-E1-V3

NBB2-8GM25-E0-V3  
NBB2-8GM30-E0  
NBB2-8GM40-E0-V1  
NBB2-8GM50-E0

NBB2-8GM25-E2-V3  
NBB2-8GM30-E2  
NBB2-8GM30-E2-V1  
NBB2-8GM40-E2-V3  
NBB2-8GM50-E2  
NBB2-8GM40-E2-V1

NBB2-8GM30-A0-V1

NBB2-8GM40-A2-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

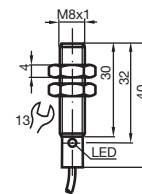
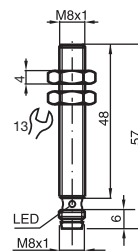


- **Basic series**  
1.5 mm embeddable
- **NBB1,5...**
- **Comfort series**  
NCB1,5...  
NJ1,5...



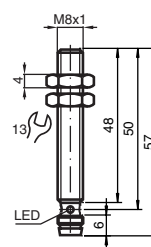
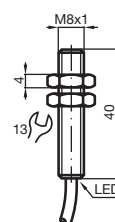
NBB1,5-8GM50-Z1-V3  
NBB1,5-8GM50-Z3-V3

NJ1,5-8GM40-WO  
NJ1,5-8GM40-WS

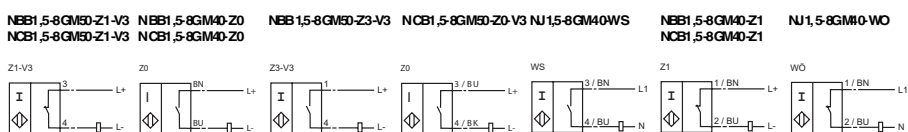


NBB1,5-8GM40-Z0  
NBB1,5-8GM40-Z1  
NCB1,5-8GM40-Z0  
NCB1,5-8GM40-Z1

NCB1,5-8GM50-Z0-V3



		NBB1,5-8GM40-Z0	NBB1,5-8GM40-Z1	NBB1,5-8GM50-Z1-V3	NBB1,5-8GM50-Z3-V3	NCB1,5-8GM40-Z0	NCB1,5-8GM40-Z1	NCB1,5-8GM50-Z0-V3	NCB1,5-8GM50-Z1-V3	NJ1,5-8GM40-WO	NJ1,5-8GM40-WS
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	AC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	AC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.21 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	AC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	24 ... 264 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	24 ... 264 V AC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1200 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 25 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Reverse polarity protection	tolerant	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Voltage drop	≤ 5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1000 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
LED, red		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆



Date of edition: 20.08.03-11

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1.1

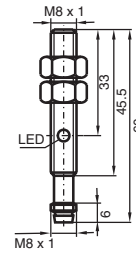
Inductive sensors, standard, cylindrical designs



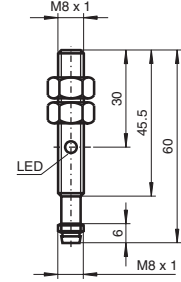
- increased operating distance
- Comfort series
- 3 mm quasi-embeddable  
NEB3...
- 4 mm quasi-embeddable  
NEB4...



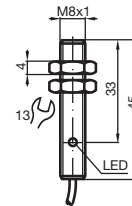
NEB3-8GM50-E-V3  
NEB4-8GM50-E2-V3



NEB3-8GM50-E2-V3



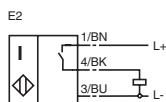
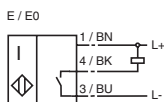
NEB3-8GM45-E  
NEB3-8GM45-E2  
NEB4-8GM45-E2



		NEB3-8GM45-E	NEB3-8GM45-E2	NEB3-8GM50-E-V3	NEB3-8GM50-E2-V3	NEB4-8GM45-E2	NEB4-8GM50-E2-V3
Rated operating distance	3 mm	◆	◆	◆	◆		
	4 mm					◆	◆
Installation	quasi embedd.	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	NPN	◆		◆		◆	
	PNP		◆		◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆		
	0 ... 3.24 mm					◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆		
	0 ... 500 Hz					◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection		◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V3-connector			◆	◆		
	2 m, PUR cable	◆	◆			◆	
Housing material	brass, chromium plated	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆

NEB3-8GM45-E  
NEB3-8GM50-E-V3

NEB3-8GM45-E2  
NEB3-8GM50-E2-V3  
NEB4-8GM45-E2  
NEB4-8GM50-E2-V3

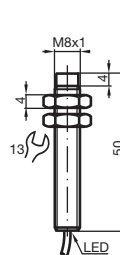


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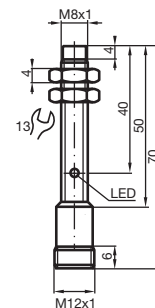
- Basic series
- 2 mm not embeddable



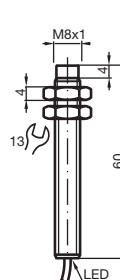
NBN2-8GM50-E0  
NBN2-8GM50-E2



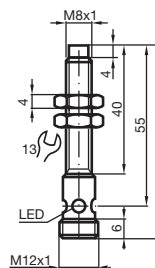
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NBN2-8GM50-A2-V1



NBN2-8GM60-A0  
NBN2-8GM60-A2

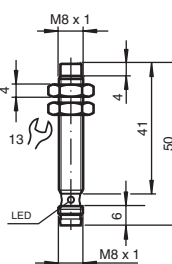


NBN2-8GM10-E0-V1  
NBN2-8GM10-E2-V1

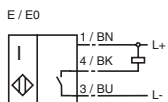


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Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire						◆				◆
Switching element function	NPN Antivalent					◆					◆
	NPN Make function	◆	◆				◆				
	PNP Antivalent							◆			◆
	PNP Make function								◆		◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA		◆								
	≤ 15 mA		◆								
	≤ 20 mA										
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 2000 Hz										
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 1.5 V										
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow							◆			◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V3-connector		◆								
	2 m, PVC cable							◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

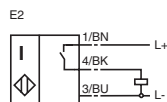
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NBN2-8GM40-E2-V3



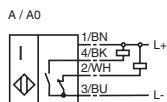
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NBN2-8GM50-E0



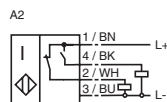
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NBN2-8GM40-E2-V3  
NBN2-8GM50-E2



NBN2-8GM50-A0-V1  
NBN2-8GM60-A0



NBN2-8GM50-A2-V1  
NBN2-8GM60-A2



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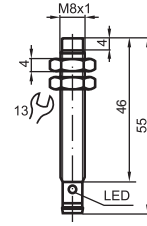
1.1

Inductive sensors, standard, cylindrical designs

- Basic series
- 3 mm not embeddable

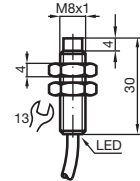
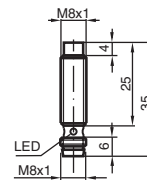


NBN3-8GM45-E2-V3



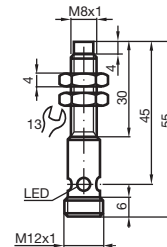
NBN3-8GM25-E0-V3  
NBN3-8GM25-E1-V3  
NBN3-8GM25-E2-V3  
NBN3-8GM25-E3-V3

NBN3-8GM30-E0  
NBN3-8GM30-E2



		NBN3-8GM25-E0-V3	NBN3-8GM25-E1-V3	NBN3-8GM25-E2-V3	NBN3-8GM25-E3-V3	NBN3-8GM30-E0	NBN3-8GM30-E0-V1	NBN3-8GM30-E2	NBN3-8GM30-E2-V1	NBN3-8GM45-E2-V3
Rated operating distance	3 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Current consumption	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆
	no	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤	2.5 V	1.5 V	3 V	3 V	3 V	2 V	3 V	3 V	3 V
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN3-8GM30-E0-V1  
NBN3-8GM30-E2-V1

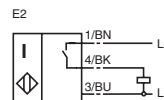
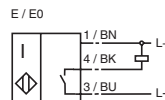
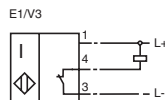
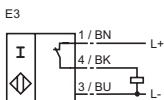


NBN3-8GM25-E3-V3

NBN3-8GM25-E1-V3

NBN3-8GM25-E0-V3  
NBN3-8GM30-E0

NBN3-8GM25-E2-V3  
NBN3-8GM30-E2  
NBN3-8GM30-E2-V1  
NBN3-8GM45-E2-V3



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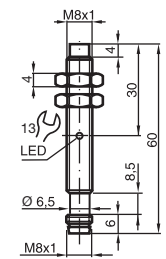
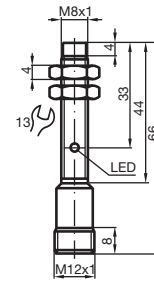


- Comfort series
- 6 mm not embeddable
- increased operating distance



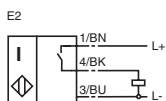
NE N6-8GM45-E2-V1

NE N6-8GM45-E2-V3



		NE N6-8GM45-E2-V3	NE N6-8GM45-E2-V1
Rated operating distance	6 mm	◆	◆
Installation	not embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Make function	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 10 mA	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 2 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	V1-connector	◆	◆
	V3-connector	◆	◆
Housing material	brass, chromium plated	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

NE N6-8GM45-E2-V1  
NE N6-8GM45-E2-V3



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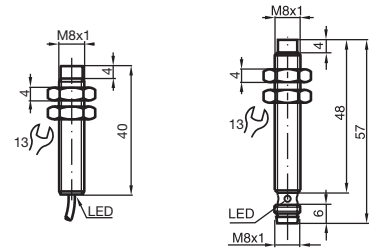
Inductive sensors, standard, cylindrical designs



- **Comfort series**
- **2 mm not embeddable**  
NCN2...
- **Basic series**
- **2 mm not embeddable**  
NBN2..

NBN2-8GM40-Z1  
NCN2-8GM40-Z0  
NCN2-8GM40-Z1

NBN2-8GM50-Z1-V3  
NBN2-8GM50-Z3-V3  
NCN2-8GM50-Z0-V3  
NCN2-8GM50-Z1-V3



		NBN2-8GM40-Z1	NBN2-8GM50-Z1-V3	NBN2-8GM50-Z3-V3	NCN2-8GM40-Z0	NCN2-8GM40-Z1	NCN2-8GM50-Z0-V3	NCN2-8GM50-Z1-V3
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆					
	DC Make function			◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	5 ... 60 V	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1200 Hz	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	tolerant	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 5 V	◆	◆	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector		◆	◆			◆	◆
	2 m, PUR cable				◆	◆		
	2 m, PVC cable	◆						
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆

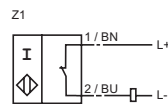
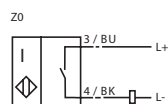
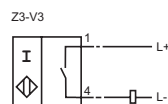
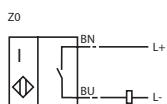
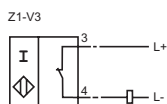
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NCN2-8GM50-Z1-V3

NCN2-8GM40-Z0

NBN2-8GM50-Z3-V3

NCN2-8GM50-Z0-V3

NBN2-8GM40-Z1  
NCN2-8GM40-Z1

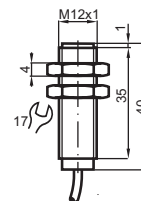


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

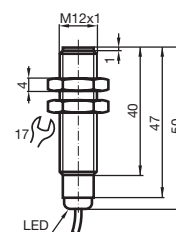


- **Basic series**
- **2 mm embeddable**  
NBB2..
- **Comfort series**
- **2 mm embeddable**  
NJ2..
- **With increased sealing, protection class IP68 / IP69k**

NJ2-12GK40-E  
NJ2-12GK40-E1  
NJ2-12GK40-E2  
NJ2-12GK40-E3

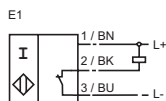


NBB2-12GK50-E0  
NBB2-12GK50-E2

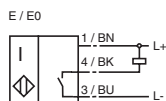


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Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function				◆		
	NPN Make function	◆		◆			
	PNP Break function						◆
	PNP Make function		◆			◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆		◆	◆	◆
	10 ... 60 V			◆	◆	◆	◆
No-load supply current	≤ 11 mA				◆		
	≤ 15 mA					◆	◆
	≤ 17 mA	◆	◆				
Switching frequency	0 ... 1500 Hz	◆	◆				
	0 ... 3000 Hz			◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆				
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	2 m, PUR cable			◆	◆	◆	◆
	2 m, PVC cable	◆	◆				
Housing material	PBT	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆	◆
	IP68 / IP69K	◆	◆				

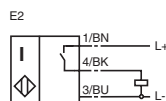
NJ2-12GK40-E1



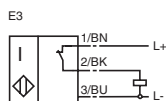
NBB2-12GK50-E0  
NBB2-12GK40-E



NBB2-12GK50-E2  
NJ2-12GK40-E2



NJ2-12GK40-E3



Date of edition: 2008-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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1.1

Inductive sensors, standard, cylindrical designs

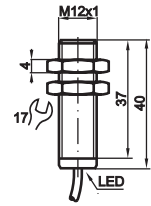
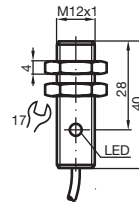


- **Comfort series**
- **2 mm embeddable**  
NJ2...
- **Basic series**
- **2 mm embeddable**  
NBB2...



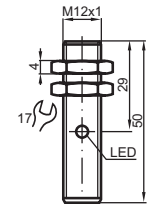
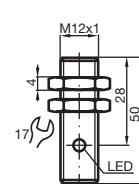
NL2-12GM40-E  
NL2-12GM40-E1  
NL2-12GM40-E2  
NL2-12GM40-E3

NBB2-12GM40-E0  
NBB2-12GM40-E1  
NBB2-12GM40-E2  
NBB2-12GM40-E3



NL2-12GM40-E3-V1  
NL2-12GM40-E1-V1  
NL2-12GM40-E2-V1

NBB2-12GM40-E0-V1  
NBB2-12GM40-E2-V1



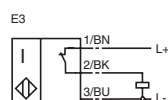
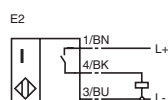
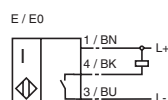
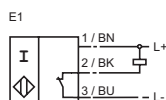
		NJ2-12GM40-E	NJ2-12GM40-E-V1	NJ2-12GM40-E1	NJ2-12GM40-E2	NJ2-12GM40-E2-V1	NJ2-12GM40-E3	NBB2-12GM40-E0	NBB2-12GM40-E0-V1	NBB2-12GM40-E1	NBB2-12GM40-E2	NBB2-12GM40-E2-V1	NBB2-12GM40-E3
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function			◆									
	NPN Make function	◆	◆					◆	◆				
	PNP Break function					◆				◆			◆
	PNP Make function	◆	◆								◆	◆	
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 11 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA			◆									
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 3000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA			◆									
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow							◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	2 m, PVC cable							◆	◆				◆
	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	brass, nickel-plated							◆	◆	◆	◆	◆	◆
	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	

NBB2-12GM40-E1  
NL2-12GM40-E1

NBB2-12GM40-E0  
NBB2-12GM40-E0-V1  
NL2-12GM40-E  
NL2-12GM40-E-V1

NBB2-12GM40-E2  
NBB2-12GM40-E2-V1  
NJ2-12GM40-E2  
NJ2-12GM40-E2-V1

NBB2-12GM40-E3  
NL2-12GM40-E3  
NL2-12GM40-E3-V1



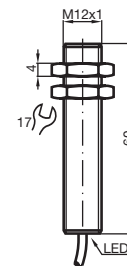
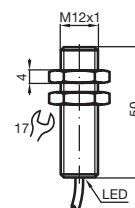
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Basic series
- 2 mm embeddable



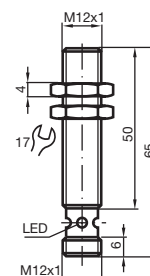
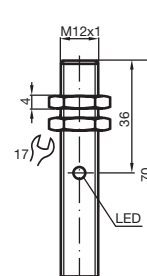
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NBB2-12GM50-E2

NBB2-12GM60-A0  
NBB2-12GM60-A2



NBB2-12GM60-A0-V1  
NBB2-12GM60-A2-V1

NBB2-12GM50-E0-V1  
NBB2-12GM50-E2-V1



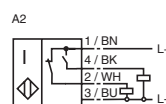
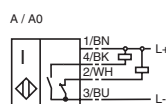
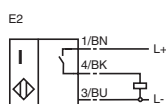
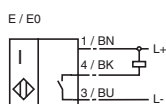
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Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire					◆	◆	◆	◆
Switching element function	NPN Antivalent					◆	◆		
	NPN Make function	◆	◆						
	PNP Antivalent							◆	◆
	PNP Make function			◆	◆				
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 17 mA	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA					◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1500 Hz					◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow		◆		◆		◆		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

NBB2-12GM50-E0  
NBB2-12GM50-E0-V1

NBB2-12GM50-E2  
NBB2-12GM50-E2-V1

NBB2-12GM60-A0  
NBB2-12GM60-A0-V1

NBB2-12GM60-A2  
NBB2-12GM60-A2-V1



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1.1

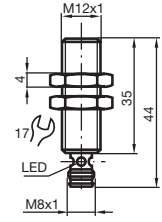
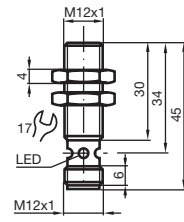
Inductive sensors, standard, cylindrical designs

- Increased operating distance
- Basic series
- 4 mm embeddable

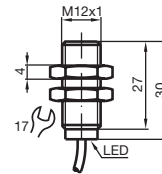


NBB4-12GM30-E2-V1  
NBB4-12GM30-E3-V1

NBB4-12GM30-E2-V3  
NBB4-12GM30-E3-V3



NBB4-12GM30-E2  
NBB4-12GM30-E3

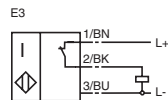
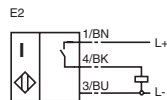
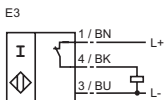


		NBB4-12GM30-E2	NBB4-12GM30-E2-V1	NBB4-12GM30-E2-V3	NBB4-12GM30-E3	NBB4-12GM30-E3-V1	NBB4-12GM30-E3-V3
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	PNP Break function	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
	V3-connector			◆			◆
	2 m, PVC cable	◆			◆		
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Mass	30 g	◆	◆	◆	◆	◆	◆

NBB4-12GM30-E3-V3

NBB4-12GM30-E2  
NBB4-12GM30-E2-V1  
NBB4-12GM30-E2-V3

NBB4-12GM30-E3  
NBB4-12GM30-E3-V1



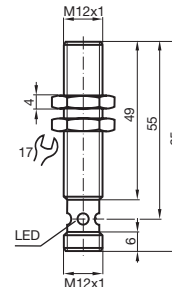
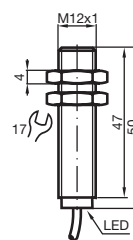
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Increased operating distance
- Basic series
- 4 mm embeddable



NBB4-12GM50-A0  
NBB4-12GM50-A2  
NBB4-12GM50-E0  
NBB4-12GM50-E2  
NBB4-12GM50-E3

NBB4-12GM50-A0-V1  
NBB4-12GM50-A2-V1  
NBB4-12GM50-E0-V1  
NBB4-12GM50-E2-V1  
NBB4-12GM50-E3-V1



		NBB4-12GM50-A0	NBB4-12GM50-A0-V1	NBB4-12GM50-A2	NBB4-12GM50-A2-V1	NBB4-12GM50-E0	NBB4-12GM50-E0-V1	NBB4-12GM50-E2	NBB4-12GM50-E2-V1	NBB4-12GM50-E3	NBB4-12GM50-E3-V1
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire	◆	◆	◆	◆						
	NPN Antivalent	◆	◆								
	NPN Make function					◆	◆				
	PNP NO							◆	◆		
Switching element function	PNP Antivalent			◆	◆						
	PNP Break function									◆	◆
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 20 mA	◆	◆	◆	◆						
	0 ... 1000 Hz	◆	◆	◆	◆						
	0 ... 1500 Hz	◆	◆	◆	◆						
Switching frequency	0 ... 800 Hz	◆	◆	◆	◆						
	Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow			◆	◆	◆	◆				
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Connection type	Connector M12 x 1					◆					
	V1-connector									◆	
Housing material	2 m, PVC cable			◆						◆	
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	

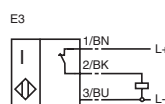
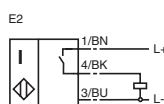
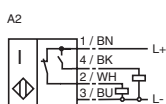
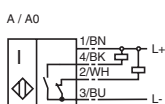
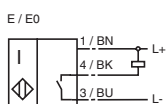
NBB4-12GM50-E0  
NBB4-12GM50-E0-V1

NBB4-12GM50-A0  
NBB4-12GM50-A0-V1

NBB4-12GM50-A2  
NBB4-12GM50-A2-V1

NBB4-12GM50-E2  
NBB4-12GM50-E2-V1

NBB4-12GM50-E3  
NBB4-12GM50-E3-V1



Date of edition: 2008-03-11

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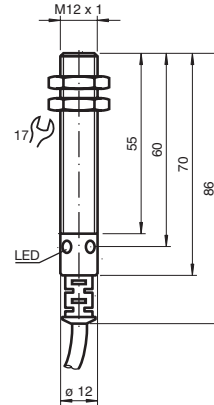
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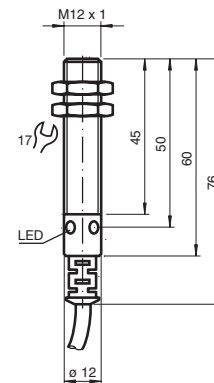
- Extended temperature range - 40 ... + 85 °C
- e1-Type approval
- 4 mm embeddable
- Basic series  
NBB4...
- Comfort series  
NCB4...



NBB4-12GM70-E0-M  
NBB4-12GM70-E1-M  
NBB4-12GM70-E2-M  
NBB4-12GM70-E3-M



NBB4-12GM60-E0-M  
NBB4-12GM60-E1-M  
NBB4-12GM60-E2-M  
NBB4-12GM60-E3-M



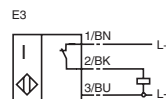
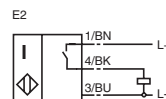
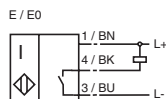
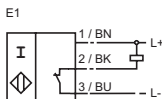
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Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Break function	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 800 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.5 V	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆	◆	◆
e1 Type approval	2004/104/EC	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP69K	◆	◆	◆	◆	◆	◆	◆	◆
Mass	120 g	◆	◆	◆	◆	◆	◆	◆	◆

NBB4-12GM60-E1-M  
NBB4-12GM70-E1-M

NBB4-12GM60-E0-M  
NBB4-12GM70-E0-M

NBB4-12GM60-E2-M  
NBB4-12GM70-E2-M

NBB4-12GM60-E3-M  
NBB4-12GM70-E3-M



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 2008-03-11



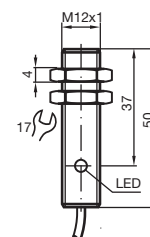
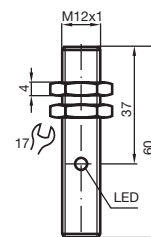


- **Comfort series**
- **6 mm quasi-embeddable**  
NEB6...
- **8 mm quasi-embeddable**  
NEB8-12GM50-E2-V1

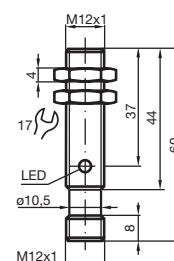


NEB6-12GM50-E2-V1

NEB6-12GM50-E2

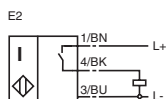


NEB8-12GM50-E2-V1



		NEB 6-12GM50-E2	NEB6-12GM50-E2-V1	NEB8-12GM50-E2-V1
Rated operating distance	6 mm	◆	◆	
	8 mm			◆
Installation	quasi embedd.	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	PNP Make function	◆	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	◆	
	0 ... 6.48 mm			◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆
Switching frequency	0 ... 300 Hz	◆	◆	◆
	0 ... 800 Hz			◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection		◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Off-state current	0 ... 0.1 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector	◆	◆	◆
	2 m, PVC cable	◆	◆	◆
Housing material	brass, chromium plated	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

NEB6-12GM50-E2  
NEB6-12GM50-E2-V1  
NEB8-12GM50-E2-V1



Date of edition: 20.08.03-11

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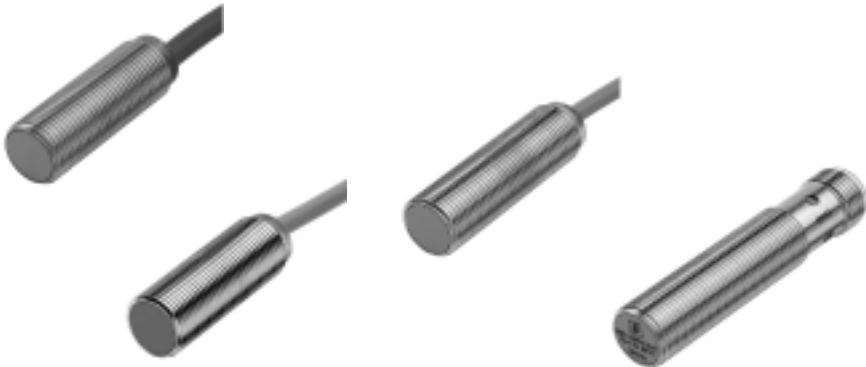
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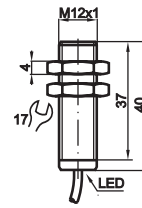
1.1

Inductive sensors, standard, cylindrical designs

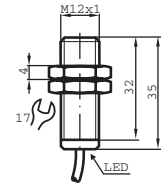
- Basic series / Comfort series
- 4 mm embeddable
- 2 mm embeddable



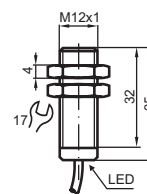
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NCB2-12GM40-Z0  
NCB2-12GM40-Z1



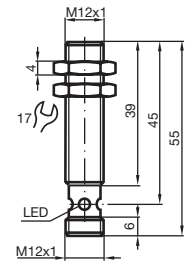
NCB4-12GM35-Z4



NCB4-12GM35-Z5

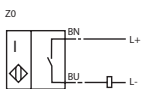


NBB2-12GM40-Z0-V1  
NBB2-12GM40-Z3-V1  
NCB2-12GM40-Z0-V1  
NCB2-12GM40-Z1-V1  
NCB4-12GM40-Z4-V1  
NCB4-12GM40-Z5-V1

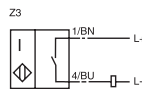


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Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 800 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	conductive	◆	◆	◆	◆	◆	◆	◆	◆	◆
	tolerant	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0.4 ... 0.6 mA typ. 0.5 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Pre-fault indication	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆

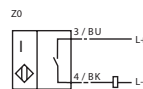
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NCB2-12GM40-Z0



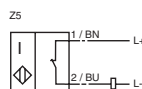
NBB2-12GM40-Z3-V1



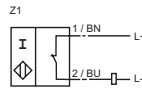
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NCB2-12GM40-Z0-V1



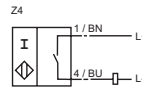
NCB4-12GM35-Z5  
NCB4-12GM40-Z5-V1



NCB2-12GM40-Z1  
NCB2-12GM40-Z1-V1



NCB4-12GM35-Z4  
NCB4-12GM40-Z4-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

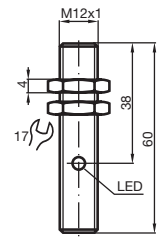
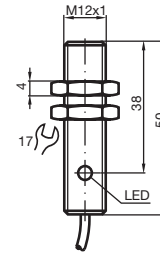
Date of edition 2008-03-11

- Comfort series
- 2 mm embeddable



NJ2-12GM50-WO

NJ2-12GM50-WO-V13  
NJ2-12GM50-WS-V13

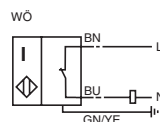
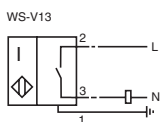
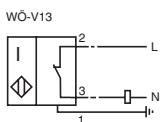


		NJ2-12GM50-WO	NJ2-12GM50-WO-V13	NJ2-12GM50-WS-V13
Rated operating distance	2 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC Break function	◆	◆	
	AC Make function			◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆
Kind of voltage	AC	◆	◆	◆
Operating voltage	20 ... 253 V	◆	◆	◆
Switching frequency	0 ... 20 Hz	◆	◆	◆
Voltage drop	typ. 4 V at 15 ... 200 mA	◆	◆	◆
	typ. 6,5 V at 5 mA			
Operating current	5 ... 200 mA	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1200 mA	◆	◆	◆
Off-state current	typ. 0.7 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V13- connector		◆	◆
	2 m, PVC cable	◆		
Housing material	Stainless steel	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

NJ2-12GM50-WO-V13

NJ2-12GM50-WS-V13

NJ2-12GM50-WO



Date of edition: 20.08.03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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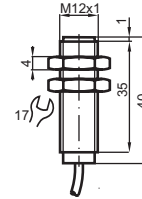
1.1

Inductive sensors, standard, cylindrical designs

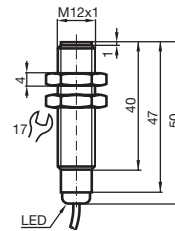


- With increased sealing, protection class IP68 / IP69k
- Basic series NBN4
- Comfort series NJ4...
- 4 mm not embeddable

NJ4-12GK40-E  
 NJ4-12GK40-E1  
 NJ4-12GK40-E2  
 NJ4-12GK40-E3

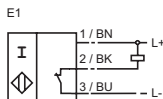


NBN4-12GK50-E0  
 NBN4-12GK50-E2

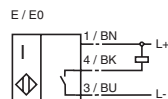


		NBN4-12GK50-E0	NBN4-12GK50-E2	NJ4-12GK40-E	NJ4-12GK40-E1	NJ4-12GK40-E2	NJ4-12GK40-E3
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function			◆			
	NPN Make function	◆		◆			
	PNP Break function						◆
	PNP Make function		◆				◆
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆		◆	◆	◆
	10 ... 60 V			◆	◆	◆	◆
No-load supply current	≤ 15 mA			◆	◆	◆	◆
	≤ 17 mA	◆	◆				
Switching frequency	0 ... 1200 Hz	◆	◆				
	0 ... 2000 Hz			◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆				
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	2 m, PUR cable			◆	◆	◆	◆
	2 m, PVC cable	◆	◆				
Housing material	PBT	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP68			◆	◆	◆	◆
	IP68 / IP69K	◆	◆				

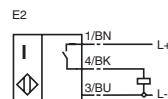
NJ4-12GK40-E1



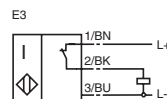
NBN4-12GK50-E0  
 NBN4-12GK50-E2



NBN4-12GK50-E2  
 NJ4-12GK40-E2



NJ4-12GK40-E3



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 2008-03-11

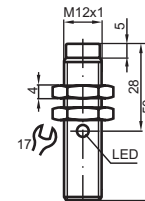
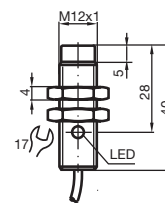


- **Comfort series**  
NJ4...
- **Basic series**  
NBN4...
- **4 mm not embeddable**



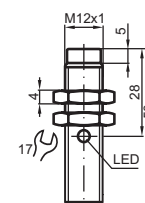
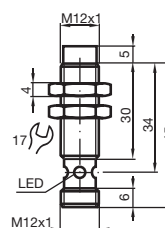
NJ4-12GM40-E  
NJ4-12GM40-E1  
NJ4-12GM40-E2  
NJ4-12GM40-E3

NJ4-12GM40-E3-V1  
NJ4-12GM40-E-V1  
NJ4-12GM40-E2-V1



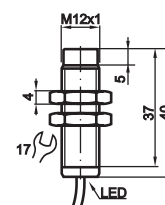
NBN4-12GM35-A0-V1  
NBN4-12GM35-A2-V1

NBN4-12GM40-E0-V1  
NBN4-12GM40-E2-V1



		NJ4-12GM40-E	NJ4-12GM40-E-V1	NJ4-12GM40-E1	NJ4-12GM40-E2	NJ4-12GM40-E2-V1	NJ4-12GM40-E3	NJ4-12GM40-E3-V1	NBN4-12GM40-E0	NBN4-12GM40-E0-V1	NBN4-12GM40-E2	NBN4-12GM40-E2-V1	NBN4-12GM35-A0-V1	NBN4-12GM35-A2-V1
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire													◆
	NPN Antivalent													◆
	NPN Break function										◆			
	NPN Make function										◆			
	PNP Antivalent													◆
Assured operating distance	0 ... 3.24 mm													
	Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA													◆
Switching frequency	≤ 8 mA													◆
	0 ... 2000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	0 ... 800 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 1.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow													◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable													◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated													◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN4-12GM40-E0  
NBN4-12GM40-E2



NJ4-12GM40-E1

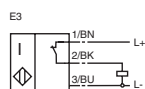
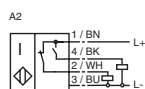
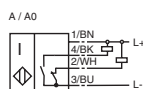
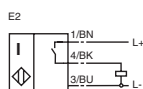
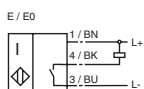
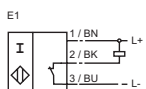
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NJ4-12GM40-E  
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NBN4-12GM40-E2-V1  
NJ4-12GM40-E2  
NJ4-12GM40-E2-V1

NBN4-12GM35-A0-V1

NBN4-12GM35-A2-V1

NJ4-12GM40-E3  
NJ4-12GM40-E3-V1



Date of edition: 20.08.03-11

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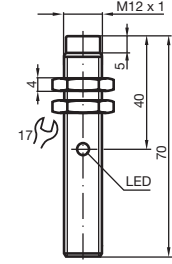
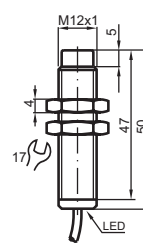
Inductive sensors, standard, cylindrical designs

- Basic series
- 4 mm not embeddable



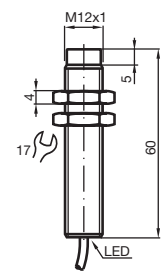
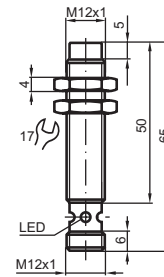
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NBN4-12GM50-E1  
NBN4-12GM50-E2  
NBN4-12GM50-E3

NBN4-12GM60-A0-V1  
NBN4-12GM60-A2-V1



NBN4-12GM50-E0-V1  
NBN4-12GM50-E1-V1  
NBN4-12GM50-E2-V1  
NBN4-12GM50-E3-V1

NBN4-12GM60-A0  
NBN4-12GM60-A2



		NBN4-12GM50-E0	NBN4-12GM50-E0-V1	NBN4-12GM50-E1	NBN4-12GM50-E1-V1	NBN4-12GM50-E2	NBN4-12GM50-E2-V1	NBN4-12GM50-E3	NBN4-12GM50-E3-V1	NBN4-12GM60-A0	NBN4-12GM60-A0-V1	NBN4-12GM60-A2	NBN4-12GM60-A2-V1
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire												
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent												
	NPN					◆	◆						
	Break function												
	Make function												
PNP	Antivalent												
	Break function							◆	◆				
	Make function												
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
No-load supply current	≤ 17 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
	≤ 20 mA												
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
	0 ... 1200 Hz												
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow												
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m PVC cable												
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	

NBN4-12GM50-E1  
NBN4-12GM50-E1-V1

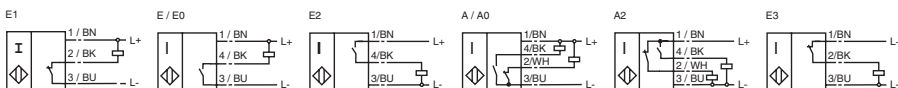
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NBN4-12GM50-E2-V1

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NBN4-12GM60-A0-V1

NBN4-12GM60-A2  
NBN4-12GM60-A2-V1

NBN4-12GM50-E3  
NBN4-12GM50-E3-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

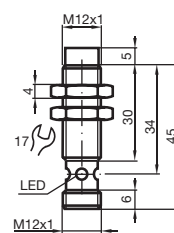
Date of edition 2008-03-11



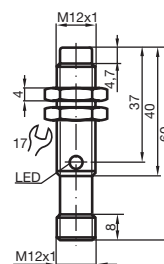
- **Basic series**
- **7 mm not embeddable**  
NBN7...
- **8 mm not embeddable**  
NBN8...
- **Comfort series**
- **10 mm not embeddable**  
NEN10-12GM50-E2-V1



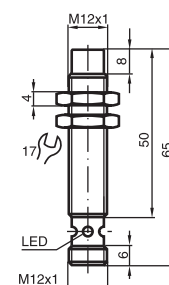
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NBN7-12GM35-E3-V1



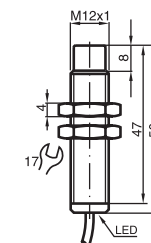
NEN10-12GM50-E2-V1



NBN8-12GM50-A0-V1  
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NBN8-12GM50-E0-V1  
NBN8-12GM50-E2-V1

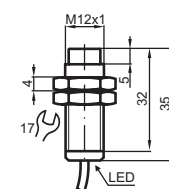


NBN8-12GM50-A0  
NBN8-12GM50-A2  
NBN8-12GM50-E0  
NBN8-12GM50-E2

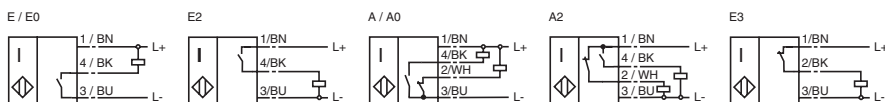


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Rated operating distance	10 mm												
	7 mm	◆	◆										
	8 mm				◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable												
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire									◆	◆	◆	◆
Switching element function	NPN Antivalent												
	NPN Make function				◆	◆							
	PNP Antivalent										◆	◆	
	PNP Break function					◆							
	PNP Make function	◆	◆				◆	◆					◆
Assured operating distance	0 ... 5.67 mm		◆	◆									
	0 ... 6.48 mm				◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 8.1 mm												◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA												◆
	≤ 15 mA	◆	◆										
	≤ 16 mA				◆	◆	◆	◆	◆	◆	◆	◆	
Switching frequency	0 ... 1500 Hz				◆	◆	◆	◆	◆	◆	◆	◆	
	0 ... 300 Hz				◆	◆							
	0 ... 400 Hz				◆	◆							◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 2 V												◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆										
	0 ... 200 mA				◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow												◆
	Multihole-LED, yellow						◆	◆	◆	◆	◆	◆	
	all direction LED, yellow												◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable				◆	◆	◆	◆	◆	◆	◆	◆	
Housing material	brass, chromium plated												◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN7-12GM35-E2



NBN7-12GM50-E0  
NBN7-12GM50-E0-V1  
NBN7-12GM85-E2  
NBN7-12GM85-E2-V1  
NBN8-12GM50-E2  
NBN8-12GM50-E2-V1  
NEN10-12GM50-E2-V1  
NBN8-12GM50-A0  
NBN8-12GM50-A0-V1  
NBN8-12GM50-A2  
NBN8-12GM50-A2-V1  
NBN7-12GM85-E3-V1



Date of edition: 20.08-03-11

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1.1

Inductive sensors, standard, cylindrical designs

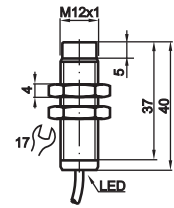
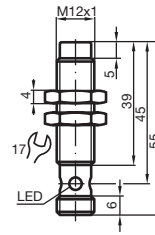


- **Comfort series**  
4 mm not embeddable  
NCN4...
- **Comfort series**  
8 mm not embeddable  
NCN8...
- **Basic series**  
4 mm not embeddable  
NBN4...

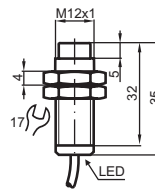


NBN4-12GM40-Z0-V1  
NBN4-12GM40-Z3-V1  
NCN4-12GM40-Z0-V1  
NCN4-12GM40-Z1-V1  
NCN8-12GM40-Z4-V1  
NCN8-12GM40-Z5-V1

NBN4-12GM40-Z0  
NCN4-12GM40-Z0  
NCN4-12GM40-Z1



NCN8-12GM35-Z4  
NCN8-12GM35-Z5



		NBN4-12GM40-Z0	NBN4-12GM40-Z0-V1	NBN4-12GM40-Z3-V1	NCN4-12GM40-Z0	NCN4-12GM40-Z0-V1	NCN4-12GM40-Z1	NCN4-12GM40-Z1-V1	NCN8-12GM35-Z4	NCN8-12GM35-Z5	NCN8-12GM40-Z4-V1	NCN8-12GM40-Z5-V1
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆				
	8 mm								◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0... 3.24 mm	◆	◆	◆	◆	◆	◆	◆				
	0... 6.48 mm								◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5... 60 V	◆	◆	◆	◆	◆	◆	◆				
Switching frequency	0 ... 1000 Hz	◆	◆						◆	◆	◆	◆
	0... 750 Hz								◆	◆	◆	◆
Reverse polarity protection	0... 800 Hz				◆	◆	◆	◆				
	conductive								◆	◆	◆	◆
	tolerant		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	2... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0.4 ... 0.6 mA typ. 0.5 mA								◆	◆	◆	◆
Indication of the switching state	LED, yellow								◆	◆	◆	◆
	Multihole-LED, yellow		◆	◆	◆	◆	◆	◆				
	all direction LED, yellow		◆	◆	◆	◆	◆	◆				
Pre-fault indication	LED, red								◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable				◆	◆	◆	◆				
	2 m, PVC cable				◆				◆	◆	◆	◆
Housing material	Stainless steel				◆	◆	◆	◆				
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN4-12GM40-Z0  
NCN4-12GM40-Z0

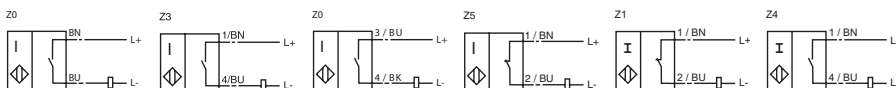
NBN4-12GM40-Z3-V1

NBN4-12GM40-Z0-V1  
NCN4-12GM40-Z0-V1

NCN8-12GM35-Z5  
NCN8-12GM40-Z5-V1

NCN4-12GM40-Z1  
NCN4-12GM40-Z1-V1

NCN8-12GM35-Z4  
NCN8-12GM40-Z4-V1



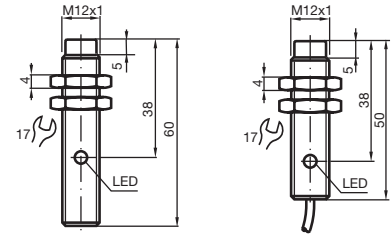
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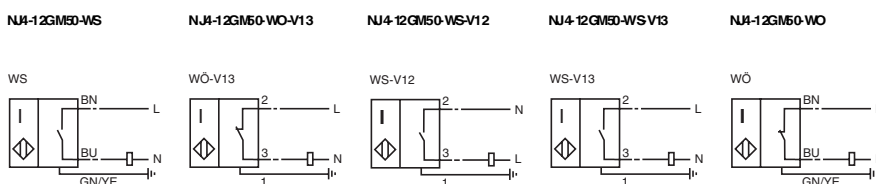
- Comfort series
- 4 mm not embeddable

NJ4-12GM50-WO-V13  
NJ4-12GM50-WS-V12  
NJ4-12GM50-WS-V13

NJ4-12GM50-WO  
NJ4-12GM50-WS



		NJ4-12GM50-WO	NJ4-12GM50-WO-V13	NJ4-12GM50-WS	NJ4-12GM50-WS-V12	NJ4-12GM50-WS-V13
Rated operating distance	4 mm	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	AC Break function	◆	◆			
	AC Make function			◆	◆	◆
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆
Kind of voltage	AC	◆	◆	◆	◆	◆
Operating voltage	20 ... 253 V	◆	◆	◆	◆	◆
Switching frequency	0 ... 20 Hz	◆	◆	◆	◆	◆
Voltage drop	typ. 4 V at 15 ... 200 mA	◆	◆	◆	◆	◆
	typ. 6,5 V at 5 mA	◆	◆	◆	◆	◆
Operating current	5 ... 200 mA	◆	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1200 mA	◆	◆	◆	◆	◆
Off-state current	typ. 0.7 mA	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	V12 device plug				◆	
	V13-connector		◆			◆
	2 m, PVC cable	◆		◆		
Housing material	Stainless steel	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆



Date of edition 2008-03-11

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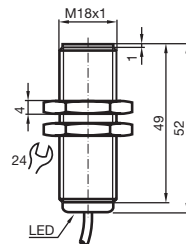
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1.1

Inductive sensors, standard, cylindrical designs

- Basic series
- 5 mm embeddable
- With increased sealing, protection class IP68 / IP69k

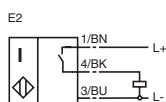
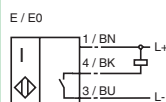
NBB5-18GK50-E0  
NBB5-18GK50-E2



		NBB5-18GK50-E0	NBB5-18GK50-E2
Rated operating distance	5 mm	◆	◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	NPN Make function	◆	
	PNP Make function		◆
Assured operating distance	0 ... 4.05 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68 / IP69K	◆	◆

NBB5-18GK50-E0

NBB5-18GK50-E2



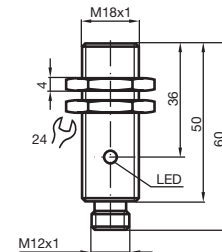
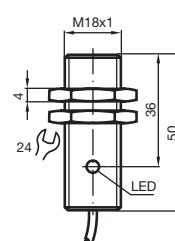
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- Comfort series
- 5 mm embeddable

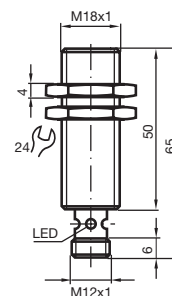


NJ5-18GM50-A2  
NJ5-18GM50-E  
NJ5-18GM50-E1  
NJ5-18GM50-E2  
NJ5-18GM50-E3

NJ5-18GM50-A2-V1  
NJ5-18GM50-E-V1



NJ5-18GM50-E2-V1



		NJ5-18GM50-E	NJ5-18GM50-E-V1	NJ5-18GM50-E1	NJ5-18GM50-E2	NJ5-18GM50-E2-V1	NJ5-18GM50-E3	NJ5-18GM50-A2	NJ5-18GM50-A2-V1
Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire							◆	◆
	NPN Break function			◆					
	NPN Make function		◆	◆					
	PNP Antivalent							◆	◆
	PNP Break function						◆		
PNP Make function					◆	◆			
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 9 mA	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆
0 ... 200 Hz								◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 400 mA							◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆			◆		◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

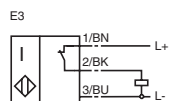
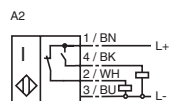
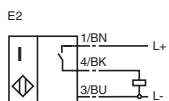
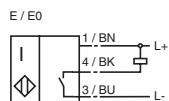
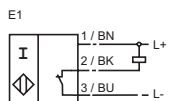
NJ5-18GM50-E1

NJ5-18GM50-E  
NJ5-18GM50-E-V1

NJ5-18GM50-E2  
NJ5-18GM50-E2-V1

NJ5-18GM50-A2  
NJ5-18GM50-A2-V1

NJ5-18GM50-E3



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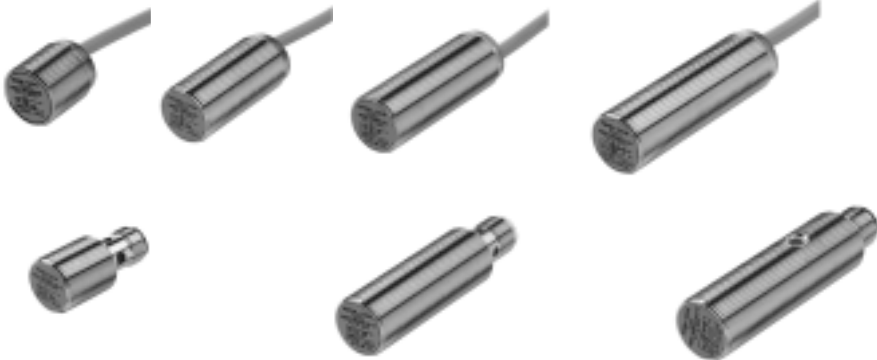
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1.1

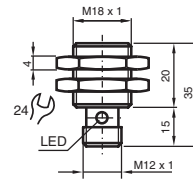
Inductive sensors, standard, cylindrical designs



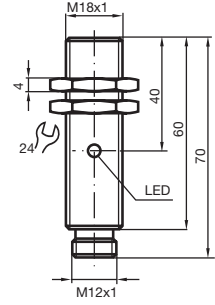
- Basic series
- 5 mm embeddable
- NBB5-18GM20-E2-V1
- NBB5-18GM40-E2
- NBB5-18GM50-E0
- NBB5-18GM50-E0-V1
- NBB5-18GM50-E2



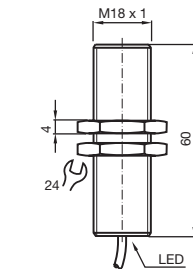
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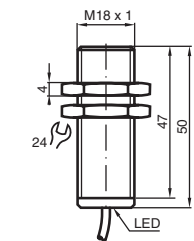
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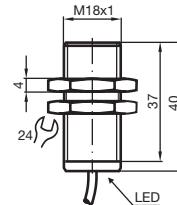
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NBB5-18GM60-A2



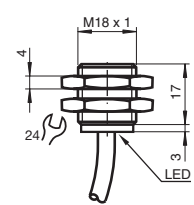
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NBB5-18GM50-E2



NBB5-18GM40-E2

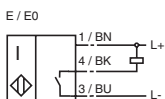


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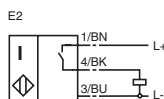


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Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 800 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihde-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

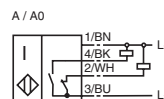
NBB5-18GM50-E0  
NBB5-18GM50-E0-V1



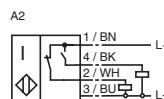
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NBB5-18GM20-E2-V1  
NBB5-18GM40-E2  
NBB5-18GM50-E2  
NBB5-18GM50-E2-V1



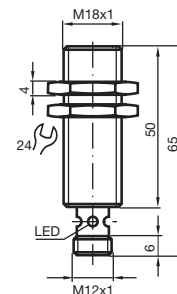
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NBB5-18GM60-A0-V1



NBB5-18GM60-A2  
NBB5-18GM60-A2-V1



NBB5-18GM50-E0-V1  
NBB5-18GM50-E2-V1

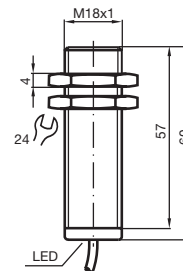


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

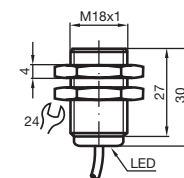
- Basic series
- 8 mm embeddable



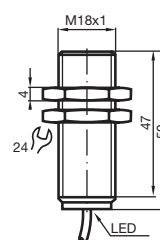
NBB8-18GM60-A0  
NBB8-18GM60-A2



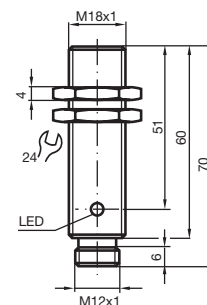
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NBB8-18GM30-E3



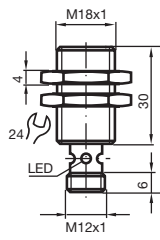
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NBB8-18GM50-E2



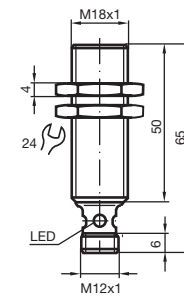
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NBB8-18GM60-A2-V1



NBB8-18GM30-E2-V1  
NBB8-18GM30-E3-V1

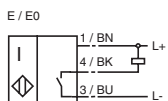


NBB8-18GM50-E0-V1  
NBB8-18GM50-E2-V1

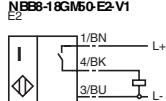


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Rated operating distance	8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire									◆	◆	◆	◆
	NPN Antivalent												
	NPN Make function							◆	◆				
	PNP Antivalent												◆
	PNP Break function												
	PNP Make function												◆
Assured operating distance	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 25 mA												
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA												
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow							◆	◆				
	all direction LED, yellow												
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector												
	2 m, PVC cable												
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

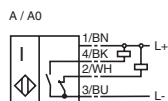
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NBB8-18GM50-E0-V1



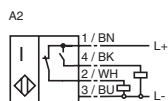
NBB8-18GM80-E2  
NBB8-18GM80-E2-V1  
NBB8-18GM60-E2  
NBB8-18GM60-E2-V1



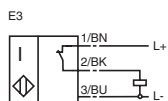
NBB8-18GM60-A0  
NBB8-18GM60-A0-V1



NBB8-18GM60-A2  
NBB8-18GM60-A2-V1



NBB8-18GM80-E3  
NBB8-18GM80-E3-V1



Date of edition: 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

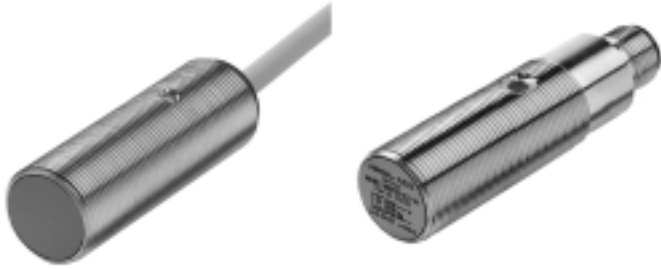
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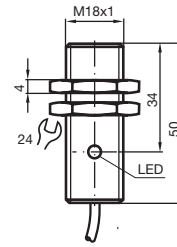
1.1

Inductive sensors, standard, cylindrical designs

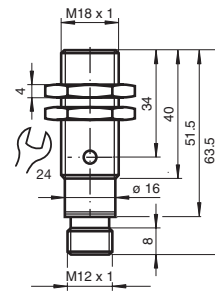
- Comfort series
- 12 mm quasi-embeddable



NEB12-18GM50-E2



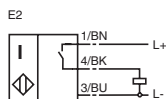
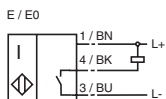
NEB12-18GM50-E2-V1  
NEB12-18GM50-E-V1



		NEB12-18GM50-E-V1	NEB12-18GM50-E2	NEB12-18GM50-E2-V1
Rated operating distance	12 mm	◆	◆	◆
Installation	quasi embedd.	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	NPN	◆	◆	◆
	PNP		◆	◆
Assured operating distance	0 ... 9.72 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	yes	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Off-state current	0 ... 0.1 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
	LED yellow		◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector	◆	◆	◆
	2 m, PVC cable		◆	◆
Housing material	brass, chromium plated	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

NEB12-18GM50-E-V1

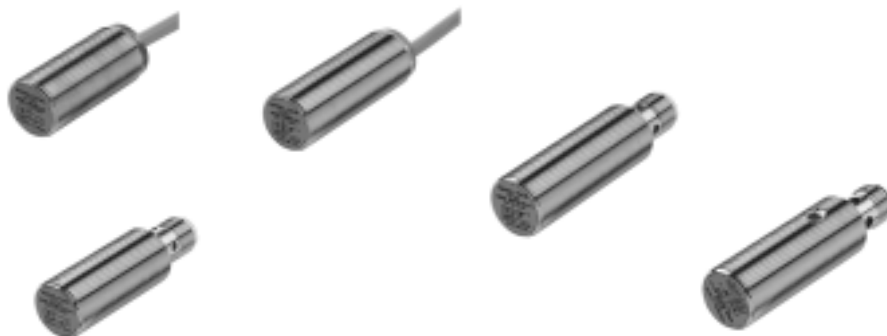
NEB12-18GM50-E2  
NEB12-18GM50-E2-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

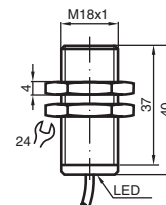
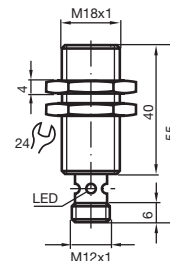


- **Comfort series**  
5 mm embeddable  
NCB5...
- **8 mm embeddable**  
NCB8...
- **Basic series**  
5 mm embeddable  
NBB5...



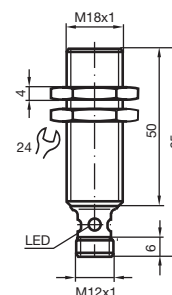
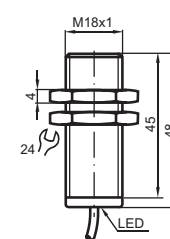
NBB5-18GM40-Z0-V1  
NBB5-18GM40-Z3-V1  
NCB5-18GM40-Z0-V1  
NCB5-18GM40-Z1-V1

NBB5-18GM40-Z0  
NCB5-18GM40-Z0  
NCB5-18GM40-Z1



NCB8-18GM50-Z4  
NCB8-18GM50-Z5

NCB8-18GM50-Z1-V1  
NCB8-18GM50-Z5-V1



		NBB5-18GM40-Z0	NBB5-18GM40-Z0-V1	NBB5-18GM40-Z3-V1	NCB5-18GM40-Z0	NCB5-18GM40-Z0-V1	NCB5-18GM40-Z1	NCB5-18GM40-Z1-V1	NCB8-18GM50-Z4	NCB8-18GM50-Z4-V1	NCB8-18GM50-Z5	NCB8-18GM50-Z5-V1
Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	8 mm								◆	◆	◆	◆
Installation	embeddable								◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 6.1 mm								◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 350 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity								◆	◆		
	reverse polarity-conductive tolerant										◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.5 V								◆	◆	◆	◆
	≤ 5 V								◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	typ. 0.8 mA								◆	◆	◆	◆
	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow								◆	◆	◆	◆
	Multihde-LED, yellow		◆	◆					◆	◆	◆	◆
	all direction LED, yellow	◆			◆				◆	◆	◆	◆
Pre-fault indication	LED, red								◆	◆	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable					◆					◆	◆
	2 m, PVC cable		◆						◆	◆	◆	◆
Housing material	Stainless steel					◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	

NBB5-18GM40-Z0  
NCB5-18GM40-Z0

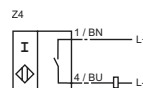
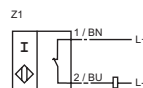
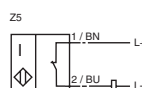
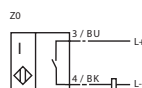
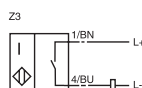
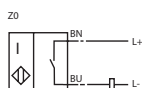
NBB5-18GM40-Z3-V1

NBB5-18GM40-Z0-V1  
NCB5-18GM40-Z0-V1

NCB8-18GM50-Z5  
NCB8-18GM50-Z5-V1

NCB5-18GM40-Z1  
NCB5-18GM40-Z1-V1

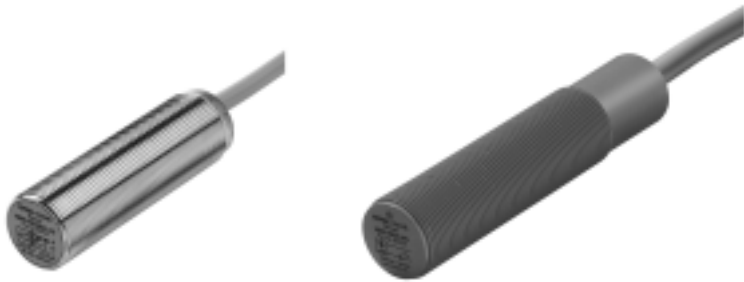
NCB8-18GM50-Z4  
NCB8-18GM50-Z4-V1



1.1

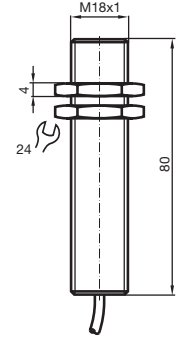
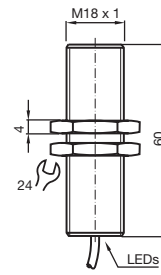
Inductive sensors, standard, cylindrical designs

- Basic series
- 5 mm embeddable



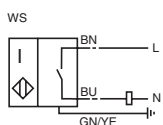
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NBB5-18GM60-WS

NBB5-18GK-WO  
NBB5-18GK-WS

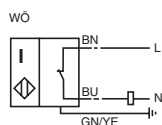


		NBB5-18GM60-WO	NBB5-18GM60-WS	NBB5-18GK-WO	NBB5-18GK-WS
Rated operating distance	5 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	AC Break function	◆		◆	
	AC Make function		◆		◆
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆
Kind of voltage	AC	◆	◆	◆	◆
Operating voltage	20 ... 250 V	◆		◆	
	20 ... 253 V	◆	◆		
Switching frequency	0 ... 20 Hz	◆	◆	◆	◆
Voltage drop	< 5 V (I <sub>L</sub> > 50 mA); < 8 V (I <sub>L</sub> < 50 mA)	◆	◆		
	≤ 8 V			◆	◆
Operating current	5 ... 200 mA	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1600 mA	◆	◆	◆	◆
Off-state current	0 ... 1.5 mA typ.			◆	
	0 ... 1.7 mA typ.	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆		
Indication of the switching state	LED, yellow	◆	◆		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆		
Sensing face	PBT			◆	◆
	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆		
	IP68			◆	◆

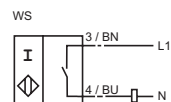
NBB5-18GM60-WS



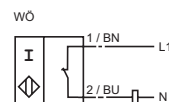
NBB5-18GM60-WO



NBB5-18GK-WS



NBB5-18GK-WO



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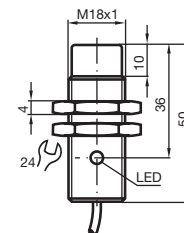
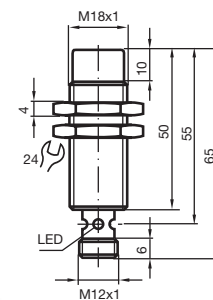


- **Comfort series**  
8 mm not embeddable  
NJ8...
- **Basic series**>  
8 mm not embeddable  
NBN8...
- **With increased sealing, protection class IP68 / IP69k**  
NBN8...



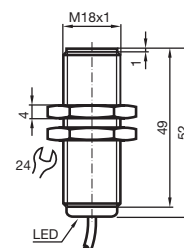
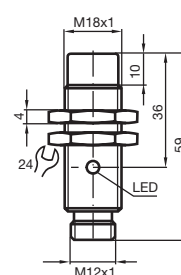
NJ8-18GM50-E-V1  
NJ8-18GM50-E2-V1

NJ8-18GM50-A2  
NJ8-18GM50-E0  
NJ8-18GM50-E2



NJ8-18GM50-A2-V1

NBN8-18GK50-E0  
NBN8-18GK50-E2

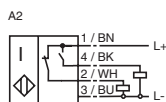
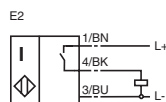
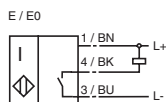


		NJ8-18GM50-E0	NJ8-18GM50-E-V1	NJ8-18GM50-E2	NJ8-18GM50-E2-V1	NJ8-18GM50-A2	NJ8-18GM50-A2-V1	NBN8-18GK50-E0	NBN8-18GK50-E2
Rated operating distance	8 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire					◆	◆		
Switching element function	NPN Make function	◆	◆					◆	
	PNP Antivalent					◆	◆		
	PNP Make function			◆	◆				◆
Assured operating distance	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V							◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 9 mA	◆	◆	◆	◆				
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆				
	0 ... 1000 Hz	◆	◆	◆	◆				
	0 ... 500 Hz							◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 400 mA					◆	◆		
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector							◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆		
	PBT							◆	◆
Sensing face	PBT							◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
	IP68 / IP69K							◆	◆

NBN8-18GK50-E0  
NBN8-18GM50-E0  
NBN8-18GM50-E-V1

NBN8-18GK50-E2  
NBN8-18GM50-E2  
NBN8-18GM50-E2-V1

NJ8-18GM50-A2  
NJ8-18GM50-A2-V1



Date of edition 20.08-03-11

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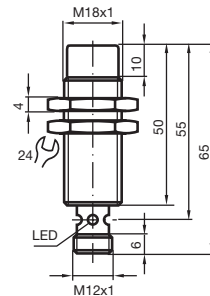
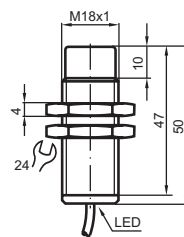
Inductive sensors, standard, cylindrical designs

- Basic series
- 8 mm not embeddable



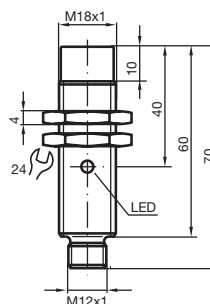
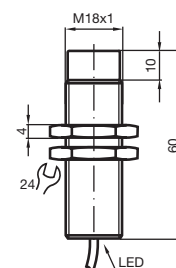
NBN8-18GM50-E0  
NBN8-18GM50-E2

NBN8-18GM50-E0-V1  
NBN8-18GM50-E2-V1



NBN8-18GM60-A0  
NBN8-18GM60-A2

NBN8-18GM60-A2-V1  
NBN8-18GM60-A0-V1



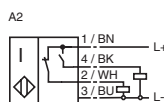
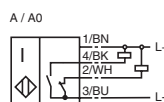
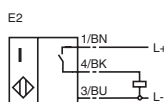
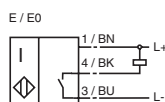
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Rated operating distance	8 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Antivalent					◆	◆		
	NPN Make function			◆	◆				
	PNP Antivalent							◆	◆
Assured operating distance	PNP Make function							◆	◆
	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 18 mA	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA					◆	◆		
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 700 Hz					◆	◆		
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow		◆		◆				
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆		◆		◆		◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

NBN8-18GM50-E0  
NBN8-18GM50-E0-V1

NBN8-18GM50-E2  
NBN8-18GM50-E2-V1

NBN8-18GM60-A0  
NBN8-18GM60-A0-V1

NBN8-18GM60-A2-V1  
NBN8-18GM60-A2

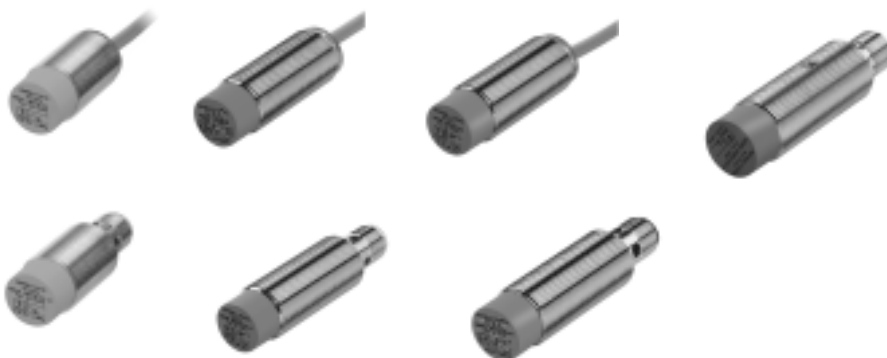


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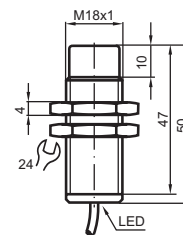
Date of edition 20.08.03-11



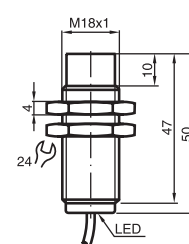
- **Basic series**  
12 mm not embeddable  
NBN12...
- **Comfort series**  
20 mm not embeddable  
NEN20-18GM50-E2-V1



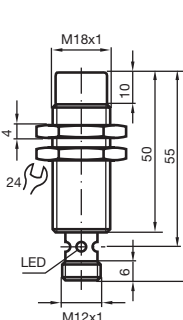
NBN12-18GM50-A0  
NBN12-18GM50-A2



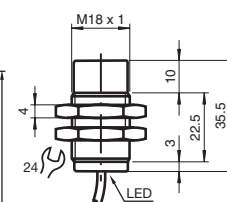
NBN12-18GM50-E0  
NBN12-18GM50-E2



NBN12-18GM50-A0-V1  
NBN12-18GM50-A2-V1

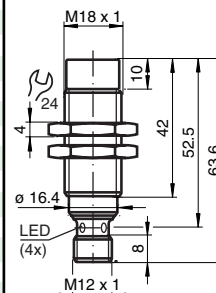


NEN20-18GM50-E2

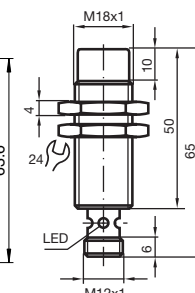


		NBN12-18GM35-E2	NBN12-18GM35-E2-V1	NBN12-18GM50-E0	NBN12-18GM50-E0-V1	NBN12-18GM50-E2	NBN12-18GM50-E2-V1	NBN12-18GM50-A0	NBN12-18GM50-A0-V1	NBN12-18GM50-A2	NBN12-18GM50-A2-V1	NEN20-18GM50-E2-V1
Rated operating distance	12 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	20 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 9.72 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 12 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 300 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 2 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 2.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	connector M12 x 1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, chromium plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

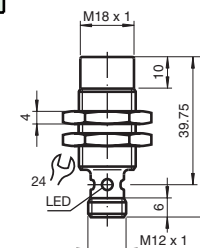
NEN20-18GM50-E2-V1



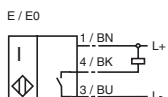
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NBN12-18GM50-E2-V1



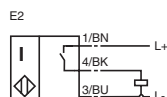
NBN12-18GM35-E2-V1



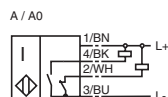
NBN12-18GM50-E0  
NBN12-18GM50-E0-V1



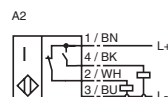
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NBN12-18GM35-E2-V1  
NBN12-18GM50-E2  
NBN12-18GM50-E2-V1  
NEN20-18GM50-E2-V1



NBN12-18GM50-A0  
NBN12-18GM50-A0-V1



NBN12-18GM50-A2  
NBN12-18GM50-A2-V1



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1.1

Inductive sensors, standard, cylindrical designs

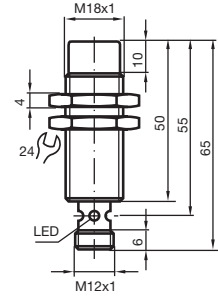
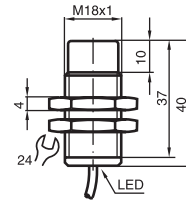


- **Comfort series**  
8 mm not embeddable  
NCN8...
- **Comfort series**  
12 mm not embeddable  
NCN12...
- **Basic series**  
8 mm not embeddable  
NBN8...



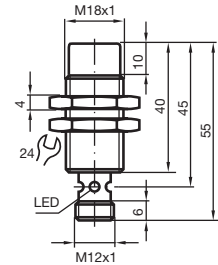
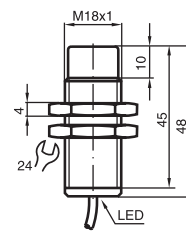
NBN8-18GM40-Z0  
NCN8-18GM40-Z0  
NCN8-18GM40-Z1

NCN12-18GM50-Z4-V1  
NCN12-18GM50-Z5-V1



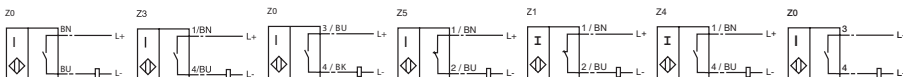
NCN12-18GM50-Z1  
NCN12-18GM50-Z5

NBN8-18GM40-Z0-V1  
NBN8-18GM40-Z3-V1  
NCN8-18GM40-Z0-V1  
NCN8-18GM40-Z1-V1



		NBN8-18GM40-Z0	NBN8-18GM40-Z0-V1	NBN8-18GM40-Z3-V1	NCN8-18GM40-Z0	NCN8-18GM40-Z0-V1	NCN8-18GM40-Z1	NCN8-18GM40-Z1-V1	NCN12-18GM50-Z4	NCN12-18GM50-Z4-V1	NCN12-18GM50-Z5	NCN12-18GM50-Z5-V1
Rated operating distance	12 mm											
	8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 6.5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 9.1 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 300 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 450 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	reverse polarity-conductive tolerant	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤3.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	typ. 0.8 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Pre-fault indication	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN8-18GM40-Z0 NBN8-18GM40-Z3-V1 NCN8-18GM40-Z0-V1 NCN12-18GM50-Z5 NCN8-18GM40-Z1 NCN12-18GM50-Z1 NBN8-18GM40-Z0-V1  
NCN8-18GM40-Z0 NCN12-18GM50-Z5-V1 NCN8-18GM40-Z1-V1 NCN12-18GM50-Z1-V1



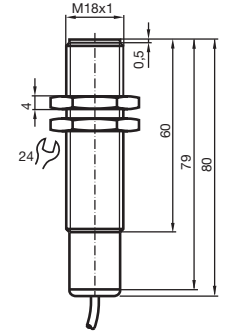
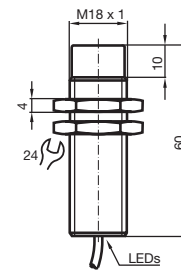
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Basic series
- 8 mm not embeddable

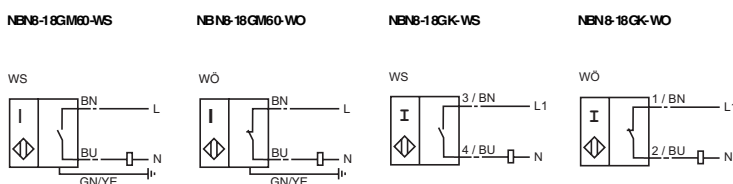


NBN8-18GM60-WO  
NBN8-18GM60-WS

NBN8-18GK-WO  
NBN8-18GK-WS



		NBN8-18GM60-WO	NBN8-18GM60-WS	NBN8-18GK-WO	NBN8-18GK-WS
Rated operating distance	8 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	AC Break function	◆		◆	
	AC Make function		◆		◆
Assured operating distance	0 ... 6.48 mm	◆	◆		
	0 ... 6.5 mm			◆	◆
Kind of voltage	AC	◆	◆	◆	◆
Operating voltage	20 ... 253 V	◆	◆	◆	◆
Switching frequency	0 ... 20 Hz	◆	◆	◆	◆
Voltage drop	< 5 V (I <sub>L</sub> > 50 mA); < 8 V (I <sub>L</sub> < 50 mA)	◆	◆		
Operating current	≤ 8 V			◆	◆
	5 ... 200 mA	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1600 mA	◆	◆	◆	◆
Off-state current	0 ... 1.7 mA typ.	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆		
Indication of the switching state	LED, yellow			◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆		
	PBT			◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆		
	IP68			◆	◆



Date of edition: 2008-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

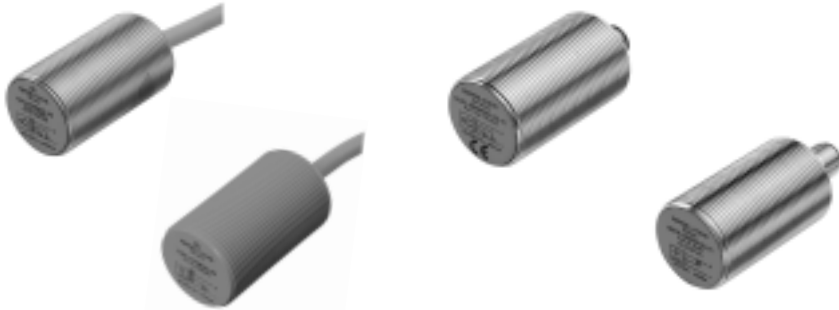
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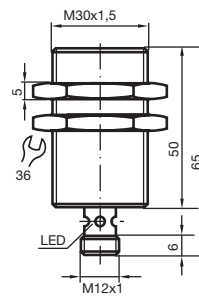
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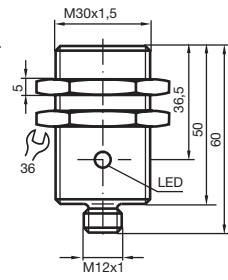
- 10 mm embeddable
- Comfort series  
NJ10...
- Basic series  
NBB10...
- With increased sealing, protection class IP68 / IP69k  
NBB10-30GK50-E0  
NBB10-30GK50-E2



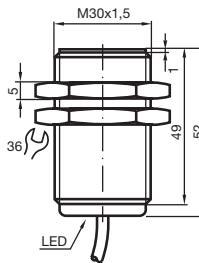
NJ10-30GM50-E2-V1



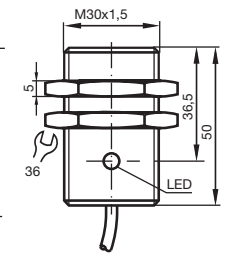
NJ10-30GM50-A2-V1



NBB10-30GK50-E0  
NBB10-30GK50-E2

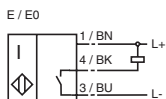


NJ10-30GM50-A2  
NJ10-30GM50-E  
NJ10-30GM50-E2

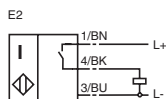


		NJ10-30GM50-E	NJ10-30GM50-E2	NJ10-30GM50-E2-V1	NJ10-30GM50-A2	NJ10-30GM50-A2-V1	NBB10-30GK50-E0	NBB10-30GK50-E2
Rated operating distance	10 mm	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire				◆	◆		
	NPN Make function		◆				◆	
	PNP Antivalent			◆	◆	◆		
	PNP Make function			◆			◆	
Assured operating distance	0 ... 8.1 mm	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA				◆	◆		
	≤ 20 mA						◆	◆
	≤ 9 mA		◆	◆				
Switching frequency	0 ... 100 Hz		◆	◆				
	0 ... 200 Hz				◆	◆		
	0 ... 650 Hz						◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V				◆	◆		
Operating current	0 ... 200 mA	◆	◆		◆	◆	◆	◆
	0 ... 400 mA				◆	◆		
Indication of the switching state	LED, yellow	◆	◆	◆				
	LED, red				◆	◆		
	all direction LED, yellow						◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector				◆	◆		
	2 m, PVC cable	◆	◆	◆			◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆		
	PBT						◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆
	IP68 / IP69K						◆	◆

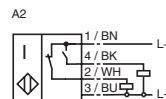
NJ10-30GM50-E  
NBB10-30GK50-E0



NJ10-30GM50-E2  
NBB10-30GK50-E2  
NJ10-30GM50-E2-V1



NJ10-30GM50-A2  
NJ10-30GM50-A2-V1



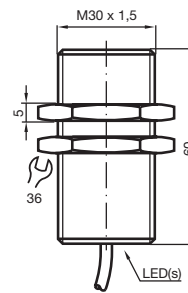
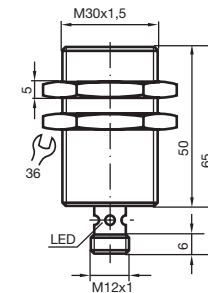
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Basic series
- 10 mm embeddable



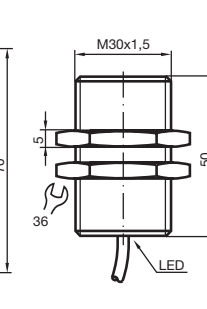
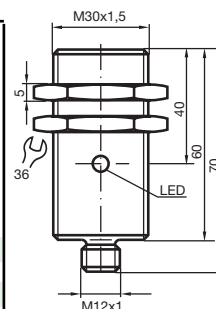
NBB10-30GM50-E0-V1  
NBB10-30GM50-E2-V1

NBB10-30GM60-A0  
NBB10-30GM60-A2



NBB10-30GM60-A0-V1  
NBB10-30GM60-A2-V1

NBB10-30GM50-E0  
NBB10-30GM50-E2



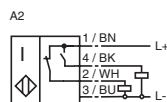
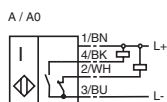
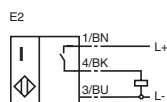
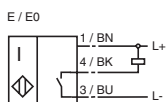
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Rated operating distance	10 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching elementfunction	4-wire					◆	◆	◆	◆
	NPN Antivalent					◆	◆		
	NPN Make function	◆	◆						
	PNP Antivalent							◆	◆
PNP Make function				◆	◆				
Assured operating distance	0 ... 8.1 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 200 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow					◆	◆	◆	◆
	Multihde-LED, yellow			◆					
	all direction LED, yellow	◆	◆						
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector			◆				◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

NBB10-30GM50-E0  
NBB10-30GM50-E0-V1

NBB10-30GM50-E2  
NBB10-30GM50-E2-V1

NBB10-30GM60-A0  
NBB10-30GM60-A0-V1

NBB10-30GM60-A2  
NBB10-30GM60-A2-V1



Date of edition 2008-03-11

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1.1

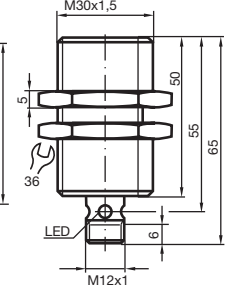
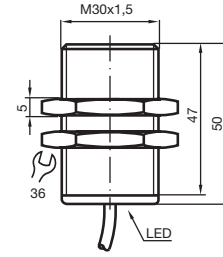
Inductive sensors, standard, cylindrical designs

- **Basic series**  
15 mm embeddable  
NBB15...
- **Comfort series**  
22 mm quasi-embeddable  
NEB22-30GM60-E2-V1



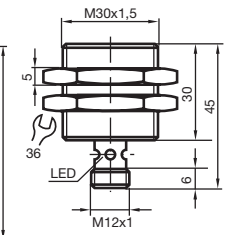
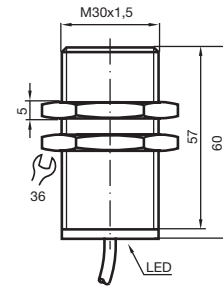
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NBB15-30GM50-E2

NBB15-30GM50-E0-V1  
NBB15-30GM50-E2-V1



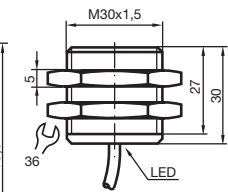
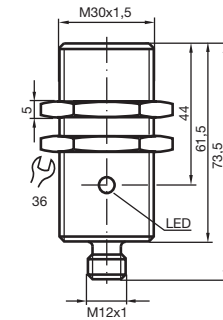
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NBB15-30GM60-A2

NBB15-30GM30-E2-V1  
NBB15-30GM30-E3-V1

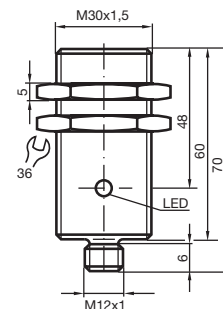


NEB22-30GM60-E2-V1

NBB15-30GM80-E2  
NBB15-30GM80-E3



NBB15-30GM60-A0-V1  
NBB15-30GM60-A2-V1



		NBB15-30GM30-E2	NBB15-30GM30-E2-V1	NBB15-30GM30-E3	NBB15-30GM30-E3-V1	NBB15-30GM50-E0	NBB15-30GM50-E0-V1	NBB15-30GM50-E2	NBB15-30GM50-E2-V1	NBB15-30GM60-A0	NBB15-30GM60-A0-V1	NBB15-30GM60-A2	NBB15-30GM60-A2-V1	NEB22-30GM60-E2-V1
Rated operating distance	15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	22 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	quasi embedd.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 17.8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 25 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, chromium plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

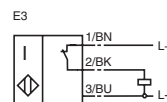
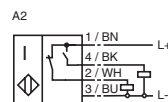
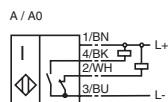
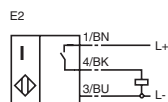
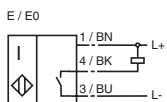
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NBB15-30GM50-E0-V1

NBB15-30GM30-E2  
NBB15-30GM30-E2-V1  
NBB15-30GM30-E3  
NBB15-30GM30-E3-V1  
NEB22-30GM60-E2-V1  
NBB15-30GM60-E2-V1

NBB15-30GM60-A0  
NBB15-30GM60-A0-V1

NBB15-30GM60-A2-V1  
NBB15-30GM60-A2

NBB15-30GM30-E3  
NBB15-30GM30-E3-V1



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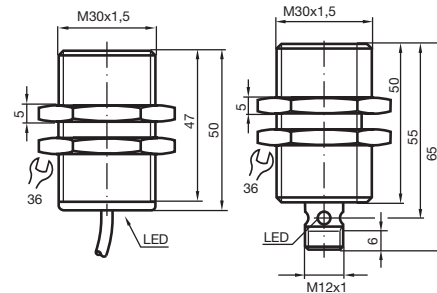


- **Comfort series, 10 mm embeddable**  
NCB10...
- **Comfort series, 15 mm embeddable**  
NCB15...
- **Basic series, 10 mm embeddable**  
NBB10...



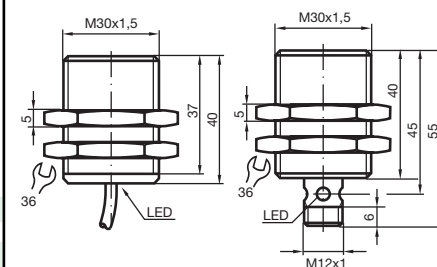
NCB1 5-30GM50-Z1  
NCB1 5-30GM50-Z5

NCB15-30GM50-Z1-V1  
NCB15-30GM50-Z5-V1



NBB10-30GM40-Z0  
NCB10-30GM40-Z0  
NCB10-30GM40-Z1

NBB10-30GM40-Z0-V1  
NCB10-30GM40-Z3-V1  
NCB10-30GM40-Z0-V1  
NCB10-30GM40-Z1-V1



		NBB10-30GM40-Z0	NBB10-30GM40-Z0-V1	NBB10-30GM40-Z3-V1	NCB10-30GM40-Z0	NCB10-30GM40-Z0-V1	NCB10-30GM40-Z1	NCB10-30GM40-Z1-V1	NCB15-30GM50-Z4	NCB15-30GM50-Z4-V1	NCB15-30GM50-Z5	NCB15-30GM50-Z5-V1
Rated operating distance	10 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	15 mm											
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 8.1 mm											
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V											
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	500 Hz											
Reverse polarity protection	protected against reverse polarity								◆	◆	◆	◆
	reverse polarity-conductive tolerant	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5 V											
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	typ. 0.8 mA											
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow				◆	◆	◆	◆				
	all direction LED, yellow	◆	◆	◆								
Pre-fault indication	LED, red							◆	◆			
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector				◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable						◆	◆				
	2 m, PVC cable	◆							◆	◆		
Housing material	Stainless steel				◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆								
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	

NBB10-30GM40-Z0  
NCB10-30GM40-Z0

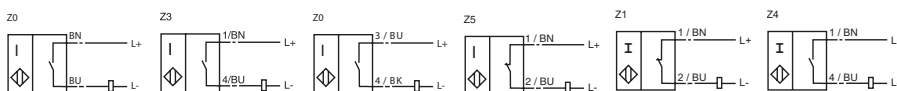
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NBB10-30GM40-Z0-V1  
NCB10-30GM40-Z0-V1

NCB15-30GM50-Z5  
NCB15-30GM50-Z5-V1

NCB10-30GM40-Z1  
NCB10-30GM40-Z1-V1

NCB15-30GM50-Z1  
NCB15-30GM50-Z1-V1



Date of edition: 20.08.03-11

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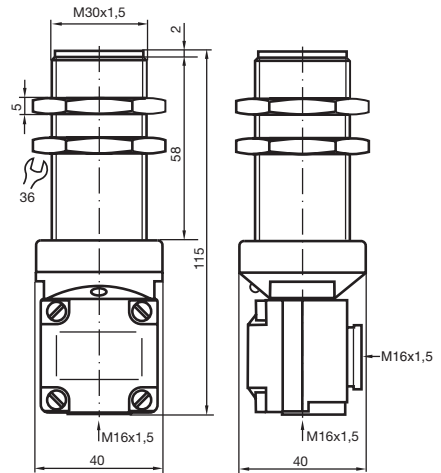
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- Basic series
- 10 mm embeddable
- 15 mm embeddable
- 15 mm quasi-embeddable



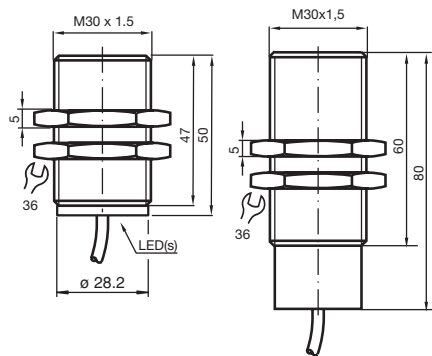
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 NBB10-30GK-K-WS  
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 NBB15-30GK-K-WS



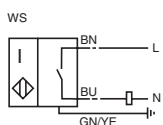
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Rated operating distance	10 mm	◆	◆	◆	◆						
Installation	15 mm					◆	◆	◆	◆	◆	◆
	embeddable										
	quasi embedd										
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	AC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	AC Break function					◆	◆	◆	◆	◆	◆
	AC Make function									◆	◆
Assured operating distance	0 ... 12.15 mm					◆	◆	◆	◆	◆	◆
	0 ... 8.1 mm					◆	◆	◆	◆	◆	◆
Kind of voltage	AC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	20 ... 250 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	20 ... 253 V					◆	◆	◆	◆	◆	◆
No-load supply current	≤ 1.7 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 20 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 25 Hz									◆	◆
Short-circuit protection						◆	◆	◆	◆	◆	◆
Voltage drop	< 5 V (I <sub>L</sub> > 50 mA); < 8 V (I <sub>L</sub> < 50 mA)					◆	◆	◆	◆	◆	◆
	≤ 8 V					◆	◆	◆	◆	◆	◆
Operating current	1.5 ... 200 mA					◆	◆	◆	◆	◆	◆
	5 ... 200 mA					◆	◆	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1600 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 1.5 mA typ.									◆	◆
	0 ... 1.7 mA					◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green					◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow					◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable									◆	◆
Housing material	brass, nickel-plated					◆	◆	◆	◆	◆	◆
	PBT					◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68									◆	◆

NBB10-30GM50-WO  
 NBB10-30GM50-WS  
 NBB15-30GM50-WO  
 NBB15-30GM50-WS

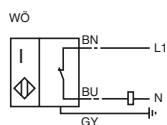
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 NBB15-30GK-WS



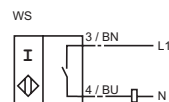
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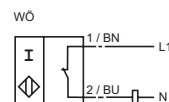
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 NBB15-30GM50-WO



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 NBB15-30GK-K-WS  
 NBB15-30GK-WS



NBB10-30GK-K-WO  
 NBB15-30GK-K-WO  
 NBB15-30GK-WO



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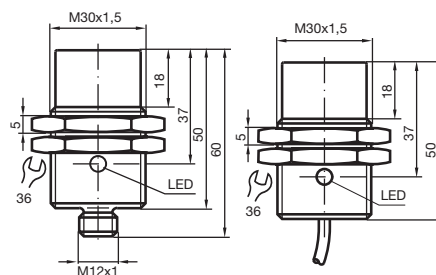


- **Comfort series, 15 mm not embeddable**  
NJ15...
- **Basic series, 15 mm not embeddable**  
NBN15...
- **With increased sealing, protection class IP68 / IP69k**  
NBN15-30GK50-E0  
NBN15-30GK50-E2

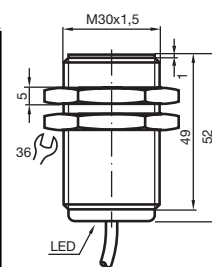


NJ15-30GM50-A2-V1  
NJ15-30GM50-E2-V1

NJ15-30GM50-E  
NJ15-30GM50-E2  
NJ15-30GM50-A2



NBN15-30GK50-E0  
NBN15-30GK50-E2

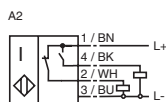
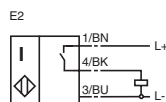
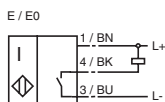


		NJ15-30GM50-E	NJ15-30GM50-E2	NJ15-30GM50-E2-V1	NJ15-30GM50-A2	NJ15-30GM50-A2-V1	NBN15-30GK50-E0	NBN15-30GK50-E2
Rated operating distance	15 mm	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire				◆	◆		
	NPN	Make function	◆				◆	
	PNP	Antivalent			◆	◆		
	PNP	Make function		◆	◆		◆	
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA				◆	◆	◆	◆
	≤ 9 mA	◆	◆	◆				
Switching frequency	0 ... 200 Hz						◆	◆
	0 ... 50 Hz				◆	◆		
	0 ... 500 Hz							
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V				◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆			◆	◆
	0 ... 400 mA				◆	◆		
Indication of the switching state	LED, yellow	◆	◆	◆				
	LED, red				◆	◆		
	all direction LED, yellow						◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector			◆	◆			
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT				◆	◆	◆	◆
	PBT	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆
	IP68 / IP69K						◆	◆

NJ15-30GM50-E  
NBN15-30GK50-E0

NJ15-30GM50-E2  
NBN15-30GK50-E2  
NJ15-30GM50-E2-V1

NJ15-30GM50-A2  
NJ15-30GM50-A2-V1



Date of edition 20.08-03-11

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1.1

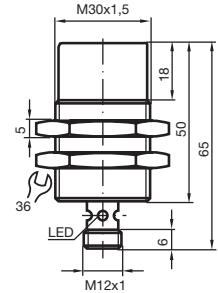
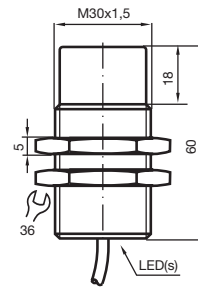
Inductive sensors, standard, cylindrical designs

- Basic series
- 15 mm not embeddable



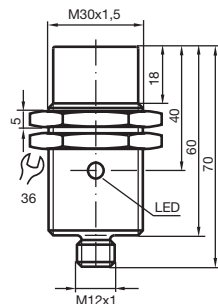
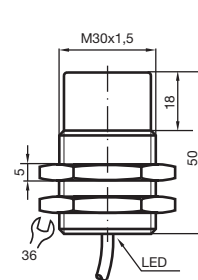
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NBN15-30GM60-A2

NBN15-30GM50-E0-V1



NBN15-30GM50-E0  
NBN15-30GM50-E2

NBN15-30GM60-A0-V1  
NBN15-30GM60-A2-V1



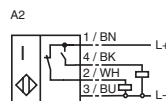
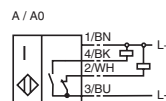
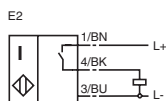
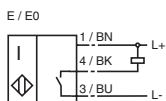
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Rated operating distance	15 mm	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire				◆	◆	◆	◆
	NPN Antivalent				◆	◆		
	NPN Make function	◆	◆					
	PNP Antivalent						◆	◆
	PNP Make function						◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA				◆	◆	◆	◆
Switching frequency	0 ... 200 Hz	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow				◆	◆	◆	◆
	Multihole-LED, yellow		◆					
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector		◆				◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆

NBN15-30GM50-E0  
NBN15-30GM50-E0-V1

NBN15-30GM50-E2

NBN15-30GM60-A0  
NBN15-30GM60-A0-V1

NBN15-30GM60-A2  
NBN15-30GM60-A2-V1



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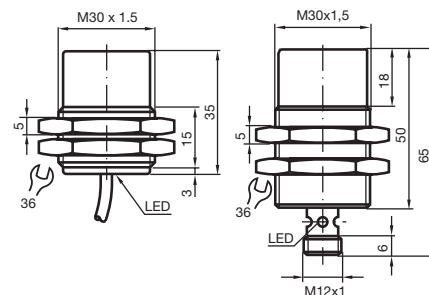


- **Basic series, 25 mm not embeddable**  
NBN25...
- **Basic series, 22 mm not embeddable**  
NBN22...
- **Comfort series, 40 mm not embeddable**  
NEN40-30GM60-E2-V1



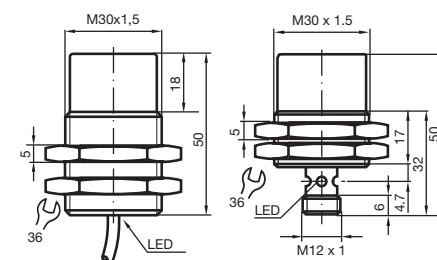
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NBN25-30GM50-E0-V1  
NBN25-30GM50-E2-V1

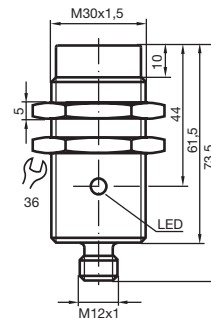


NBN25-30GM50-E0  
NBN25-30GM50-E2

NBN22-30GM35-E2-V1



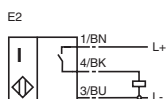
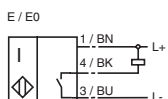
NEN40-30GM60-E2-V1



		NBN22-30GM35-E2	NBN22-30GM35-E2-V1	NBN25-30GM50-E0	NBN25-30GM50-E0-V1	NBN25-30GM50-E2	NBN25-30GM50-E2-V1	NEN40-30GM60-E2-V1
Rated operating distance	22 mm	◆	◆					
	25 mm			◆	◆	◆	◆	
	40 mm							◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Make function	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 17.82 mm	◆	◆					
	0 ... 20.25 mm			◆	◆	◆	◆	
	0 ... 32.4 mm							◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆
	≤ 12 mA							◆
Switching frequency	0 ... 100 Hz	◆	◆					
	0 ... 200 Hz			◆	◆	◆	◆	◆
	0 ... 80 Hz							◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆
	≤ 2.5 V							◆
Operating current	≤ 3 V	◆	◆	◆	◆	◆	◆	◆
	0 ... 100 mA	◆	◆					
Indication of the switching state	0 ... 200 mA			◆	◆	◆	◆	◆
	LED, yellow	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	Multihole-LED, yellow			◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆
Housing material	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆
	brass, chromium plated							◆
Sensing face	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆
Protection degree	PBT	◆	◆	◆	◆	◆	◆	◆
	IP67	◆	◆	◆	◆	◆	◆	◆

NBN25-30GM50-E0  
NBN25-30GM50-E0-V1

NBN22-30GM35-E2  
NBN22-30GM35-E2-V1  
NBN25-30GM50-E2  
NBN25-30GM50-E2-V1  
NEN40-30GM60-E2-V1



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1.1

Inductive sensors, standard, cylindrical designs

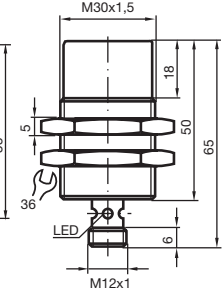
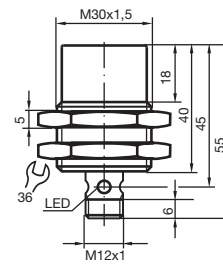


- **Comfort series, 15 mm not embeddable**  
NCN15...
- **Comfort series, 25 mm not embeddable**  
NCN25...
- **Basic series, 15 mm not embeddable**  
NBN15...



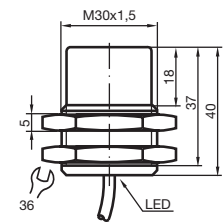
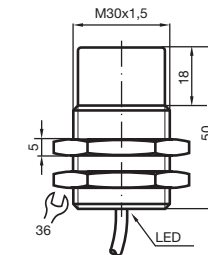
NBN15-30GM40-Z0-V1  
NBN15-30GM40-Z3-V1  
NBN15-30GM40-Z0-V1  
NBN15-30GM40-Z1-V1

NCN25-30GM50-Z1-V1  
NCN25-30GM50-Z5-V1



NCN25-30GM50-Z1  
NCN25-30GM50-Z5

NBN15-30GM40-Z0  
NBN15-30GM40-Z0  
NBN15-30GM40-Z1



		NBN15-30GM40-Z0	NBN15-30GM40-Z0-V1	NBN15-30GM40-Z3-V1	NCN15-30GM40-Z0	NCN15-30GM40-Z0-V1	NCN15-30GM40-Z1	NCN15-30GM40-Z1-V1	NCN25-30GM50-Z4	NCN25-30GM50-Z4-V1	NCN25-30GM50-Z5	NCN25-30GM50-Z5-V1
Rated operating distance	15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	25 mm											
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 20 mm											
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	3.5 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	5 ... 60 V											
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 150 Hz	◆	◆									
	500 Hz								◆	◆	◆	◆
Reverse polarity protection	reverse polarity-conductive tolerant	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	typ. 0.8 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow								◆	◆	◆	◆
	Multicolor-LED, yellow			◆	◆	◆	◆	◆				
	all direction LED, yellow	◆			◆							
Pre-fault indication	LED, red								◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector			◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable				◆							
	2 m, PVC cable	◆							◆	◆		
Housing material	Stainless steel				◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBN15-30GM40-Z0  
NBN15-30GM40-Z0

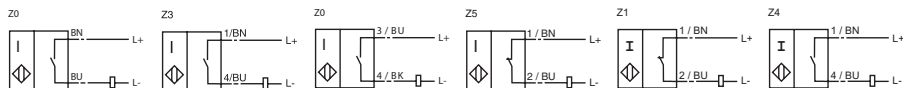
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NBN15-30GM40-Z0-V1  
NBN15-30GM40-Z0-V1

NCN25-30GM50-Z5  
NCN25-30GM50-Z5-V1

NCN15-30GM40-Z1  
NCN15-30GM40-Z1-V1

NCN25-30GM50-Z1  
NCN25-30GM50-Z1-V1



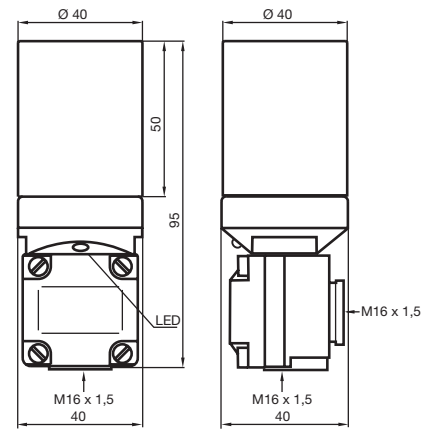
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- Comfort series
- 20 mm not embeddable



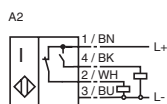
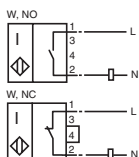
NJ20-40-A2  
NJ20-40-W



		NJ20-40-A2	NJ20-40-W
Rated operating distance	20 mm	◆	◆
Installation	not embeddable	◆	◆
Output type	2-wire		◆
	4-wire	◆	
Switching element function	AC Make/Break function		◆
	PNP Antivalent	◆	
Assured operating distance	0 ... 16.2 mm	◆	◆
Kind of voltage	AC		◆
	DC	◆	
Operating voltage	10 ... 30 V	◆	
	20 ... 253 V <sup>1)</sup>		◆
No-load supply current	≤ 20 mA	◆	
Switching frequency	0 ... 100 Hz	◆	
	0 ... 25 Hz		◆
Reverse polarity protection	protected against reverse polarity	◆	
Short-circuit protection	pulsing	◆	
Voltage drop	≤ 3 V	◆	
	≤ 7 V		◆
Operating current	0 ... 200 mA	◆	
	10 ... 500 mA		◆
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA		◆
Off-state current	0 ... 2.5 mA		◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

NJ20-40-W

NJ20-40-A2



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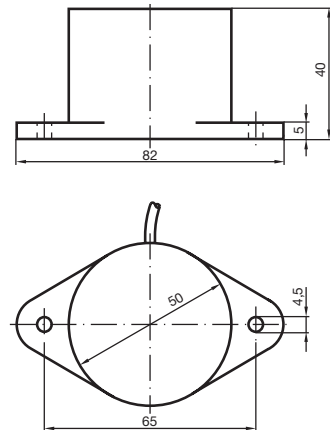
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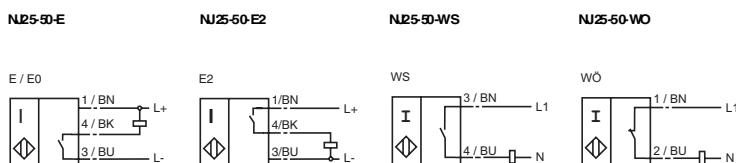
Inductive sensors, standard, cylindrical designs

- Comfort series
- 25 mm not embeddable

NJ25-50-E  
 NJ25-50-E2  
 NJ25-50-WO  
 NJ25-50-WS



		NJ25-50-E	NJ25-50-E2	NJ25-50-WO	NJ25-50-WS
Rated operating distance	25 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	2-wire			◆	◆
	3-wire	◆	◆		
Switching element function	AC Break function			◆	
	AC Make function				◆
	NPN Make function	◆			
	PNP Make function		◆		
Assured operating distance	0 ... 20.25 mm	◆	◆	◆	◆
Kind of voltage	AC			◆	◆
	DC	◆	◆		
Operating voltage	10 ... 30 V	◆	◆		
	20 ... 253 V <sup>1)</sup>			◆	◆
No-load supply current	≤ 20 mA	◆	◆		
Switching frequency	0 ... 100 Hz	◆	◆		
	0 ... 25 Hz			◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆		
Short-circuit protection	pulsing	◆	◆		
Voltage drop	≤ 3 V	◆	◆		
	≤ 7 V			◆	◆
Operating current	0 ... 200 mA	◆	◆		
	10 ... 500 mA			◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA			◆	◆
Off-state current	0 ... 2.5 mA			◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆



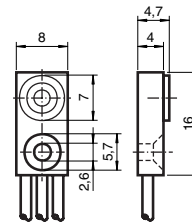
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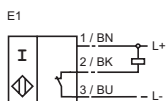
- Basic series
- 1.5 mm embeddable

NBB1,5-F79-E0  
 NBB1,5-F79-E1  
 NBB1,5-F79-E2  
 NBB1,5-F79-E3

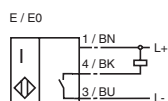


		NBB1,5-F79-E0	NBB1,5-F79-E1	NBB1,5-F79-E2	NBB1,5-F79-E3
Rated operating distance	1.5 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	NPN Break function		◆		
	NPN Make function	◆			
	PNP Break function				◆
	PNP Make function			◆	
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	5 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 1200 Hz	◆	◆	◆	◆
Reverse polarity protection	no	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 1.5 V	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆
Off-state current	≤ 10 µA	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	0.5 m, PVC - flexible lead	◆	◆	◆	◆
Housing material	PA	◆	◆	◆	◆
Sensing face	PA	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

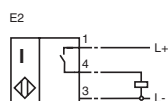
NBB1,5-F79-E1



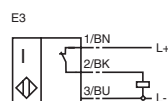
NBB1,5-F79-E0



NBB1,5-F79-E2



NBB1,5-F79-E3



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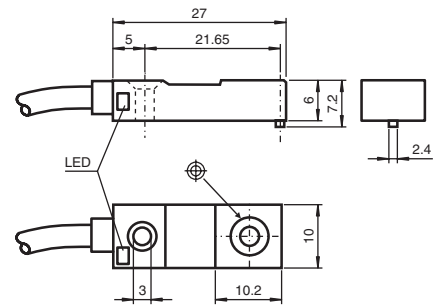
1.2

Inductive sensors, standard, cubic designs



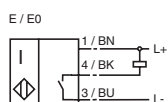
- **Basic series**
- **4 mm not embeddable**  
NBN4...
- **2 mm embeddable**  
NBB2...

NBB2-F29-A0  
NBB2-F29-A2  
NBN4-F29-A2  
NBN4-F29-E0  
NBN4-F29-E2

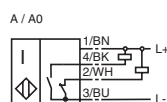


		NBB2-F29-A0	NBB2-F29-A2	NBN4-F29-E0	NBN4-F29-E2	NBN4-F29-A2
Rated operating distance	2 mm	◆	◆			
Installation	4 mm embeddable	◆	◆	◆	◆	◆
	not embeddable				◆	◆
Output type	3-wire			◆	◆	
	4-wire		◆			◆
Switching element function	NPN Antivalent	◆				
	NPN Make function			◆		
	PNP Antivalent		◆			◆
	PNP Make function				◆	
Assured operating distance	0 ... 1.62 mm	◆	◆			
	0 ... 3.24 mm			◆	◆	◆
Kind of voltage	DC	◆	◆			
Operating voltage	10 ... 30 V	◆	◆	◆	◆	
	4.75 ... 30 V	◆	◆			◆
No-load supply current	≤ 10 mA			◆	◆	
	≤ 15 mA	◆	◆			◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆			◆
	≤ 3 V			◆	◆	
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆	◆
Housing material	PPS			◆	◆	◆
	Ryton R4	◆	◆			
Sensing face	PPS			◆	◆	◆
	Ryton R4	◆	◆			
Protection degree	IP67	◆	◆	◆	◆	◆

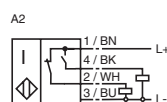
NBN4-F29-E0



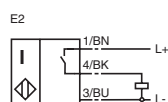
NBB2-F29-A0



NBB2-F29-A2  
NBN4-F29-A2



NBN4-F29-E2

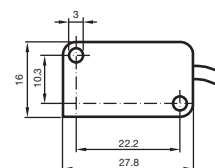
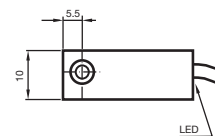


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

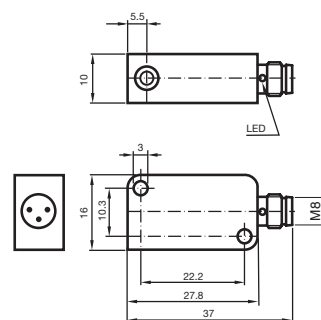
- Basic series
- 2 mm embeddable



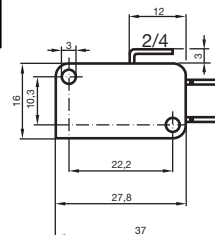
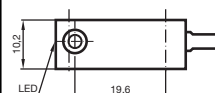
NBB2-V3-E0  
NBB2-V3-E2  
NBB2-V3-E3



NBB2-V3-E2-V3

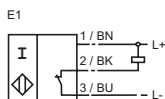


NBB2-V3-E0-V5  
NBB2-V3-E1-V5  
NBB2-V3-E2-V5  
NBB2-V3-E3-V5

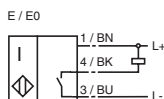


		NBB2-V3-E0	NBB2-V3-E0-V5	NBB2-V3-E1-V5	NBB2-V3-E2	NBB2-V3-E2-V3	NBB2-V3-E2-V5	NBB2-V3-E3	NBB2-V3-E3-V5
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Break function	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	Faston 4.8 mm	◆	◆	◆	◆	◆	◆	◆	◆
	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆
	0.1 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

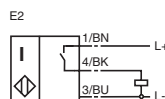
NBB2-V3-E1-V5



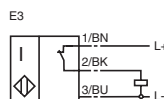
NBB2-V3-E0  
NBB2-V3-E0-V5



NBB2-V3-E2  
NBB2-V3-E2-V3  
NBB2-V3-E2-V5



NBB2-V3-E3  
NBB2-V3-E3-V5



Date of edition: 20.08-03-11

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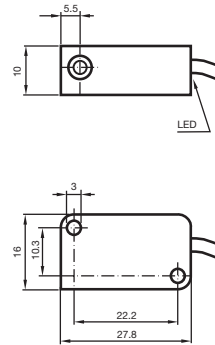
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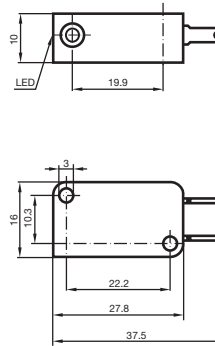
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- Basic series
- 3 mm embeddable

NBB3-V3-Z4  
NBB3-V3-Z5



NBB3-V3-Z4-V5  
NBB3-V3-Z5-V5

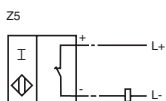


1.2

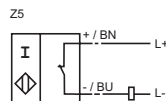
Inductive sensors, standard, cubic designs

		NBB3-V3-Z4	NBB3-V3-Z4-V5	NBB3-V3-Z5	NBB3-V3-Z5-V5
Rated operating distance	3 mm	◆	◆	◆	◆
	3 mm (approx. 3.5 mm at 85 °C)	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	DC Break function	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆
Assured operating distance	0 ... 2.4 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	5 ... 60 V	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	no	◆	◆	◆	◆
Voltage drop	≤ 5 V	◆	◆	◆	◆
Operating current	4 ... 100 mA	◆	◆	◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
	-25 ... 85 °C (248 ... 358 K)	◆	◆	◆	◆
Connection type	Faston 4.8 mm	◆	◆	◆	◆
	0.1 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

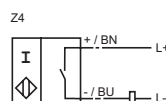
NBB3-V3-Z5-V5



NBB3-V3-Z5



NBB3-V3-Z4



NBB3-V3-Z4-V5



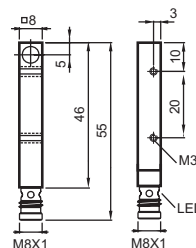
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



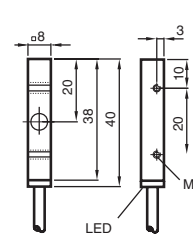
- Metal housing
- Basic series
- 1.5 mm embeddable  
NBB1,5...
- 2 mm embeddable  
NBB2...



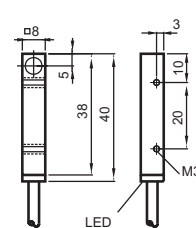
NBB1,5-F41-E2-V3  
NBB1,5-F41-E3-V3  
NBB2-F41-E2-V3



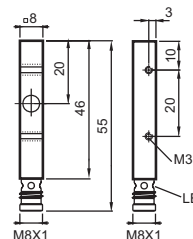
NBB1,5-F41A-E2  
NBB1,5-F41A-E3



NBB1,5-F41-E2  
NBB1,5-F41-E3

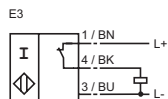


NBB1,5-F41A-E2-V3  
NBB1,5-F41A-E3-V3

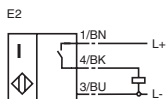


		NBB1,5-F41-E2	NBB1,5-F41-E2-V3	NBB2-F41-E2-V3	NBB1,5-F41-E3	NBB1,5-F41-E3-V3	NBB1,5-F41A-E2	NBB1,5-F41A-E2-V3	NBB1,5-F41A-E3	NBB1,5-F41A-E3-V3
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 mm			◆						
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	PNP Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1.62 mm			◆						
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 3000 Hz			◆						
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	13.5 g	◆	◆	◆	◆	◆	◆	◆	◆	◆

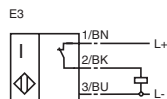
NBB1,5-F41 A-E3-V3  
NBB1,5-F41-E3-V3



NBB1,5-F41 A-E2  
NBB1,5-F41 A-E2-V3  
NBB1,5-F41-E2  
NBB1,5-F41-E2-V3  
NBB2-F41-E2-V3



NBB1,5-F41A-E3  
NBB1,5-F41-E3



Date of edition 20.08-03-11

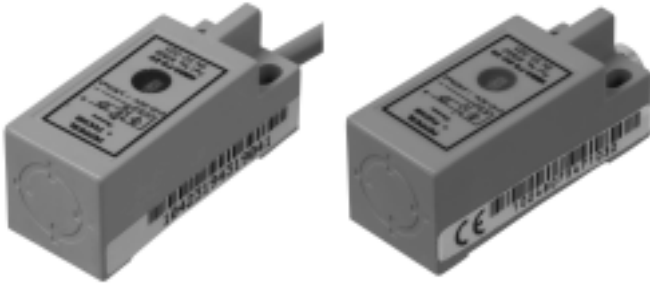
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

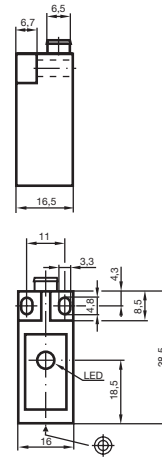
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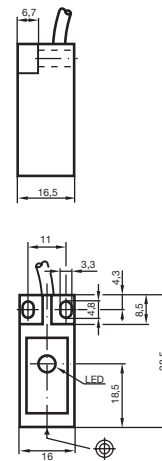
- Basic series
- 5 mm embeddable



NBB5-F9-E0-V3  
NBB5-F9-E2-V3



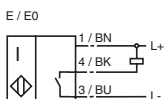
NBB5-F9-E0  
NBB5-F9-E2



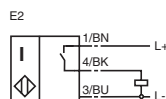
1.2 Inductive sensors, standard, cubic designs

		NBB5-F9-E0	NBB5-F9-E0-V3	NBB5-F9-E2	NBB5-F9-E2-V3
Rated operating distance	5 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	NPN Make function PNP Make function	◆	◆	◆	◆
Assured operating distance	0 ... 3.825 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 .. 343 K)	◆	◆	◆	◆
Connection type	V3-connector 2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

NBB5-F9-E0  
NBB5-F9-E0-V3



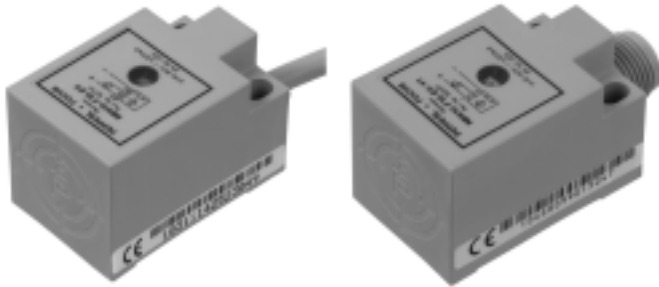
NBB5-F9-E2  
NBB5-F9-E2-V3



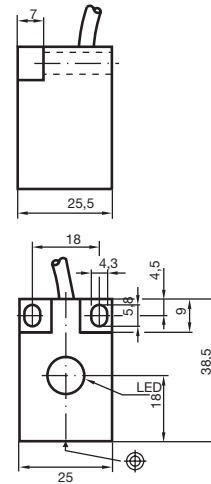
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-11

- Basic series
- 10 mm not embeddable

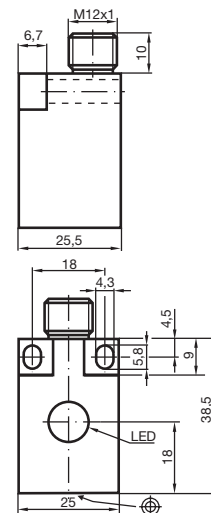


NBN10-F10-E0  
NBN10-F10-E2

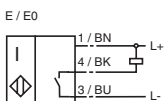


		NBN10-F10-E0	NBN10-F10-E0-V1	NBN10-F10-E2	NBN10-F10-E2-V1
Rated operating distance	10 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	NPN Make function	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆
Assured operating distance	0 ... 8.1 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

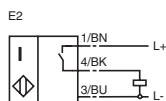
NBN10-F10-E0-V1  
NBN10-F10-E2-V1



NBN10-F10-E0  
NBN10-F10-E0-V1



NBN10-F10-E2  
NBN10-F10-E2-V1



Date of edition: 20.08.03-11

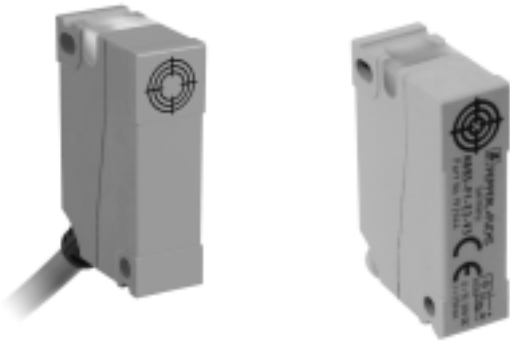
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

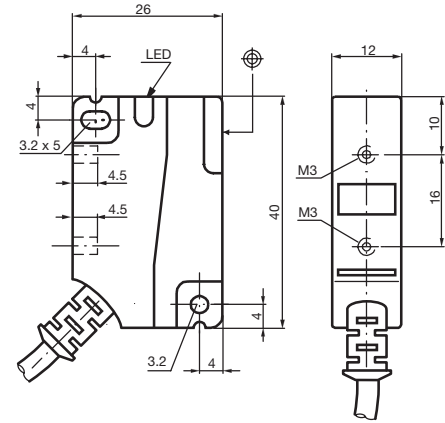
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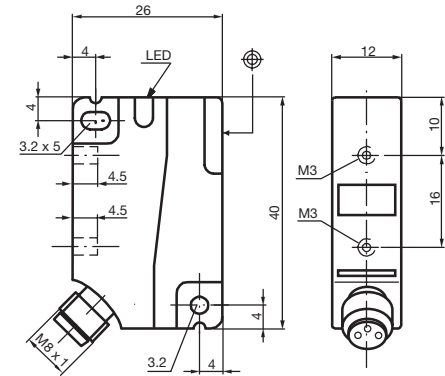
- Basic series
- 4 mm embeddable



NBB4-F1-A0  
NBB4-F1-A2  
NBB4-F1-E0  
NBB4-F1-E2  
NBB4-F1-E3

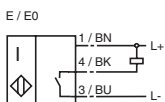


NBB4-F1-E0-V3  
NBB4-F1-E2-V3  
NBB4-F1-E3-V3

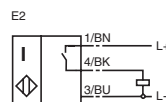


		NBB4-F1-E0	NBB4-F1-E0-V3	NBB4-F1-E2	NBB4-F1-E2-V3	NBB4-F1-E3	NBB4-F1-E3-V3	NBB4-F1-A0	NBB4-F1-A2
Rated operating distance	4 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire							◆	◆
Switching element function	NPN Anivalent								
	NPN Make function	◆	◆						
	PNP Anivalent							◆	◆
	PNP Break function						◆		
	PNP Make function			◆	◆				
Assured operating distance	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1400 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.5 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 250 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.01 mA typ. 0.1 μA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector							◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PA	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PA	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

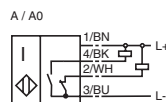
NBB4-F1-E0  
NBB4-F1-E0-V3



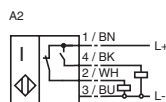
NBB4-F1-E2  
NBB4-F1-E2-V3



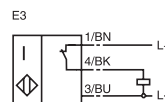
NBB4-F1-A0



NBB4-F1-A2



NBB4-F1-E3  
NBB4-F1-E3-V3



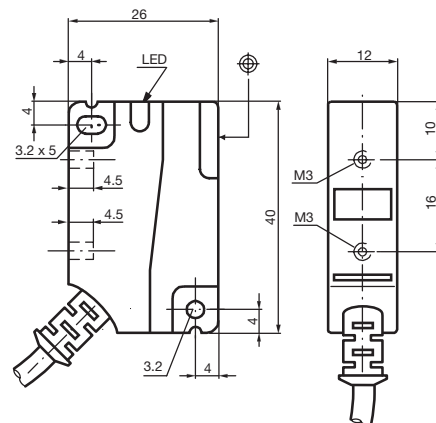
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- Basic series
- 8 mm not embeddable

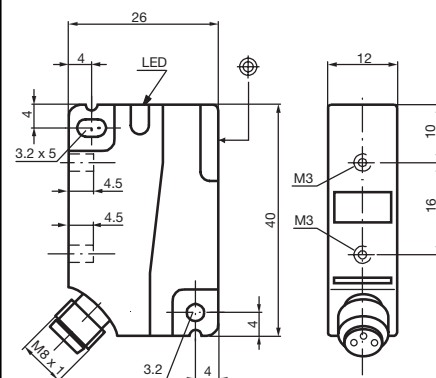


NBN8-F1-A0  
NBN8-F1-A2  
NBN8-F1-E0  
NBN8-F1-E2  
NBN8-F1-E3



		NBN8-F1-E0	NBN8-F1-E0-V3	NBN8-F1-E2	NBN8-F1-E2-V3	NBN8-F1-E3	NBN8-F1-E3-V3	NBN8-F1-A0	NBN8-F1-A2
Rated operating distance	8 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching elementfunction	4-wire							◆	◆
	NPN Antivalent								
	NPN Make function	◆	◆						
	PNP Antivalent							◆	◆
	PNP Break function					◆	◆		
Assured operating distance	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆
	Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1400 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.5 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 250 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.01 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V3-connector		◆		◆		◆		◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PA	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PA	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆

NBN8-F1-E0-V3  
NBN8-F1-E2-V3  
NBN8-F1-E3-V3



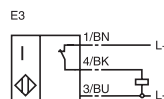
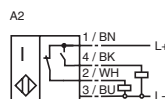
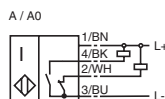
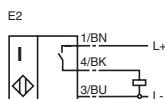
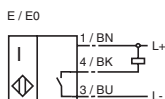
NBN8-F1-E0  
NBN8-F1-E0-V3

NBN8-F1-E2  
NBN8-F1-E2-V3

NBN8-F1-A0

NBN8-F1-A2

NBN8-F1-E3  
NBN8-F1-E3-V3



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

1.2

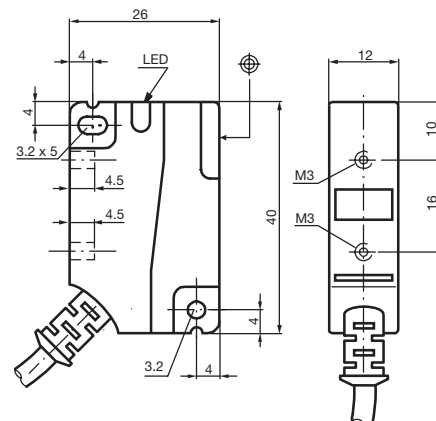
Inductive sensors, standard, cubic designs



- Basic series
- 4 mm embeddable  
NBB4...
- 2 mm embeddable  
NBB2...



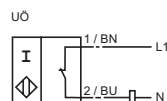
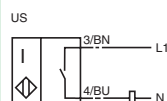
NBB2-F1-US  
NBB4-F1-UO  
NBB4-F1-US



		NBB2-F1-US	NBB4-F1-UO	NBB4-F1-US
Rated operating distance	2 mm	◆		
	4 mm		◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC/DC	◆	◆	◆
	Break function		◆	
	AC/DC	◆		◆
	Make/Break function			◆
Assured operating distance	0 ... 1.62 mm	◆		
	0 ... 3.24 mm		◆	◆
Kind of voltage	UC	◆	◆	◆
Operating voltage	20 ... 250 V	◆	◆	◆
No-load supply current	≤ 4 mA	◆	◆	◆
Switching frequency	0 ... 25 Hz	◆	◆	◆
Reverse polarity protection	yes	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆
Voltage drop	≤ 7 V	◆	◆	◆
Operating current	4 ... 250 mA AC	◆	◆	◆
	4 ... 100 mA DC	◆	◆	◆
Off-state current	0 ... 7 mA typ.	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 2100 mA	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆
Housing material	PA	◆	◆	◆
Sensing face	PA	◆	◆	◆
Protection degree	IP67	◆	◆	◆

NBB2-F1-US  
NBB4-F1-US

NBB4-F1-UO



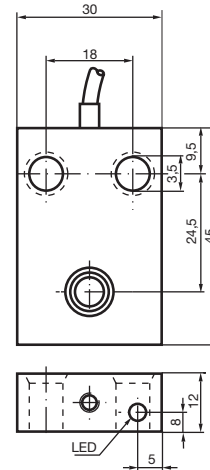
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 2008-03-11

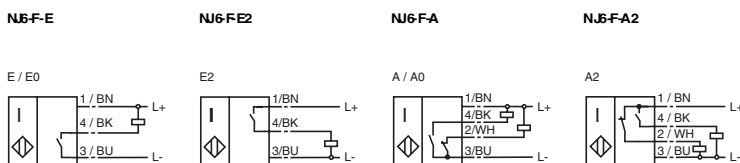
- Comfort series
- 6 mm embeddable



NJ6-F-A  
NJ6-F-A2  
NJ6-F-E  
NJ6-F-E2



		NJ6-F-E	NJ6-F-E2	NJ6-F-A	NJ6-F-A2
Rated operating distance	6 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆		
	4-wire			◆	◆
Switching element function	NPN Antivalent			◆	
	NPN Make function	◆			
	PNP Antivalent				◆
	PNP Make function		◆		
Assured operating distance	0 ... 4.8 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Off-state current	≤ 0.5 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PUR cable	◆	◆	◆	◆
Housing material	Crastin (PBTB)		◆		
	PBT	◆		◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆



Date of edition 20.08-03-11

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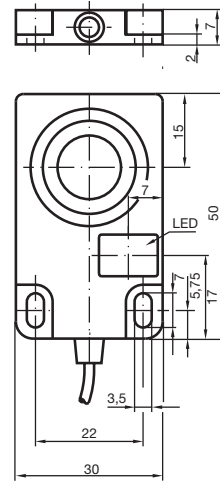
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- Comfort series
- 10 mm embeddable

NCB10-F17-E2

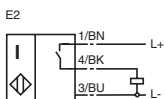


1.2

Inductive sensors, standard, cubic designs

		<b>NCB10-F17-E2</b>
Rated operating distance	10 mm	◆
Installation	embeddable	◆
Output type	3-wire	◆
Switching element function	PNP      Make function	◆
Assured operating distance	0 ... 8.1 mm	◆
Kind of voltage	DC	◆
Operating voltage	10 ... 30 V	◆
Switching frequency	0 ... 1000 Hz	◆
Reverse polarity protection		◆
Short-circuit protection	pulsing	◆
Voltage drop	≤ 2.8 V	◆
Operating current	0 ... 100 mA	◆
Indication of the switching state	LED, yellow	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	2 m, PUR cable	◆
Housing material	PMMA	◆
Sensing face	PMMA	◆
Protection degree	IP67	◆

NCB10-F17-E2



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

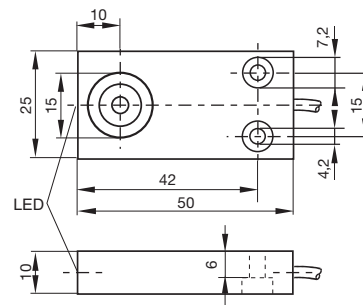
Date of edition 20.08.03-11



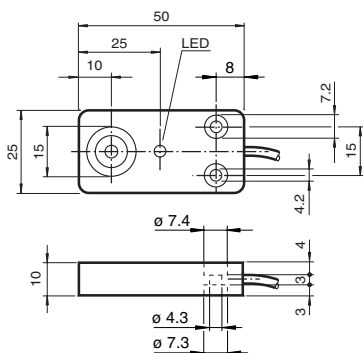
- **Basic series**
- **5 mm embeddable**  
NBB5...
- **8 mm embeddable**  
NBB8...
- **Metal housing**  
NBB5-F33M...



NBB5-F33M-A0  
NBB5-F33M-A2  
NBB5-F33M-E0  
NBB5-F33M-E2

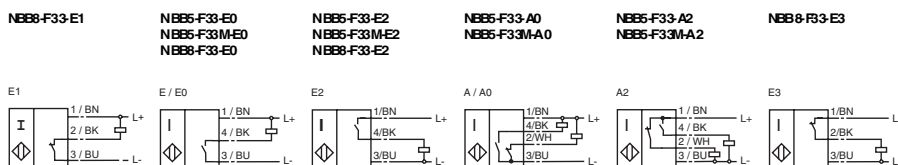
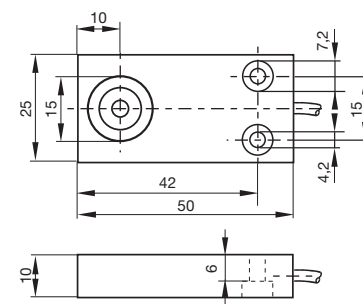


NBB8-F33-E0  
NBB8-F33-E1  
NBB8-F33-E2  
NBB8-F33-E3



		NBB5-F33-E0	NBB5-F33-E2	NBB5-F33-A0	NBB5-F33-A2	NBB5-F33M-E0	NBB5-F33M-E2	NBB5-F33M-A0	NBB5-F33M-A2	NBB8-F33-E0	NBB8-F33-E1	NBB8-F33-E2	NBB8-F33-E3
Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 350 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.1 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 μA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 μA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	LED yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	-35 ... 70 °C (238 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	metal	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NBB5-F33-A0  
NBB5-F33-A2  
NBB5-F33-E0  
NBB5-F33-E2



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

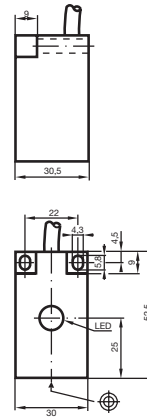
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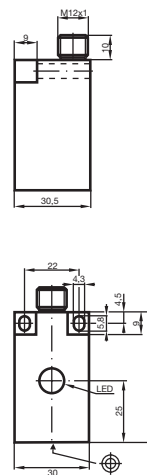
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- Basic series
- 15 mm not embeddable

NBN15-F11-E0  
NBN15-F11-E2



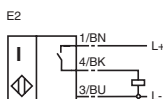
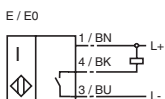
NBN15-F11-E0-V1  
NBN15-F11-E2-V1



		NBN15-F11-E0	NBN15-F11-E0-V1	NBN15-F11-E2	NBN15-F11-E2-V1
Rated operating distance	15 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	NPN Make function	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 μA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

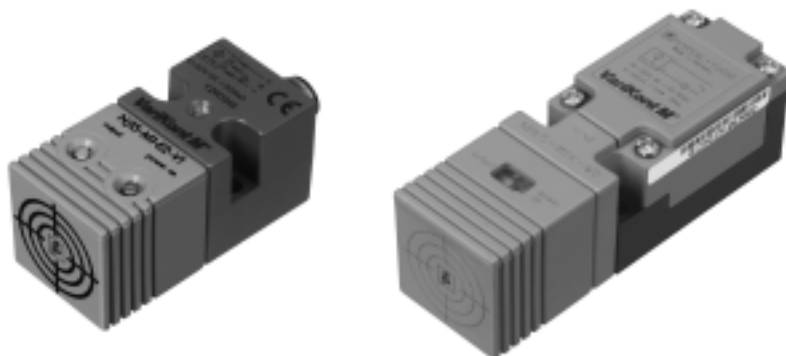
NBN15-F11-E0  
NBN15-F11-E0-V1

NBN15-F11-E2  
NBN15-F11-E2-V1

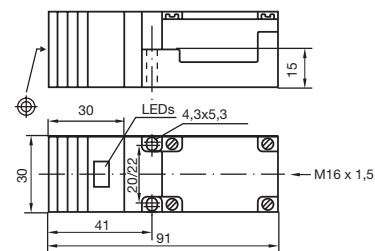


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

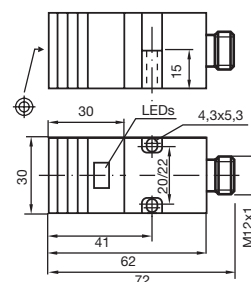
- Comfort series
- 15 mm not embeddable



NCN 5-M1K-E4  
NCN 5-M1K-E5  
NJ15-M1K-A2

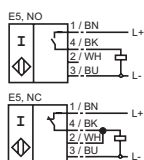


NJ15-M1-E2-V1

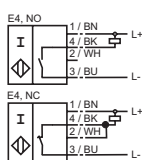


		NJ15-M1-E2-V1	NCN 15-M1K-E4	NCN 15-M1K-E5	NJ15-M1K-A2
Rated operating distance	15 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	4-wire	◆			◆
	NPN	◆	◆		
	PNP	◆		◆	
	PNP	◆		◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆
	Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆			
	10 ... 60 V		◆	◆	◆
No-load supply current	≤ 14 mA	◆	◆	◆	◆
	≤ 14.5 mA				◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 2.5 V	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆
	V1-connector	◆			
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

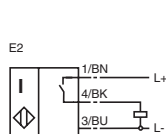
NCN 5-M1K-E5



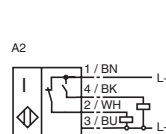
NCN 5-M1K-E4



NJ15-M1-E2-V1



NJ15-M1K-A2



Date of edition 20.08-03-11

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1.2

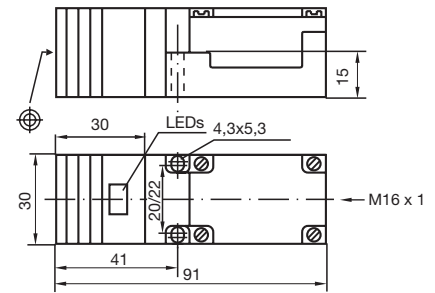
Inductive sensors, standard, cubic designs



- **Basic series**
- **15 mm not embeddable**  
NBN15-M1K-WO  
NBN15-M1K-WS
- **Comfort series**
- **15 mm not embeddable**  
NCN15-M1K-Z2



NBN15-M1K-WO  
NBN15-M1K-WS  
NCN15-M1K-Z2

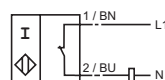
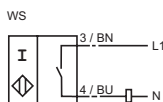
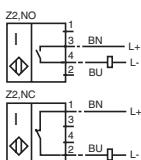


		NCN15-M1K-Z2	NBN15-M1K-WO	NBN 15-M1K-WS
Rated operating distance	15 mm	◆	◆	◆
Installation	not embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC Break function		◆	
	AC Make function			◆
	DC Make/Break function	◆		
Assured operating distance	0 ... 12.15 mm	◆	◆	◆
Kind of voltage	AC		◆	◆
	DC	◆		
Operating voltage	20 ... 250 V		◆	◆
	5 ... 60 V	◆		
Switching frequency	0 ... 150 Hz	◆		
	0 ... 20 Hz		◆	◆
Reverse polarity protection	tolerant	◆		
Short-circuit protection	pulsing	◆		
Voltage drop	≤ 5 V	◆		
	≤ 8 V		◆	◆
Operating current	2 ... 200 mA	◆		
	5 ... 400 mA		◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 2400 mA		◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆		
	0 ... 1.7 mA typ.		◆	◆
Operating voltage display	LED, green		◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Pre-fault indication	LED, red	◆		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

NCN15-M1K-Z2

NBN15-M1K-WS

NBN 15-M1K-WO



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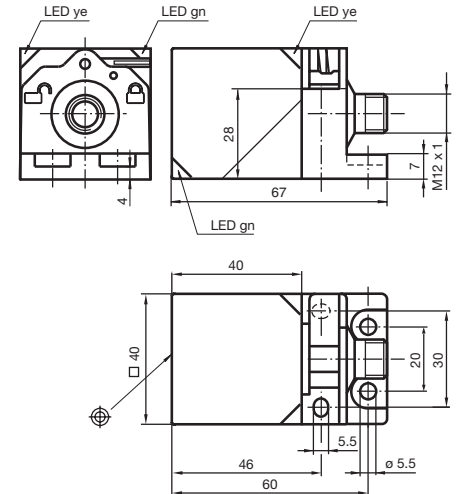




- Basic series, 20 mm embeddable
- Quick mounting shutter  
NBB20-L2...
- IP69K Steam jet proof
- 4-way LED indicator

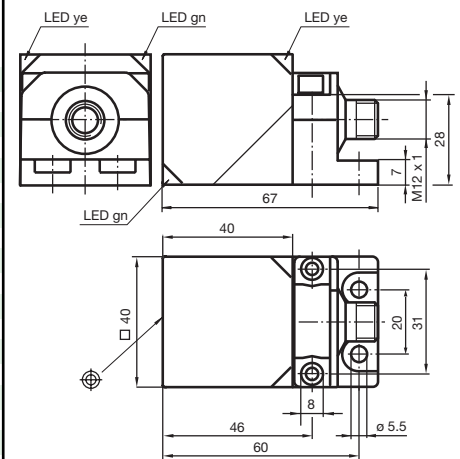


NBB20-L2-A0-V1  
NBB20-L2-A2-V1  
NBB20-L2-E0-V1  
NBB20-L2-E2-V1

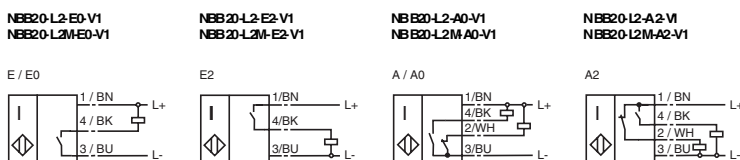
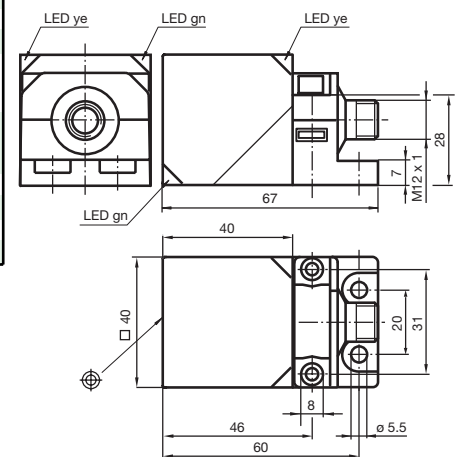


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Rated operating distance	20 mm	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire			◆	◆			◆	◆
	NPN Antivalent			◆				◆	
	NPN Make function	◆				◆			
	PNP Antivalent				◆			◆	
	PNP Make function							◆	◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤20 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤2 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PA-GF35	◆	◆	◆	◆	◆	◆	◆	◆
	PA-GF35								
	Metal base powder-coated								
	Metal mounting flange powder-coated								
	PA-GF35								
	metal base Xylan coated								◆
	metal mounting flange Xylan coated.								◆
Sensing face	PA-GF35	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP69K	◆	◆	◆	◆	◆	◆	◆	◆
Mass	130 g		◆		◆		◆		◆
	190 g								◆

NBB20-L2M-A0-V1  
NBB20-L2M-A2-V1  
NBB20-L2M-E0-V1



NBB20-L2M-E2-V1



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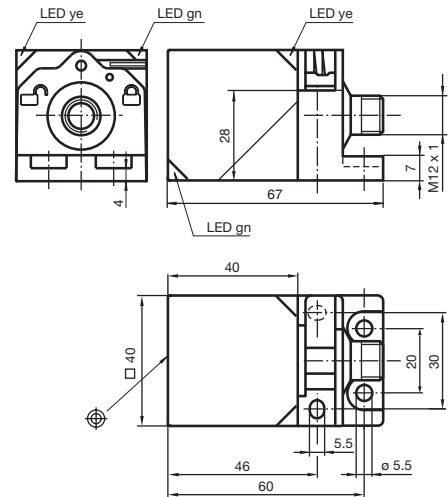
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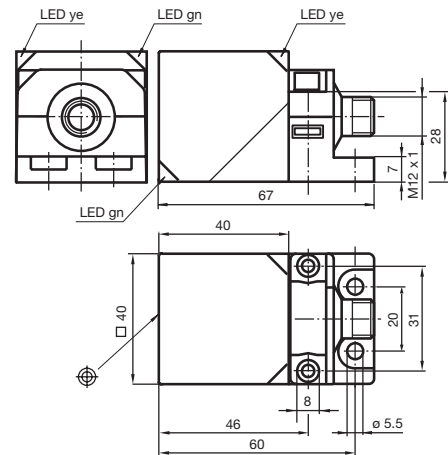
- **Basic series, 30 mm not embeddable**  
NBN30-L2..
- **Basic series, 40 mm not embeddable**  
NBN40-L2..
- **Quick mounting shutter**  
NBN30-L2..
- **IP69K Steam jet proof**
- **4-way LED indicator**



NBN30-L2-A2-V1  
NBN30-L2-E2-V1  
NBN40-L2-A2-V1  
NBN40-L2-E2-V1

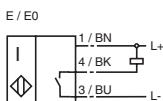


NBN40-L2M-A0-V1  
NBN40-L2M-A2-V1  
NBN40-L2M-E0-V1  
NBN40-L2M-E2-V1

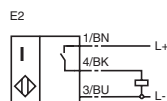


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Rated operating distance	30 mm	◆	◆							
	40 mm									
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire		◆			◆			◆	
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Anivalent									◆
	NPN	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function			◆			◆			◆
	PNP	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Anivalent									◆
	PNP	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function			◆			◆			◆
Assured operating distance	0 ... 24.3 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 32.4 mm			◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PA-GF35	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PA-GF35						◆	◆	◆	
	metal base Xylan coated						◆	◆	◆	
	metal mounting flange Xylan coated						◆	◆	◆	
Sensing face	PA-GF35	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	130 g	◆	◆	◆	◆	◆	◆	◆	◆	◆

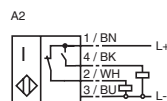
NBN40-L2-E0-V1  
NBN40-L2M-E0-V1



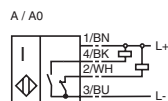
NBN30-L2-E2-V1  
NBN40-L2-E2-V1  
NBN40-L2M-E2-V1



NBN30-L2-A2-V1  
NBN40-L2-A2-V1  
NBN40-L2M-A2-V1



NBN40-L2M-A0-V1

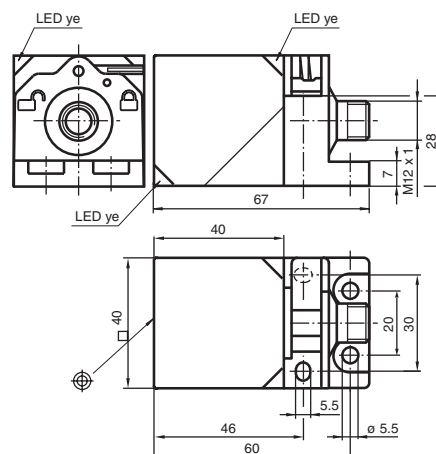


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



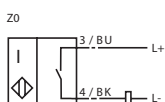
- Quick mounting shutter
- Basic series, 20 mm embeddable  
NBB20-L2...
- Basic series, 40 mm not embeddable  
NBN40-L2...
- IP69K Steam jet proof

NBB20-L2-Z0-V1  
NBB20-L2-Z1-V1  
NBB20-L2-Z5-V1  
NBN40-L2-Z0-V1  
NBN40-L2-Z1-V1  
NBN40-L2-Z5-V1

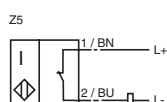


		NBB 20-L2-Z0-V1	NBB 20-L2-Z4-V1	NBB 20-L2-Z5-V1	NBN 40-L2-Z0-V1	NBN 40-L2-Z4-V1	NBN 40-L2-Z5-V1
Rated operating distance	20 mm	◆	◆	◆			
	40 mm				◆	◆	◆
Installation	embeddable	◆	◆	◆			
	not embeddable				◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆
Switching element function	NC			◆			
	NO	◆	◆		◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆			
	0 ... 32.4 mm				◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	3.8 ... 30 V		◆	◆		◆	◆
	5 ... 30 V	◆			◆		
Switching frequency	0 ... 30 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection			◆	◆		◆	◆
	tolerant	◆			◆		
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3.8 V		◆	◆		◆	◆
	≤ 5 V	◆			◆		
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	connector M12 x 1	◆	◆	◆			
	V1-connector				◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP68				◆	◆	◆
	IP69K	◆	◆	◆	◆	◆	◆

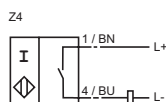
NBN40-L2-Z0-V1  
NBB20-L2-Z0-V1



NBB20-L2-Z5-V1  
NBN40-L2-Z5-V1



NBB20-L2-Z4-V1  
NBN40-L2-Z4-V1



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

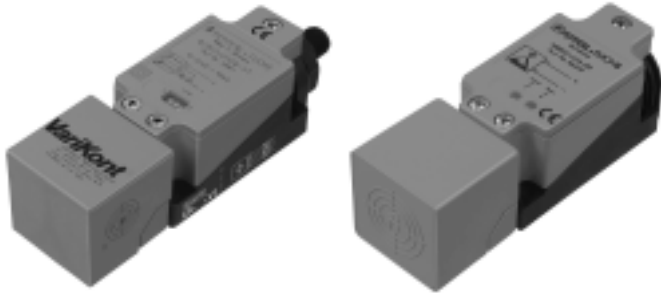
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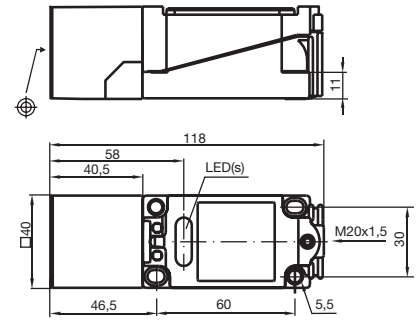
1.2



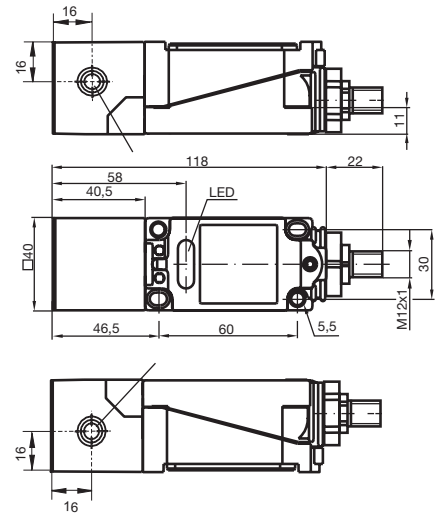
- **Comfort series**
- **15 mm not embeddable**  
**Fe = output 4/BK**  
**Ne = output 2/WH**  
 NJ15+U1+2E2-NE/FE
- **Twin sensor with  $S_n = 2 \times 15 \text{ mm}$ , not embeddable**  
 NJ15/2+U1+E8-V1



NJ15+U1+2E2-NE/FE



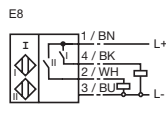
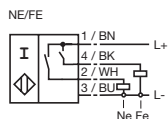
NJ15/2+U1+E8-V1



		NJ15/2+U1+E8-V1	NJ15+U1+2E2-NE/FE
Rated operating distance	15 mm	◆	◆
Installation	not embeddable	◆	◆
Output type	3-wire	◆	◆
	4-wire		◆
Switching element function	PNP Make function	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 20 mA	◆	◆
	≤ 30 mA		◆
Switching frequency	0 ... 100 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
	0 ... 200 mA		◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
	LED, yellow=Fe; red=Al		◆
Ambient temperature	0 ... 50 °C (273 ... 323 K)	◆	◆
	-25 ... 70 °C (248 ... 343 K)	◆	
Connection type	terminal compartment	◆	◆
	V1-connector		◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
	IP68		◆

NJ15+U1+2E2-NE/FE

NJ15/2+U1+E8-V1

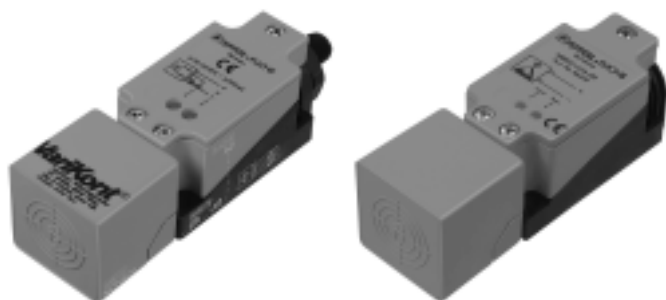


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

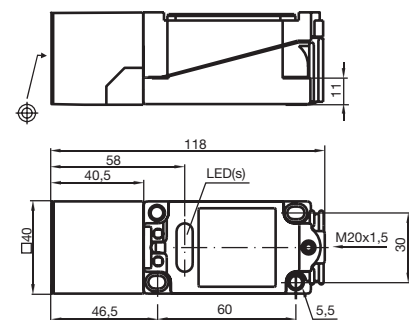
Date of edition 20.08.03-11



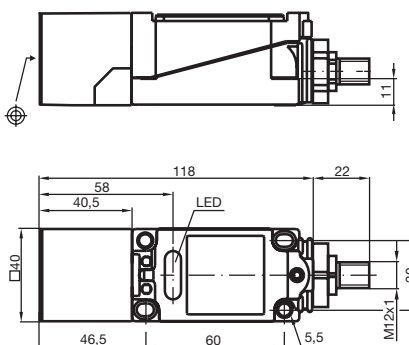
- Comfort series
- 15 mm embeddable
- With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)  
NJ15+ U10...



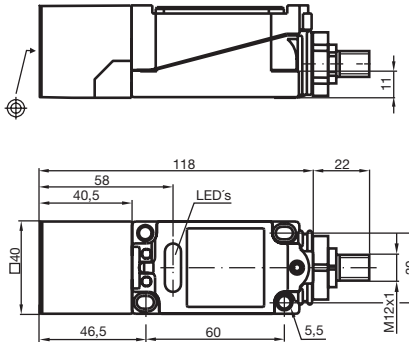
NJ15+U1+A  
NJ15+U1+E  
NJ15+U1+E1  
NJ15+U1+E2  
NJ15+U1+E3  
NJ15+U1+A2



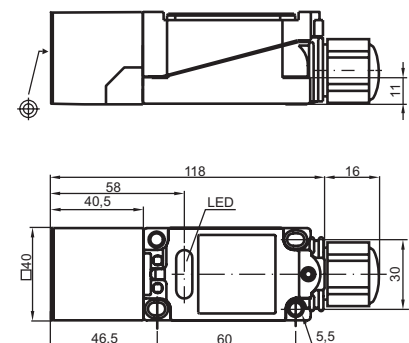
NJ15+U1+E2-V1



NJ15+U1+A2-V1

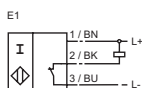


NJ15+U10+A2  
NJ15+U10+E2

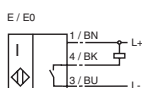


		NJ15+U1+E	NJ15+U1+E1	NJ15+U1+E2	NJ15+U1+E2-V1	NJ15+U1+E3	NJ15+U1+A	NJ15+U1+A2	NJ15+U1+A2-V1	NJ15+U10+E2
Rated operating distance	15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire						◆	◆	◆	◆
Switching element function	NPN Antivalent									
	NPN Break function				◆					
	NPN Make function						◆			
	PNP Antivalent							◆	◆	◆
	PNP Break function									
	PNP Make function									◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V1-connector									◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆	◆	◆	◆	◆

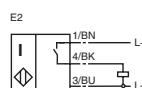
NJ15+U1+E1



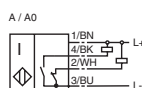
NJ15+U1+E



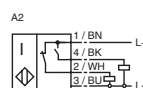
NJ15+U1+E2  
NJ15+U1+E2-V1  
NJ15+U10+E2



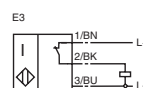
NJ15+U1+A



NJ15+U1+A2-V1  
NJ15+U10+A2  
NJ15+U1+A2



NJ15+U1+E3



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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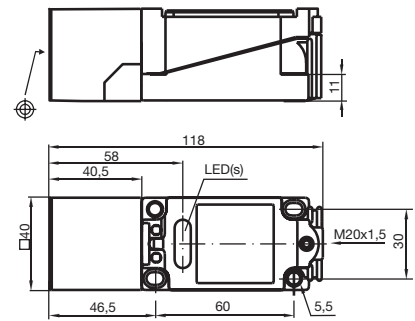
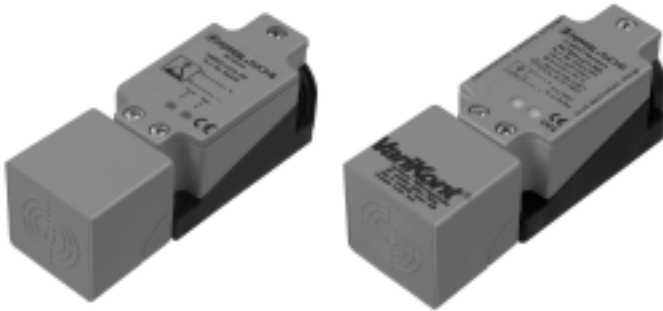
- Comfort series
- 15 mm embeddable

NJ15-U1-W

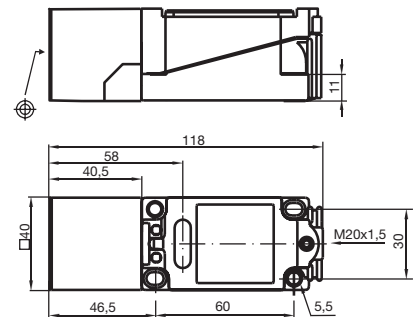


1.2

Inductive sensors, standard, cubic designs

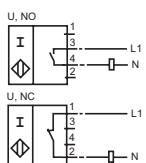


NCB15-U1-U  
NCB15-U1-Z2

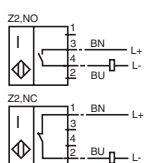


		NCB15+U1+U	NJ15+U1+W	NCB15+U1+Z2
Rated operating distance	15 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC/DC	◆		
	AC		◆	
	DC			◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆
Kind of voltage	AC		◆	
	DC			◆
	UC	◆		
Operating voltage	20 ... 253 V	◆		
	20 ... 253 V <sup>1)</sup>		◆	
	5 ... 60 V			◆
Operating voltage DC	20 ... 300 V	◆		
	0 ... 20 Hz		◆	
Switching frequency	0 ... 25 Hz	◆		
	0 ... 400 Hz			◆
Reverse polarity protection	tolerant			◆
Short-circuit protection	pulsing	◆		◆
Voltage drop	≤ 12 V		◆	
	≤ 4 V	◆		
	≤ 5 V			◆
Operating current	2 ... 200 mA			◆
	5 ... 500 mA	◆		
	8 ... 500 mA		◆	
Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	◆	◆	
	0 ... 1 mA typ. 0.7 mA			◆
Off-state current	0 ... 2.5 mA typ. 1.5 mA	◆		
	0.5 ... 1.95 mA typ. 1.2 mA		◆	
	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

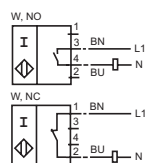
NCB15-U1-U



NCB15-U1-Z2



NJ15-U1-W



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

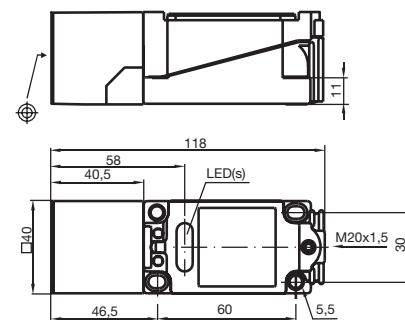
Date of edition 20.08.03-11



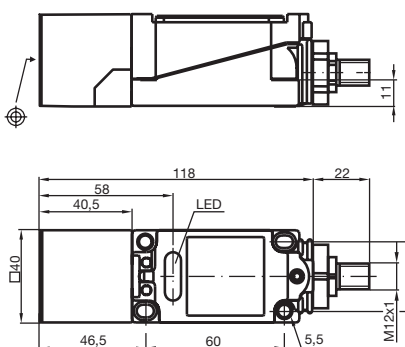
- **Comfort series, 20 mm embeddable**
- **With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)**  
NJ20+U10+...
- **Surface mount**  
NJ20+U4+E2-BHMS4
- **Only for NE-meta**  
NJ20P+U1+A2



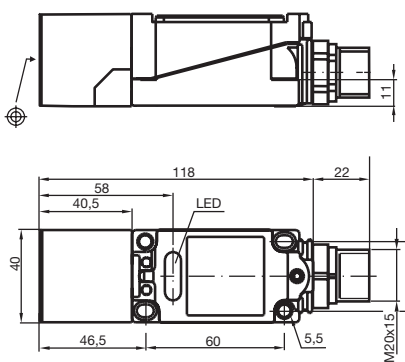
NJ20+U1-A  
NJ20+U1-A2  
NJ20+U1-E  
NJ20+U1-E1  
NJ20+U1-E2  
NJ20+U1-E3  
NJ20P+U1-A2



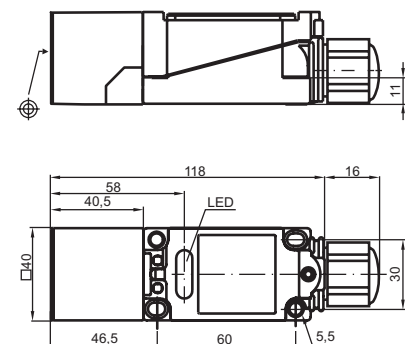
NJ20+U1-A2-V1  
NJ20+U1-E2-V1



NJ20+U1-E2-BHMS4



NJ20+U10-A2  
NJ20+U10-E2



		NJ20+U1-E	NJ20+U1+E1	NJ20+U1+E2	NJ20+U1+E2-V1	NJ20+U1+E3	NJ20+U1+A	NJ20+U1+A2	NJ20+U1+A2-V1	NJ20+U10+E2	NJ20P+U1+A2	NJ20+U4+E2-BHMS4
Rated operating distance	20 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	not embeddable											◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire											◆
Switching element function	NPN Antivalent											◆
	NPN Break function		◆									
	NPN Make function		◆									
	PNP Antivalent								◆	◆	◆	◆
	PNP Break function											◆
	PNP Make function											◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V											◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA											◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 Hz											◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V											◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	nicht uebersetzt!											◆
	V1-connector											◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PBT/metal											◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NJ20+U1-E1

NJ20+U1-E

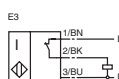
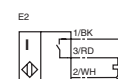
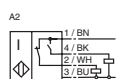
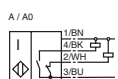
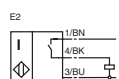
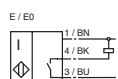
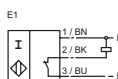
NJ20+U1-E2  
NJ20+U1-E2-V1  
NJ20+U10-E2

NJ20+U1-A

NJ20-U1+A2  
NJ20-U1+A2-V1  
NJ20-U10+A2  
NJ20P-U1+A2

NJ20+U4+E2-BHMS4

NJ20+U1+E3



Date of edition 20.08.03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

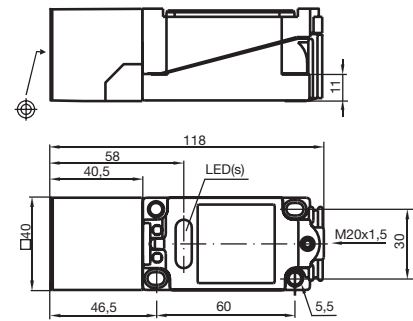
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- Comfort series
- 20 mm not embeddable

NCN20-U1-U  
 NCN20-U1-Z2  
 NJ20-U1-W

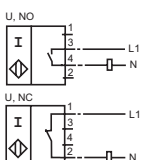


Inductive sensors, standard, cubic designs

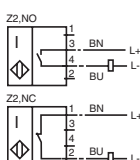
1.2

		NCN20+U1+U	NJ20+U1+W	NCN20+U1+Z2
Rated operating distance	20 mm	◆	◆	◆
Installation	not embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC/DC	◆		
	AC		◆	
	DC			◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆
Kind of voltage	AC		◆	
	DC			◆
	UC	◆		
Operating voltage	20 ... 253 V	◆		
	20 ... 253 V <sup>1)</sup>		◆	
	5 ... 60 V			◆
Operating voltage DC	20 ... 300 V	◆		
Switching frequency	0 ... 20 Hz		◆	
	0 ... 25 Hz	◆		
	0 ... 250 Hz			◆
Reverse polarity protection	tolerant			◆
Short-circuit protection	pulsing	◆		◆
Voltage drop	≤ 12 V		◆	
	≤ 4 V	◆		
	≤ 5 V			◆
Operating current	2 ... 200 mA			◆
	5 ... 500 mA	◆		
	8 ... 500 mA		◆	
Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	◆	◆	
	0 ... 1 mA typ. 0.7 mA			◆
Off-state current	0 ... 2.5 mA typ. 1.5 mA	◆		
	0.5 ... 1.95 mA typ. 1.2 mA		◆	
	LED, green	◆	◆	
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

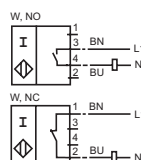
NCN20-U1-U



NCN20-U1-Z2



NJ20-U1-W



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

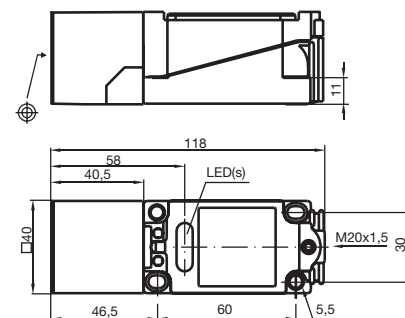




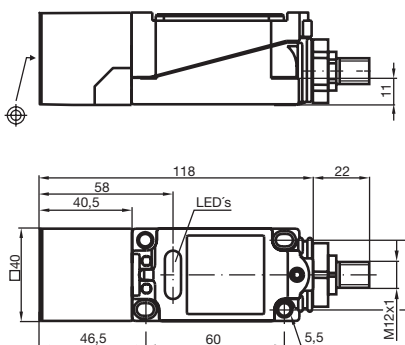
- **Comfort series, 30 mm not embeddable**
- **only for NE-metals**  
NJ30P+U1+A2
- **With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)**  
NJ30+U10...



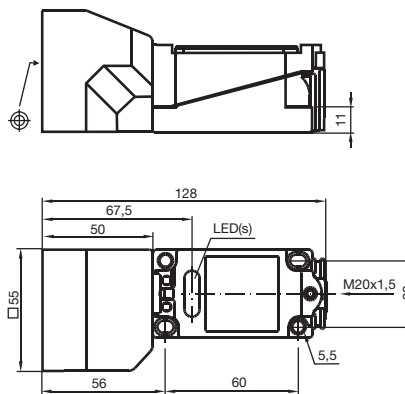
NB0+U1-A  
NB0+U1-A2  
NB0+U1-E  
NB0+U1-E1  
NB0+U1-E2  
NB0+U1-E3



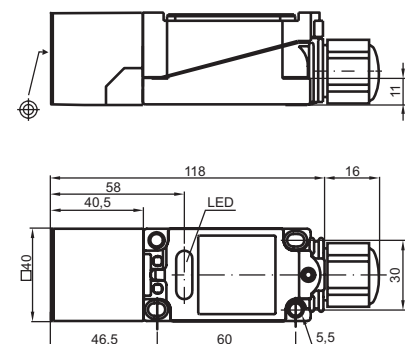
NB0+U1-A2-V1  
NB0+U1-E2-V1



NB0P+U1-A2



NB0+U10-E2



		NJ30+U1+E	NJ30+U1+E1	NJ30+U1+E2	NJ30+U1+E2-V1	NJ30+U1+E3	NJ30+U1+A	NJ30+U1+A2	NJ30+U1+A2-V1	NJ30+U10+E2	NJ30P+U1+A2
Rated operating distance	30 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire						◆	◆	◆	◆	◆
Switching element function	NPN Antivalent										
	NPN Break function				◆						
	NPN Make function	◆									
	PNP Antivalent							◆	◆	◆	◆
	PNP Break function					◆					
	PNP Make function									◆	◆
Assured operating distance	0 ... 24.3 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	V1-connector						◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NB0+U1-E1

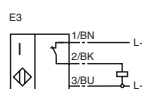
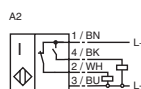
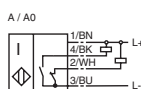
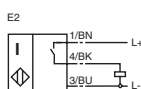
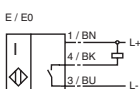
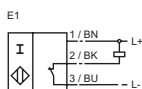
NB0+U1-E

NB0+U1-E2  
NB0+U1-E2-V1  
NB0+U10-E2

NB0+U1-A

NB0+U1-A2  
NB0+U1-A2-V1  
NB0P+U1-A2

NJ30+U1-E3



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

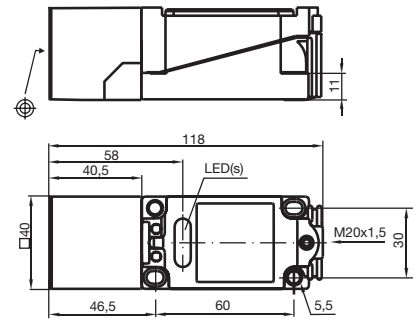
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- Comfort series
- 30 mm not embeddable

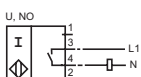
NCN30-U1-U  
 NCN30-U1-Z2  
 NJ30-U1-W



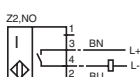
Inductive sensors, standard, cubic designs

		NCN30-U1+U	NJ30-U1+W	NCN30+U1+Z2
Rated operating distance	30 mm	◆	◆	◆
Installation	not embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	AC/DC	◆		
	AC		◆	
	DC			◆
Assured operating distance	0 ... 24.3 mm	◆	◆	◆
Kind of voltage	AC		◆	
	DC			◆
	UC	◆		
Operating voltage	20 ... 253 V	◆		
	20 ... 253 V <sup>1)</sup>		◆	
	5 ... 60 V			◆
Operating voltage DC	20 ... 300 V	◆		
Switching frequency	0 ... 150 Hz			◆
	0 ... 20 Hz		◆	
	0 ... 25 Hz	◆		
Reverse polarity protection	tolerant			◆
Short-circuit protection	pulsing	◆		◆
Voltage drop	≤ 12 V		◆	
	≤ 4 V	◆		
	≤ 5 V			◆
Operating current	2 ... 200 mA			◆
	5 ... 500 mA	◆		
	8 ... 500 mA		◆	
Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	◆	◆	
Off-state current	0 ... 1 mA typ. 0.7 mA			◆
	0 ... 2.5 mA typ. 1.5 mA	◆		
	0.5 ... 1.95 mA typ. 1.2 mA		◆	
Operating voltage display	LED, green	◆	◆	
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

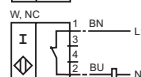
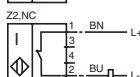
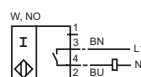
NCN30-U1-U



NCN30-U1-Z2



NJ30-U1-W



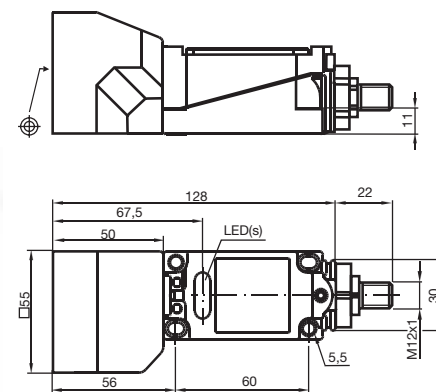
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



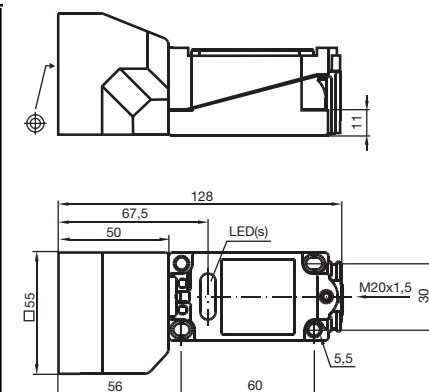
- **Comfort series, 40 mm not embeddable**
- **Surface mount**  
NJ40+ U4+ W4-BHMS5
- **With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)**  
NJ40+ U10+E2



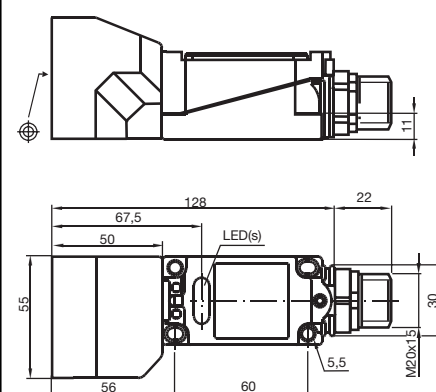
NJ40+U1-A2-V1



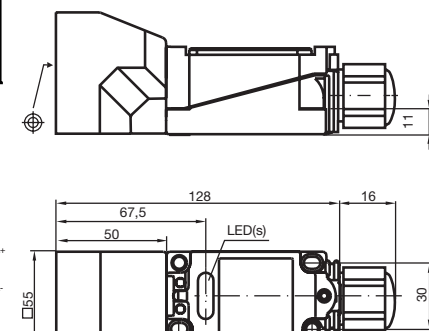
NJ40+U1-A



NJ40+U4-W4-BHMS5

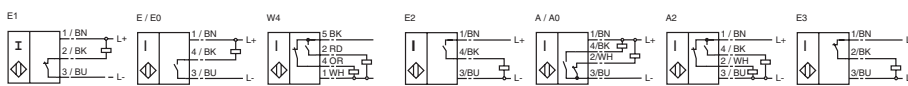


NJ40+U10+E2



		NJ40+U1+E	NJ40+U1+E1	NJ40+U1+E2	NJ40+U1+E2-V1	NJ40+U1+E3	NJ40+U1+A	NJ40+U1+A2	NJ40+U1+A2-V1	NJ40+U10+E2	NJ40+U4-W4-BHMS5
Rated operating distance	40 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4-wire										
Switching element function	AC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make/Break function										
	NPN Antivalent										
	NPN Break function										
	NPN Make function			◆							
	PNP Antivalent										
	PNP Break function										
	PNP Make function										
Assured operating distance	0 ... 24.3 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 32.4 mm										
Kind of voltage	AC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC										
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	20 ... 253 V										
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 20 Hz										
	0 ... 30 Hz										
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	4 V										
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	8 ... 500 mA										
Momentary current (20 ms, 0.1 Hz)	≤ 4 A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 2.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	LED green: NC										
	LED red: NO										
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Quick disconnect type BHMS5										
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PBT/metal										
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68										

NJ40+U1-E1 NJ40+U1-E NJ40+U4-W4-BHMS5 NJ40+U1+E2 NJ40+U1+E2-V1 NJ40+U10+E2 NJ40+U1-A NJ40+U1-A2 NJ40+U1-A2-V1 NJ40+U1-E3



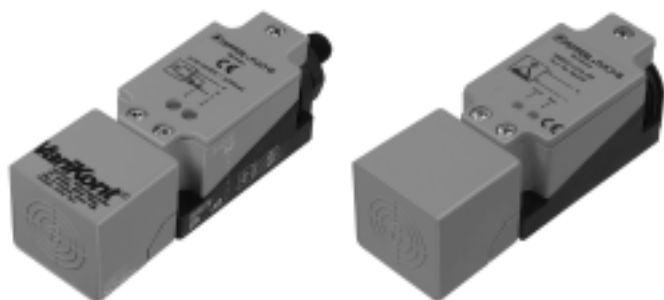
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

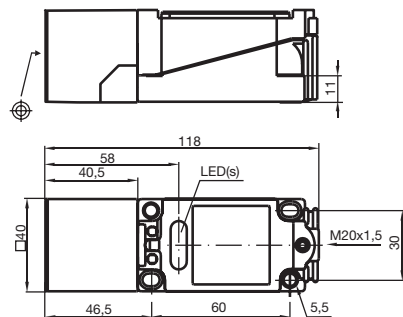
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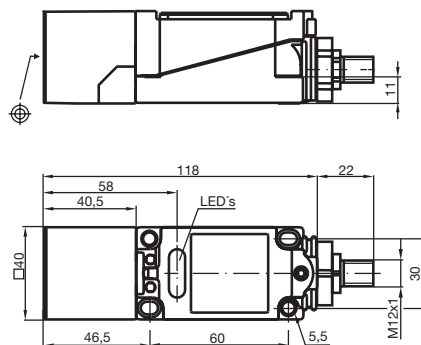
- Comfort series
- 40 mm not embeddable



NCN40-U1+A0  
 NCN40-U1+A2  
 NCN40-U1+E0  
 NCN40-U1+E2

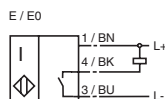


NCN40-U1+A2-V1

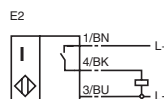


		NCN40-U1+E0	NCN40-U1+E2	NCN40-U1+A0	NCN40-U1+A2	NCN40-U1+A2-V1
Rated operating distance	40 mm	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆
Switching element function	4-wire			◆	◆	◆
	NPN Antivalent				◆	◆
	NPN Make function	◆				
	PNP Antivalent				◆	◆
	PNP Make function		◆			
Assured operating distance	0 ... 32.4 mm	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆
Switching frequency	0 ... 30 Hz	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	
	V1-connector					◆
Housing material	PBT	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆

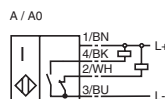
NCN40-U1+E0



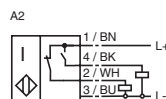
NCN40-U1+E2



NCN40-U1+A0



NCN40-U1+A2  
 NCN40-U1+A2-V1



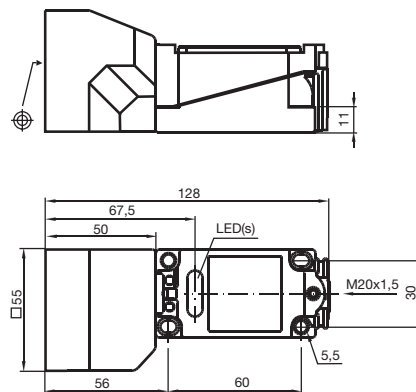
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-11

- Comfort series
- 40 mm not embeddable

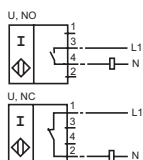


NCN40-U1-U  
 NCN40-U1-Z2  
 NJ40-U1-W  
 NCN40-U4-Z2

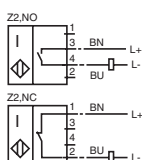


		NJ40-U1+W	NCN40-U1+U	NCN40-U1+Z2	NCN40-U4+Z2
Rated operating distance	40 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	AC/DC		◆		
	AC	◆			
	DC			◆	◆
Assured operating distance	0 ... 32.4 mm	◆	◆	◆	◆
Kind of voltage	AC	◆			
	DC			◆	◆
	UC		◆		
Operating voltage	20 ... 253 V	◆	◆		
	20 ... 253 V <sup>1)</sup>	◆			
	5 ... 60 V			◆	◆
Operating voltage DC	20 ... 300 V		◆		
Switching frequency	0 ... 100 Hz			◆	◆
	0 ... 20 Hz	◆			
	0 ... 25 Hz		◆		
Reverse polarity protection	tolerant			◆	◆
Short-circuit protection	pulsing		◆	◆	◆
Voltage drop	≤ 12 V	◆			
	≤ 4 V		◆		
	≤ 5 V			◆	◆
Operating current	2 ... 200 mA			◆	◆
	5 ... 500 mA		◆		
	8 ... 500 mA	◆	◆		
Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	◆	◆		
	0 ... 1 mA typ. 0.7 mA			◆	◆
Off-state current	0 ... 2.5 mA typ. 1.5 mA		◆		
	0.5 ... 1.95 mA typ. 1.2 mA	◆			
	LED, green	◆	◆		
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
	PBT/metal				◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆

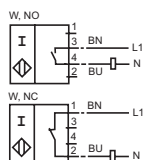
NCN40-U1-U



NCN40-U1-Z2



NJ40-U1-W



Date of edition: 20.08.03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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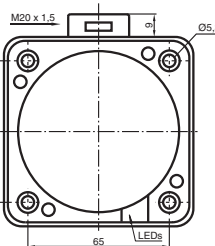
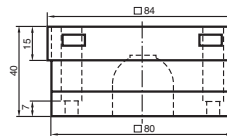
1.2



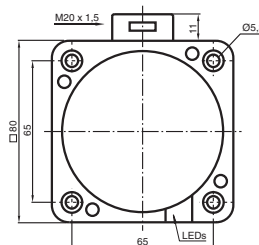
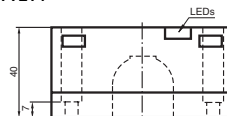
- Comfort series, 40 mm embeddable  
NCB40-...
- Comfort series, 50 mm embeddable  
NCB50-...



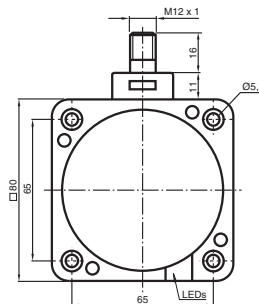
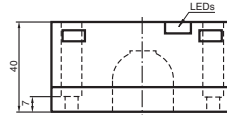
NCB50-FP-A2-P1



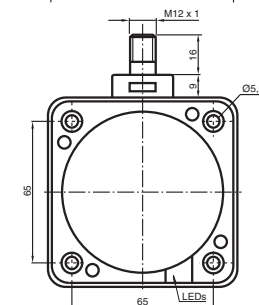
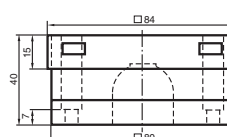
NCB40-FP-A2-P1



NCB40-FP-A2-P1-V1

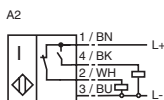


NCB50-FP-A2-P1-V1



		NCB40-FP-A2-P1	NCB40-FP-A2-P1-V1	NCB50-FP-A2-P1	NCB50-FP-A2-P1-V1
Rated operating distance	40 mm	◆	◆		
	50 mm			◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	4-wire	◆	◆	◆	◆
Switching element function	PNP Antivalent	◆	◆	◆	◆
Assured operating distance	0 ... 32.4 mm	◆	◆		
	0 ... 40.5 mm			◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching frequency	0 ... 80 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆
	V1-connector		◆		◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆

NCB40-FP-A2-P1-V1  
NCB50-FP-A2-P1  
NCB50-FP-A2-P1-V1  
NCB40-FP-A2-P1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

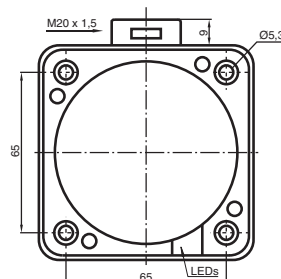
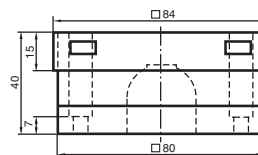
Date of edition 20.08.03-11



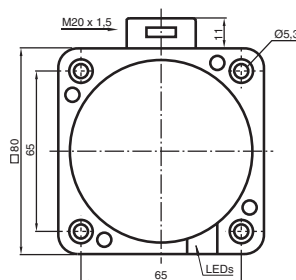
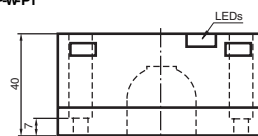
- **Comfort series, 40 mm embeddable**  
NCB40-...
- **Comfort series, 50 mm embeddable**  
NCB50-...



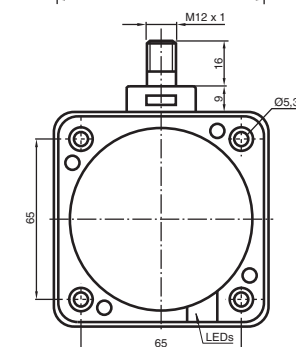
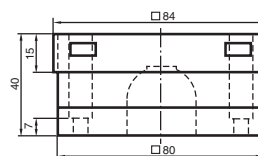
NCB40-FP-Z2-P1  
NCB50-FP-Z2-P1



NCB40-FP-W-P1

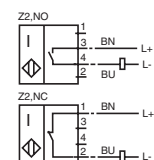


NCB50-FP-Z4-V1  
NCB50-FP-Z5-V1

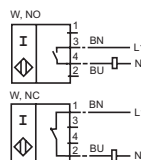


		NCB40-FP-W-P1	NCB40-FP-Z2-P1	NCB50-FP-Z2-P1	NCB50-FP-Z4-V1	NCB50-FP-Z5-V1
Rated operating distance	40 mm	◆	◆			
	50 mm			◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	AC Make/Break function	◆				
	DC Make/Break function		◆	◆		
	NC					◆
	NO					◆
Assured operating distance	0 ... 32.4 mm	◆	◆			
	0 ... 40.5 mm			◆	◆	◆
Kind of voltage	AC	◆				
	DC		◆	◆	◆	◆
Operating voltage	10 ... 60 V			◆	◆	◆
	20 ... 253 V	◆				
Switching frequency	0 ... 20 Hz	◆				
	0 ... 50 Hz		◆			
	0 ... 80 Hz				◆	◆
Reverse polarity protection	tolerant				◆	◆
	no	◆				
	pulsing		◆	◆	◆	◆
Voltage drop	≤ 3.8 V				◆	◆
	≤ 5 V typ. 4V	◆				
	≤ 6 V			◆		
Operating current	2 ... 200 mA			◆	◆	◆
	5 ... 500 mA	◆				
Momentary current (20 ms, 0.1 Hz)	≤ 4000 mA	◆				
Off-state current	≤ 0.6 mA				◆	◆
	0.3 ... 1 mA typ. 0.7 mA	◆				
	0.4 ... 1 mA typ. 0.6 mA		◆			
Operating voltage display	LED, green	◆				
Indication of the switching state	LED, yellow		◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆		
	V1-connector				◆	◆
Housing material	PBT	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67		◆			
	IP68	◆		◆	◆	◆
Protection class	II				◆	

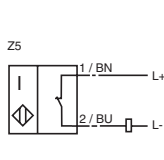
NCB40-FP-Z2-P1  
NCB50-FP-Z2-P1



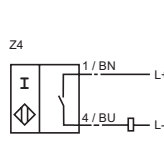
NCB40-FP-W-P1



NCB50-FP-Z5-V1



NCB50-FP-Z4-V1



Date of edition 20.08-03-11

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1.2

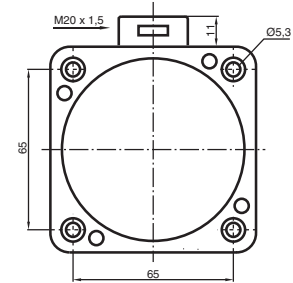
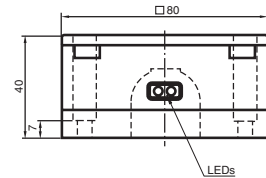
Inductive sensors, standard, cubic designs



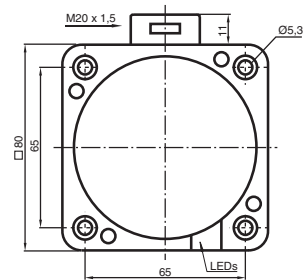
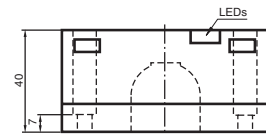
- **Comfort series**  
40 mm not embeddable  
50 mm not embeddable  
60 mm not embeddable
- **only for NE-metals**  
NJ40P-FP-A2-P1



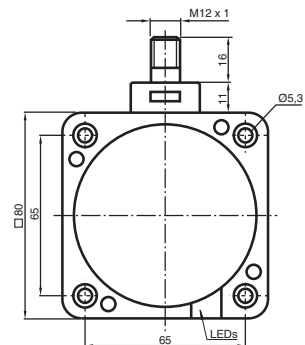
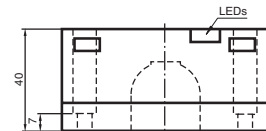
NJ40P-FP-A2-P1  
NJ50-FP-A-P1  
NJ60-FP-E2-P2



NCN50-FP-A2-P1

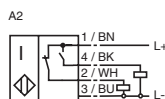


NCN50-FP-A2-P1-V1

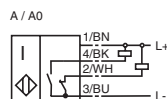


		NJ40P-FP-A2-P1	NJ50-FP-A-P1	NCN50-FP-A2-P1	NCN50-FP-A2-P1-V1	NJ60-FP-E2-P2
Rated operating distance	40 mm	◆				
	50 mm		◆	◆	◆	
	60 mm					◆
Installation	not embeddable	◆	◆	◆	◆	◆
Output type	3-wire					◆
	4-wire	◆	◆	◆	◆	
Switching element function	NPN Antivalent		◆			
	PNP Antivalent	◆			◆	
	PNP Make function					◆
Assured operating distance	0 ... 32.4 mm	◆				
	0 ... 40.5 mm		◆	◆	◆	
	0 ... 48.6 mm					◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆		◆	◆
	10 ... 60 V				◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz		◆			
	0 ... 150 Hz	◆				
	0 ... 20 Hz					◆
	0 ... 80 Hz					◆
Reverse polarity protection		◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	
	LED, red					◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆	◆	◆	◆
	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	terminal housing					◆
	terminal compartment	◆	◆	◆	◆	
	V1-connector					◆
Housing material	PBT	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆
	IP67		◆			
	IP68	◆		◆	◆	

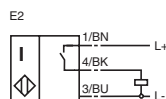
NCN50-FP-A2-P1  
NCN50-FP-A2-P1-V1  
NJ40P-FP-A2-P1



NJ50-FP-A-P1



NJ60-FP-E2-P2



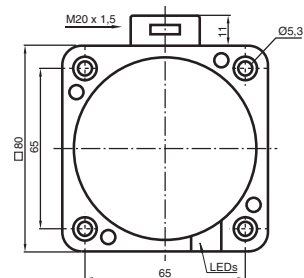
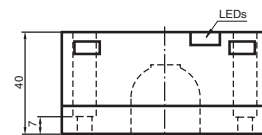
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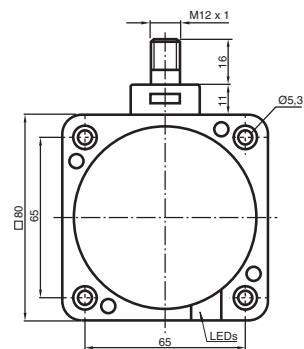
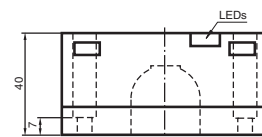
- Comfort series
- 50 mm not embeddable



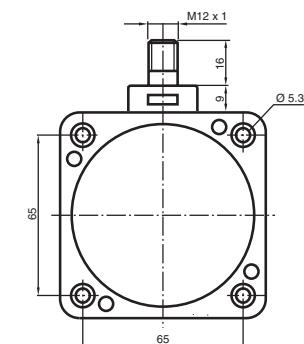
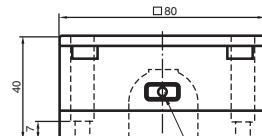
NCN50-FP-W-P1  
NCN50-FP-Z2-P1



NCN50-FP-Z5-V1

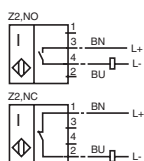


NCN50-FP-Z4-V1

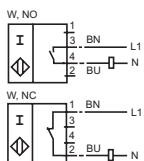


		NCN50-FP-W-P1	NCN50-FP-Z2-P1	NCN50-FP-Z4-V1	NCN50-FP-Z5-V1
Rated operating distance	50 mm	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	AC Make/Break function	◆			
	DC Make/Break function		◆		
	NC				◆
	NO			◆	
Assured operating distance	0 ... 40.5 mm	◆	◆	◆	◆
Kind of voltage	AC	◆			
	DC		◆	◆	◆
Operating voltage	10 ... 60 V		◆	◆	◆
	20 ... 253 V	◆			
Switching frequency	0 ... 20 Hz	◆			
	0 ... 80 Hz		◆	◆	◆
Reverse polarity protection	protected against reverse polarity			◆	◆
	tolerant	◆	◆		
Short-circuit protection	no	◆			
	pulsing		◆	◆	◆
Voltage drop	≤ 4.3 V			◆	◆
	≤ 5 V typ. 4V	◆			
Operating current	≤ 6 V		◆		
	2 ... 200 mA	◆		◆	◆
Momentary current (20 ms, 0.1 Hz)	5 ... 500 mA		◆	◆	◆
	≤ 4000 mA	◆			
Off-state current	0.3 ... 1 mA typ. 0.7 mA	◆			
	0.4 ... 1 mA typ. 0.6 mA		◆	◆	◆
Operating voltage display	LED, green	◆			
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆		
	V1-connector			◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
	IP68	◆			

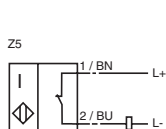
NCN50-FP-Z2-P1



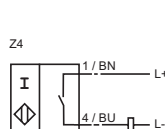
NCN50-FP-W-P1



NCN50-FP-Z5-V1



NCN50-FP-Z4-V1



Date of edition 20.08.03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

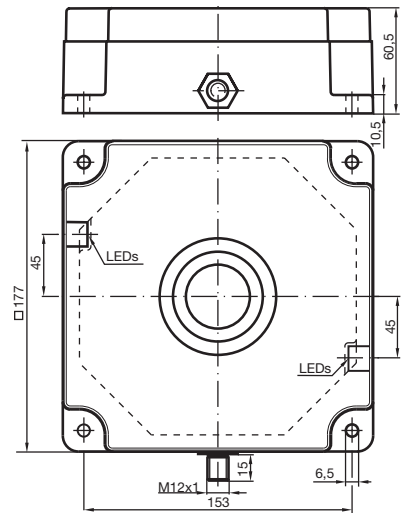
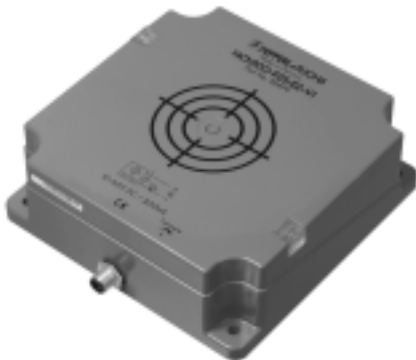
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- Comfort series
- 100 mm not embeddable

NCN100-F23-E2-V1

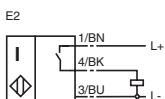


1.2

Inductive sensors, standard, cubic designs

		NCN100-F23-E2-V1
Rated operating distance	100 mm	◆
Installation	not embeddable	◆
Output type	3-wire	◆
Switching element function	PNP Make function	◆
Assured operating distance	0 ... 81 mm	◆
Kind of voltage	DC	◆
Operating voltage	10 ... 60 V	◆
No-load supply current	≤ 20 mA	◆
Switching frequency	0 ... 10 Hz	◆
Reverse polarity protection	protected against reverse polarity	◆
Short-circuit protection	pulsing	◆
Voltage drop	≤ 3 V	◆
Operating current	0 ... 200 mA	◆
Operating voltage display	LED, green	◆
Indication of the switching state	LED, yellow	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	V1-connector	◆
Housing material	ABS (TSG), bottom Al	◆
Sensing face	ABS	◆
Protection degree	IP67	◆

NCN100-F23-E2-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-11

## Weld-immune sensors

### General

Installing inductive sensors near electric welding systems can have two negative effects:

The strong magnetic fields produced by the high welding currents penetrate the core of the sensor element and can cause the material to become saturated or at least alter the switching point to such a degree that the reversible permeability drops considerably. This significantly reduces the quality factor of the coil. The coil system is thus damped by the magnetic fields, which may cause the proximity sensor to be switched. This is remedied by using special cores made of sintered iron powder, that has a higher saturation flux density than ordinary ferrite.

The second negative effect is that the magnetic alternating fields produced by an alternating field welding system induce voltages in the sensor coil. These voltages affect the oscillator and can lead to uncontrolled switching. This is prevented by suitable technical measures.

Sensors used in welding system applications are characterized by a greater level of durability in order to cope with harsh environmental conditions:

- To protect them from weld slag, they have a front face made of Ryton®.
- The housings are made of Teflon-coated brass (except limit switch style).

Weld-immune sensors are indicated by a -C at the end of the model number.

### Recommended values for magnetic induction

The diagram on the right shows how magnetic induction varies with the distance from the current-carrying conductor.



By using the following formula

$$B \text{ [mT]} = \frac{0,2 \times I \text{ [A]}}{r \text{ [mm]}}$$

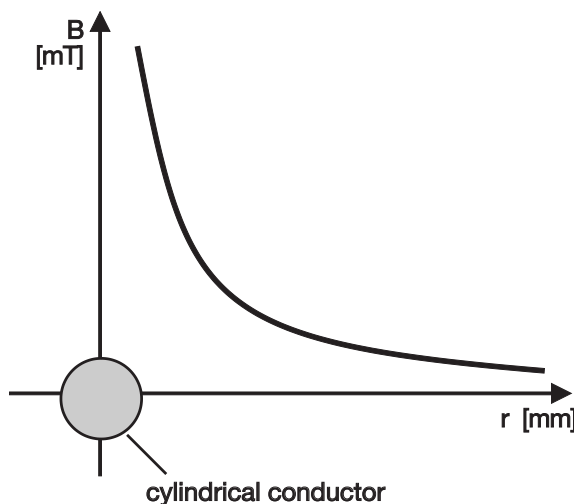
it is possible to calculate the magnetic induction in the vicinity of the current-carrying conductor.

Definitions:

- I = current through the conductor [A]
- r = distance from the center of the conductor [mm]
- B = magn. induction [mT]

The field distribution can be influenced by the design of the electrodes and adjacent iron structures. The formula and table do not take these influences into account:

I [kA]	Distance [mm]			
	12,5	25	50	100
5	80 mT	40 mT	20 mT	10 mT
10	160 mT	80 mT	40 mT	20 mT
20	320 mT	160 mT	80 mT	40 mT
50	800 mT	400 mT	200 mT	100 mT
100	1600 mT	800 mT	400 mT	200 mT



Intensity of the magnetic induction near a cylindrical conductor

**Other "magnet resistant" sensors can be found in the section "Sensors with reduction factor 1" see Page 137 .**

- Resistant to welding
- Basic series



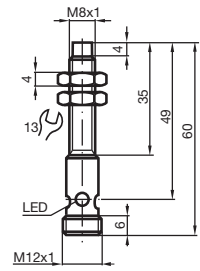
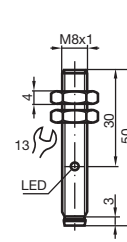
1.3

Inductive sensors, weld-proof



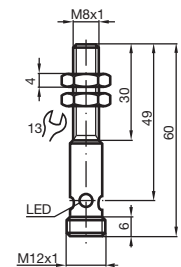
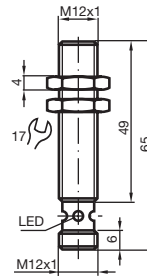
NBB1,5-8GM40-E2-C-V3

NBN3-8GM80-E2-C-V1

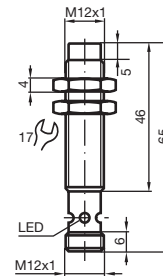


NBB2-12GM50-E2-C-V1  
NBB2-12GM50-E0-C-V1

NBB1,5-8GM30-E2-C-V1



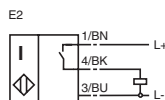
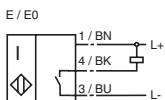
NBN4-12GM50-E2-C-V1



		NBB1,5-8GM40-E2-C-V3	NBB1,5-8GM30-E2-C-V1	NBN3-8GM30-E2-C-V1	NBB2-12GM50-E0-C-V1	NBB2-12GM50-E2-C-V1	NBN4-12GM50-E2-C-V1
Rated operating distance		1.5	1.5	3	2	2	4
Installation	embeddable not embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	NPN Make function PNP Make function	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm 0 ... 1.62 mm 0 ... 2.43 mm 0 ... 3.24 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA ≤ 20 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1200 Hz 0 ... 1500 Hz 0 ... 1800 Hz 50 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA 0 ... 200 mA	◆	◆	◆	◆	◆	◆
Constant magnetic field	200 mT	◆	◆	◆	◆	◆	◆
Alternating magnetic field	100 mT 200 mT	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow Multihole-LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-cornektor V3-cornektor	◆	◆	◆	◆	◆	◆
Housing material	brass, teflon coated	◆	◆	◆	◆	◆	◆
Sensing face	PPS PPS, Ryton R4 Ryton R4	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆

NBB2-12GM50-E0-C-V1

NBN4-12GM50-E2-C-V1  
NBB2-12GM50-E2-C-V1  
NBB1,5-8GM30-E2-C-V1  
NBB1,5-8GM40-E2-C-V3  
NBN3-8GM80-E2-C-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

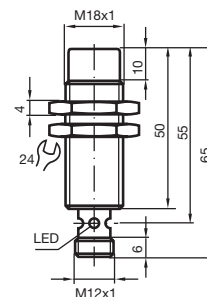
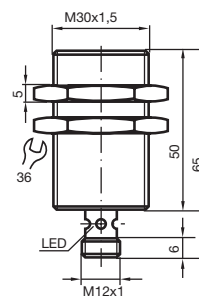
Date of edition 20.08.03-11

- Resistant to welding



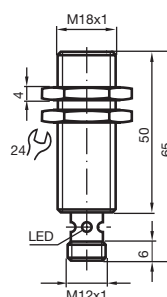
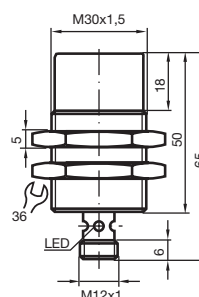
NBB10-30GM50-E2-CV1

NBN8-18GM50-E2-C-V1



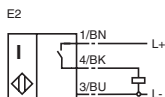
NBN15-30GM50-E2-CV1

NBB5-18GM50-E2-C-V1



		NBB5-18GM50-E2-C-V1	NBN8-18GM50-E2-C-V1	NBB10-30GM50-E2-C-V1	NBN15-30GM50-E2-C-V1
Rated operating distance		5 mm	8 mm	10 mm	15 mm
Installation	embeddable	◆		◆	
	not embeddable		◆		◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP	◆	◆	◆	◆
	Make function		◆	◆	◆
Assured operating distance	0 ... 12.5 mm				◆
	0 ... 4.05 mm	◆			
	0 ... 6.48 mm		◆		
	0 ... 8.1 mm			◆	
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 10 Hz		◆		◆
	0 ... 500 Hz		◆		◆
	0 ... 800 Hz				◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Constant magnetic field	100 mT		◆	◆	◆
	150 mT	◆			◆
Alternating magnetic field	100 mT		◆	◆	◆
	150 mT	◆	◆		◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
Housing material	brass, teflon coated	◆	◆	◆	◆
Sensing face	PPS	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

NBB5-18GM50-E2-C-V1  
NBN8-18GM50-E2-C-V1  
NBB10-30GM50-E2-CV1  
NBN15-30GM50-E2-CV1



Date of edition 2008-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

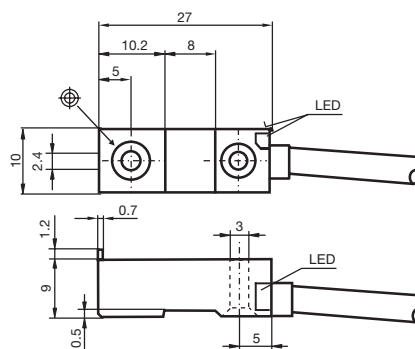
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- Basic series
- 4 mm not embeddable
- For use in direct- and alternating-field welding systems

NBN-F29A-E2-C



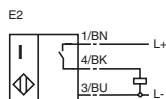
1.3

Inductive sensors, weld-proof



		NBN-F29A-E2-C
Rated operating distance	4 mm	◆
Installation	not embeddable	◆
Output type	3-wire	◆
Switching element function	PNP Make function	◆
Assured operating distance	0 ... 3.24 mm	◆
Kind of voltage	DC	◆
Operating voltage	10 ... 30 V	◆
No-load supply current	≤ 10 mA	◆
Switching frequency	0 ... 1000 Hz	◆
Reverse polarity protection		◆
Short-circuit protection	pulsing	◆
Voltage drop	≤ 3 V	◆
Operating current	0 ... 100 mA	◆
Constant magnetic field	200 mT	◆
Alternating magnetic field	200 mT	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆
Indication of the switching state	LED, yellow	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	2 m, PUR cable irradiated	◆
Housing material	PPS	◆
Sensing face	PPS	◆
Protection degree	IP67	◆

NBN-F29A-E2-C



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

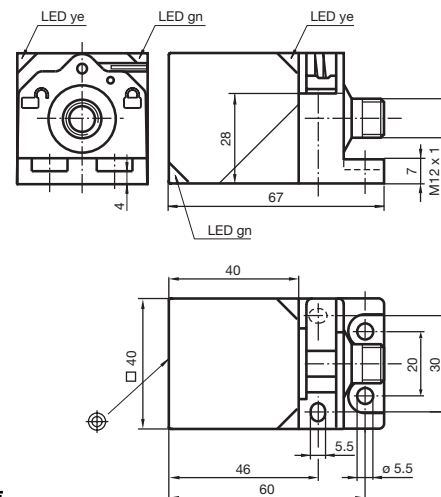
Date of edition 20.08.03-11



- Quick mounting shutter
- IP69K Steam jet proof
- 4-way LED indicator
- Resistant to welding
- Bistable version  
NBN40-L2-E2B-C-V1
- Set and Reset function  
NBN40-L2-E2B-C-V1

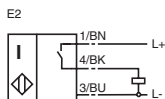


NBB20-L2-A2-C-V1  
 NBB20-L2-E2-CV1  
 NBN30-L2-A2-C-V1  
 NBN40-L2-A2-C-V1  
 NBN40-L2-E2B-C-V1  
 NBN40-L2-E2-CV1

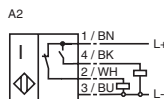


		NBB20-L2-E2-C-V1	NBB20-L2-A2-C-V1	NBN30-L2-A2-C-V1	NBN40-L2-E2-C-V1	NBN40-L2-E2B-C-V1	NBN40-L2-A2-C-V1
Rated operating distance	20 mm	◆	◆				
	30 mm			◆			
	40 mm				◆	◆	◆
Installation	embeddable	◆	◆				
	not embeddable			◆	◆	◆	◆
Output type	3-wire	◆			◆	◆	◆
	4-wire		◆	◆			◆
Switching element function	PNP Antivalent	◆	◆	◆			◆
	PNP Make function				◆	◆	
Assured operating distance	0 ... 16.2 mm	◆	◆				
	0 ... 24.3 mm			◆			
	0 ... 32.4 mm				◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤20 mA	◆	◆	◆	◆	◆	◆
	≤25 mA					◆	
Switching frequency	0 ... 10 Hz	◆	◆	◆	◆	◆	◆
	0 ... 50 Hz					◆	
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆
	0 ... 1 mA					◆	
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
Housing material	PA 6 Grivory GVN-35H	◆	◆	◆	◆	◆	◆
Sensing face	PA 6 Grivory GVN-35H	◆	◆	◆	◆	◆	◆
Protection degree	IP69K	◆	◆	◆	◆	◆	◆

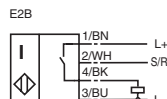
NBB20-L2-E2-CV1  
 NBN40-L2-E2-CV1



NBB20-L2-A2-C-V1  
 NBN30-L2-A2-C-V1  
 NBN40-L2-A2-C-V1



NBN40-L2-E2B-C-V1



Date of edition: 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

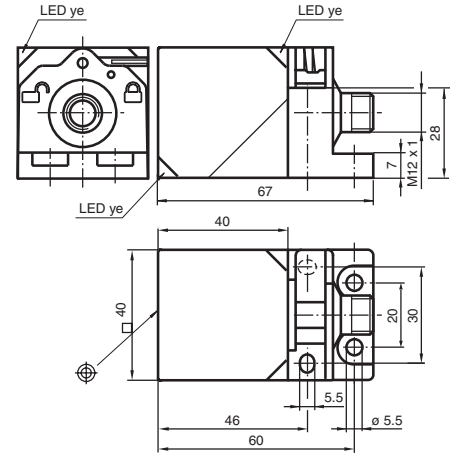
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- Quick mounting shutter
- IP69K Steam jet proof
- Resistant to welding
- 4-way LED indicator

NBB20-L2-Z4-C-V1  
 NBB20-L2-Z5-C-V1  
 NBN40-L2-Z4-C-V1  
 NBN40-L2-Z5-C-V1



1.3

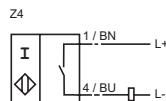
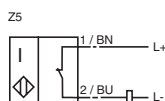
Inductive sensors, weld-proof



		NBB20-L2-Z4-C-V1	NBB20-L2-Z5-C-V1	NBN40-L2-Z4-C-V1	NBN40-L2-Z5-C-V1
Rated operating distance	20 mm	◆	◆		
	40 mm			◆	◆
Installation	embeddable	◆	◆		
	not embeddable			◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NC		◆		◆
	NO	◆		◆	
Assured operating distance	0 ... 16.2 mm	◆	◆		
	0 ... 32.4 mm			◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	3.8 ... 30 V	◆	◆	◆	◆
Switching frequency	0 ... 3 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆
Voltage drop	≤ 3.8 V	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆
Off-state current	0 ... 0.6 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	connector M12 x 1	◆	◆		
	V1-connector			◆	◆
Housing material	PA 6 Grivory GVN-35H	◆	◆	◆	◆
Sensing face	PA 6 Grivory GVN-35H	◆	◆	◆	◆
Protection degree	IP68			◆	◆
	IP69K	◆	◆		

NBB20-L2-Z5-C-V1  
 NBN40-L2-Z5-C-V1

NBB20-L2-Z4-C-V1  
 NBN40-L2-Z4-C-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

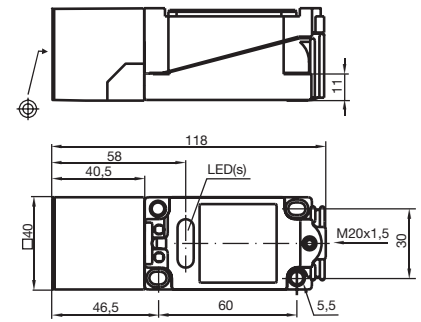
Date of edition 20.08.03-11



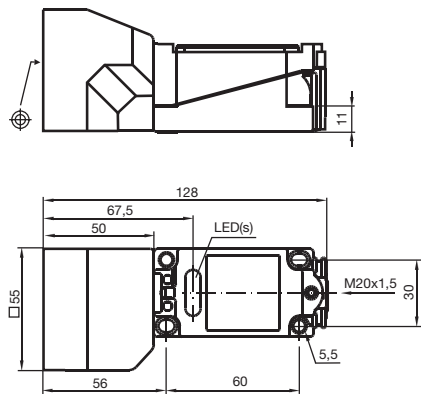
- For use in direct- and alternating-field welding systems



NJ15+U1+E2-C

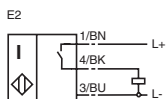


NJ40+U1+E2-C



		NJ15+U1+E2-C	NJ40+U1+E2-C
Rated operating distance	15 mm	◆	◆
	40 mm	◆	◆
Installation	embeddable	◆	◆
	not embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Make function	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆
	0 ... 32.4 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤20 mA	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Alternating magnetic field	180 mT	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆

NJ15+U1+E2-C  
NJ40+U1+E2-C



Date of edition: 20.08.03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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- Resistant to welding
- Comfort series

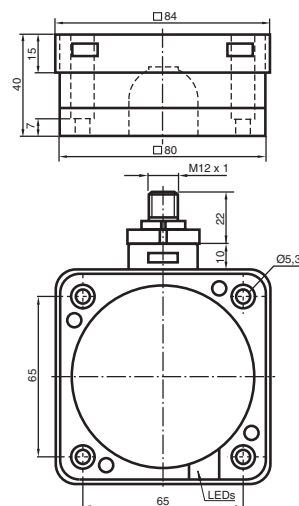


1.3

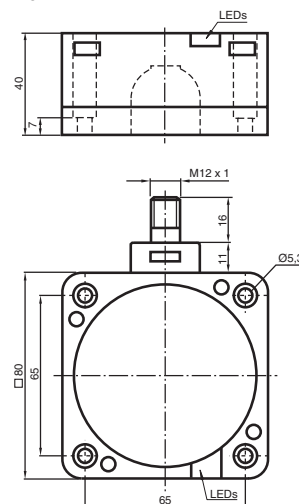
Inductive sensors, weld-proof



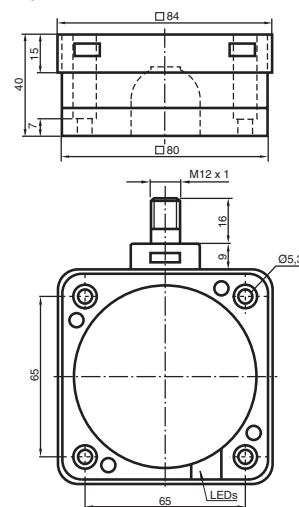
NCB50-FP-A2-C-P3-V1  
NCB50-FP-E2-C-P3-V1



NCB40-FP-A2-C-P1-V1  
NCN50-FP-A2-C-P1-V1

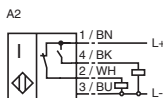


NCB50-FP-A2-C-P1-V1  
NCB50-FP-E2-C-P1-V1

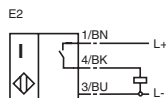


		NCB40-FP-A2-C-P1-V1	NCB50-FP-E2-C-P1-V1	NCB50-FP-E2-C-P3-V1	NCB50-FP-A2-C-P1-V1	NCB50-FP-A2-C-P3-V1	NCN50-FP-A2-C-P1-V1
Rated operating distance	40 mm	◆					
	50 mm		◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
	not embeddable						◆
Output type	3-wire		◆	◆			
	4-wire	◆			◆	◆	◆
Switching element function	PNP NO		◆	◆			
	PNP Antivalent	◆			◆	◆	◆
Assured operating distance	0 ... 32.4 mm	◆					
	0 ... 40.5 mm		◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1 Hz	◆	◆	◆	◆	◆	◆
	0 ... 80 Hz	◆					◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing				◆		
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆
	PBT/metal			◆		◆	
Sensing face	PBT, active surface Teflon coated	◆	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆	◆

NCB40-FP-A2-C-P1-V1  
NCB50-FP-A2-C-P1-V1  
NCB50-FP-A2-C-P3-V1  
NCN50-FP-A2-C-P1-V1



NCB50-FP-E2-C-P1-V1  
NCB50-FP-E2-C-P3-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-11

## Sensors with reduction factor 1

### Standard behavior of inductive sensors

Standard proximity sensors are subject to sensing range reductions when detecting nonferrous metal objects. This factor depends on both the design features of the sensor (for example the housing material) and the material the target is made of. This characteristic can have a disruptive effect in certain applications. To counter this special sensors have been developed without it.

### One for all

Reduction factor 1 sensors are inductive sensors equipped with a special type oscillator. At the center are two air-core coils which adjust to the characteristics of the respective metal. This guarantees maximum operating distances and material independent detection of all metals.

### Our know-how, your benefit

Do you want to extend an existing plant? Are you looking for a way to quickly change over to new products without changing sensors? Do you have an application where objects from different materials must be reliably detected? Using the sensors

with reduction factor 1 keeps you flexible at all times. With only a few sensor types required, you will reduce storage costs and increase production uptime.

### Key features

- detects all metals at the same nominal sensing range
- sensing range up to 75 mm
- resistant to electromagnetic fields
- available in weld-immune versions
- complete, standardized product portfolio of cylindrical and cubic sensor designs
- extremely robust

### Sensing range

The reduction factor series enables targets of various metals to be detected at the same range as standard ferrous targets. The dimensions of the target are calculated in the same way as the target for a standard inductive sensor.

### Identification

Sensors with reduction factor 1 are indicated by an R in the second position of the model number (example: NRB3-...).

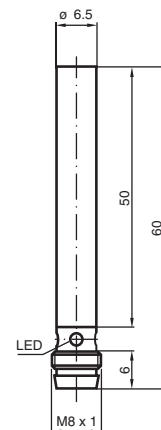
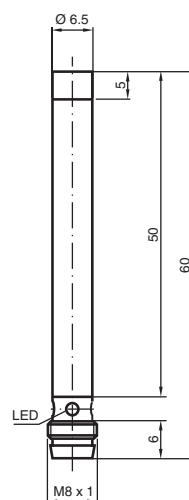




- **Magnetic field resistant**
- **Reduction factor = 1**
- **2 mm embeddable**  
NRB2-6,5M50-E2-V3
- **6 mm not embeddable**  
NRN6-6,5M50-E2-V3

NRN6-6,5M50-E2-V3

NRB2-6,5M50-E2-V3



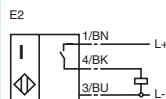
1.4

Inductive sensors with reduction factor 1



		NRB2-6,5M50-E2-V3	NRN6-6,5M50-E2-V3
Rated operating distance	2 mm	◆	
	6 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	3-wire	◆	◆
Switching element function	PNP      Make function	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	
	0 ... 4.86 mm		◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 1000 Hz	◆	
	0 ... 400 Hz		◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 .. 343 K)	◆	◆
Connection type	V3-connector	◆	◆
Housing material	stainless steel 1.4305	◆	◆
Sensing face	Crastin (PBTB)	◆	◆
Protection degree	IP67	◆	◆

NRB2-6,5M50-E2-V3  
NRN6-6,5M50-E2-V3



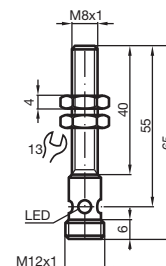
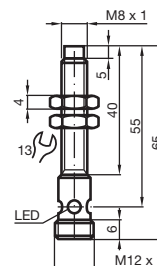
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- Reduction factor = 1
- Resistant to welding  
NR...-8GM40-E2-C-V1
- Magnetic field resistant  
NR...-8GM40-E2-V1

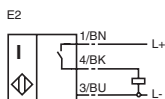
NRN4-8GM40-E2-C-V1  
NRM4-8GM40-E2-V1  
NRN6-8GM40-E2-C-V1  
NRM6-8GM40-E2-V1

NRB1,5-8GM40-E2-C-V1  
NRB1,5-8GM40-E2-V1  
NRB2-8GM40-E2-C-V1  
NRB2-8GM40-E2-V1



		NRB1,5-8GM40-E2-C-V1	NRB1,5-8GM40-E2-V1	NRB2-8GM40-E2-C-V1	NRB2-8GM40-E2-V1	NRN4-8GM40-E2-C-V1	NRN4-8GM40-E2-V1	NRN6-8GM40-E2-C-V1	NRN6-8GM40-E2-V1
Rated operating distance		1.5 mm	1.5 mm	2 mm	2 mm	4 mm	4 mm	6 mm	6 mm
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
	not embeddable					◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	PNP	◆	◆	◆	◆	◆	◆	◆	◆
	Make function					◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆						
	0 ... 1.62 mm			◆	◆				
	0 ... 3.24 mm					◆	◆		
	0 ... 4.86 mm							◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 20 mA							◆	◆
Switching frequency	0 ... 1000 Hz			◆	◆	◆	◆		
	0 ... 400 Hz							◆	◆
	0 ... 800 Hz								◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, teflon coated	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated		◆	◆	◆	◆	◆	◆	◆
Sensing face	Crastin (PBTB)		◆	◆	◆	◆	◆	◆	◆
	Crastin (PBTB), black	◆		◆	◆	◆	◆	◆	◆
	Crastin (PBTB); teflon coated					◆	◆		
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II					◆	◆		
Mass	19 g					◆	◆		

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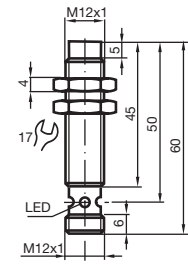
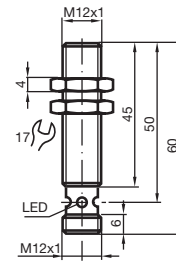
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- Reduction factor = 1
- Resistant to welding  
NR...-12GM...-E2-C-V1



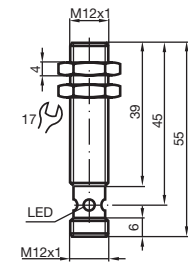
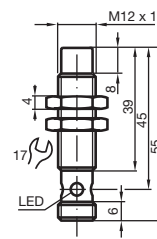
NRE2-12GM45-E2-C-V1

NFN4-12GM45-E2-C-V1  
NFB8-12GM45-E2-C-V1

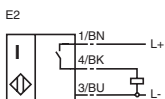


NFN10-12GM40-E2-C-V1  
NFB4-12GM40-E2-C-V1

NFN10-12GM40-E2-V1  
NFB4-12GM40-E2-V1



		NRE2-12GM45-E2-C-V1	NFN4-12GM40-E2-C-V1	NFB4-12GM40-E2-V1	NFN4-12GM45-E2-C-V1	NRN4-12GM45-E2-C-V1	NRN8-12GM45-E2-C-V1	NFN10-12GM40-E2-C-V1	NFN10-12GM40-E2-V1
Rated operating distance		2 mm	4 mm	4 mm	4 mm	4 mm	8 mm	10 mm	10 mm
Installation	embeddable	◆	◆	◆					
	not embeddable				◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	PNP      Make function	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆							
	0 ... 3.24 mm		◆	◆					
	0 ... 6.48 mm				◆	◆			
	0 ... 8.1 mm						◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 12 mA		◆	◆	◆	◆	◆	◆	◆
	≤ 15 mA	◆							
Switching frequency	0 ... 1000 Hz				◆	◆		◆	◆
	0 ... 200 Hz	◆					◆		
	0 ... 2000 Hz		◆	◆					
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆
Constant magnetic field	200 mT	◆	◆	◆	◆	◆	◆	◆	◆
Alternating magnetic field	200 mT	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, teflon coated	◆	◆		◆	◆	◆	◆	◆
	brass, nickel-plated								◆
Sensing face	Crastin (PBTB)				◆				◆
	PPS	◆			◆	◆			
	Ryton R4		◆					◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆	◆	◆
Mass	23 g		◆	◆				◆	◆



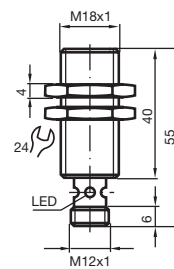
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



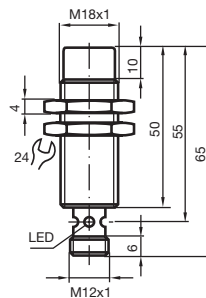
- Reduction factor = 1
- Resistant to welding  
NRB...C...
- Magnetic field resistant  
NRB...E2-V1



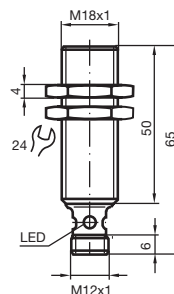
NRB12-18GM40-E2-V1  
NRB12-18GM40-E2-CV1



NRN12-18GM50-E2-C-V1  
NRN15-18GM50-E2-C-V1  
NRN15-18GM50-E2-V1  
NRN8-18GM50-E2-CV1

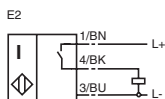


NRB5-18GM50-E2-C-V1  
NRB8-18GM50-E2-C-V1  
NRB8-18GM50-E2-V1



		NRB5-18GM50-E2-C-V1	NRB8-18GM50-E2-C-V1	NRB8-18GM50-E2-V1	NRB12-18GM40-E2-V1	NRB12-18GM40-E2-C-V1	NRN8-18GM50-E2-C-V1	NRN12-18GM50-E2-C-V1	NRN15-18GM50-E2-C-V1	NRN15-18GM50-E2-V1
Rated operating distance		5 mm	8 mm	8 mm	12 mm	12 mm	8 mm	12 mm	15 mm	15 mm
Installation	embeddable	◆	◆							
	not embeddable									
	quasi embedd.				◆	◆		◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	PNP	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function									
Assured operating distance	0 ... 12.15 mm									◆
	0 ... 4.05 mm	◆								
	0 ... 6.48 mm		◆	◆			◆			
	0 ... 9.72 mm				◆	◆	◆	◆		
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 25 mA									
Switching frequency	0 ... 100 Hz							◆		
	0 ... 150 Hz								◆	◆
	0 ... 350 Hz									
	0 ... 600 Hz	◆								
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆
Constant magnetic field	200 mT	◆	◆							
Alternating magnetic field	200 mT	◆	◆							
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel				◆					
	brass, teflon coated	◆	◆							
	brass, nickel-plated									◆
Sensing face	Crastin (PBTB)			◆						
	PPS	◆						◆	◆	
	Rybn R4		◆			◆				◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆	◆	◆	◆	◆	◆

Date of edition 2008-03-11



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

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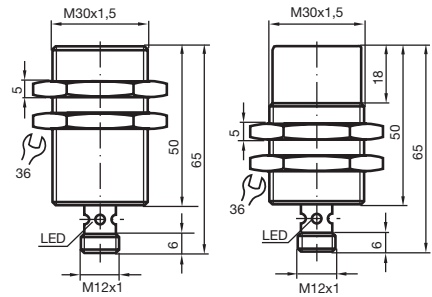
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- **Reduction factor = 1**
- **Resistant to welding**  
NR...-30GM50-E2-C-V1
- **Magnetic field resistant**  
NRB...-30GM50-E2-V1

NRB10-30GM50-E2-CV1  
NRB15-30GM50-E2-CV1  
NRB15-30GM50-E2-V1

NRN15-30GM50-E2-CV1  
NRN20-30GM50-E2-CV1  
NRN30-30GM50-E2-CV1  
NRN30-30GM50-E2-V1

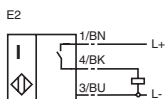


1.4

Inductive sensors with reduction factor 1



		NRB10-30GM50-E2-C-V1	NRB15-30GM50-E2-C-V1	NRB15-30GM50-E2-V1	NRN15-30GM50-E2-C-V1	NRN20-30GM50-E2-C-V1	NRN30-30GM50-E2-C-V1	NRN30-30GM50-E2-V1
Rated operating distance		10 mm	15 mm	15 mm	15 mm	20 mm	30 mm	30 mm
Installation	embeddable	◆	◆	◆				
	not embeddable				◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	PNP      Make function	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm		◆	◆	◆			
	0 ... 16.2 mm					◆		
	0 ... 24.3 mm						◆	◆
	0 ... 8.1 mm	◆						
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 20 Hz				◆	◆		
	0 ... 300 Hz						◆	◆
	0 ... 50 Hz	◆						
	0 ... 750 Hz		◆	◆				
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection		◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆
Constant magnetic field	> 200 mT		◆	◆				
Alternating magnetic field	> 200 mT	◆	◆	◆			◆	◆
	100 mT	◆			◆	◆		
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆
Housing material	brass, PTFE coated		◆				◆	
	brass, teflon coated	◆				◆		
	brass, nickel-plated			◆				◆
Sensing face	Crastin (PBTB)			◆				◆
	PPS				◆	◆		
	PTFE (Teflon)	◆						
	Ryton R4		◆				◆	
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆
Protection class	II		◆	◆			◆	◆



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

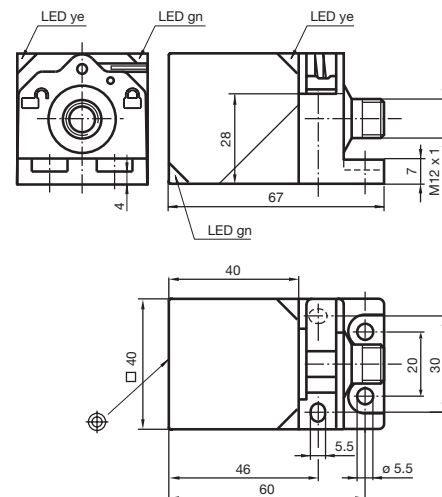




- Reduction factor = 1
- Quick mounting shutter
- 4-way LED indicator
- Resistant to welding  
NR...L3(K)-A2-C-V1

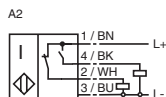
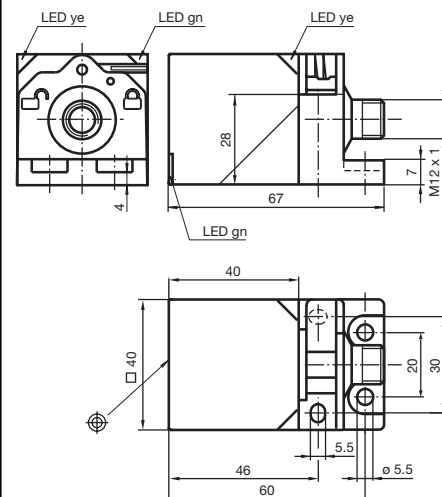


NRN35-L3-A2-C-V1  
NRN35-L3-A2-V1  
NRN40-L3K-A2-C-V1  
NRN40-L3K-A2-V1



		NRB20-L3-A2-C-V1	NRB20-L3-A2-V1	NRN35-L3-A2-C-V1	NRN35-L3-A2-V1	NRN40-L3K-A2-C-V1	NRN40-L3K-A2-V1
Rated operating distance	20 mm	◆	◆				
	35 mm			◆	◆		
	40 mm					◆	◆
Installation	embeddable	◆	◆				
	not embeddable			◆	◆	◆	◆
Output type	4-wire	◆	◆	◆	◆	◆	◆
Switching element function	PNP Antivalent	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	◆				
	0 ... 28.35 mm			◆	◆		
	0 ... 32.4 mm					◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤25 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤2.5 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Alternating magnetic field	160 mT	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
Housing material	GD-ZnAl4Cu1, coated mounting flange PA6-GF35	◆	◆	◆	◆	◆	◆
Sensing face	PA 6 Grivory GVN-35H	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Mass	180 g	◆	◆	◆	◆	◆	◆

NRB20-L3-A2-C-V1  
NRB20-L3-A2-V1



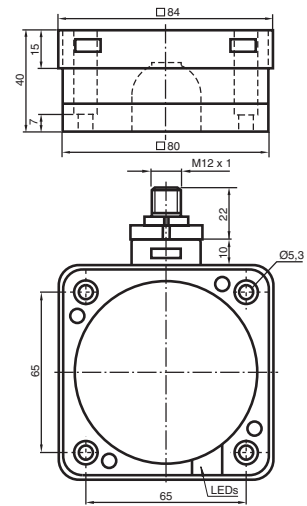
1.4

Inductive sensors with reduction factor 1

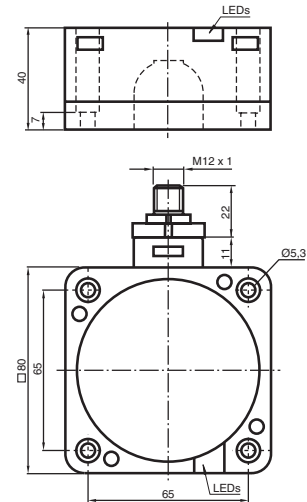


- Reduction factor = 1
- 75 mm not embeddable
- 50 mm embeddable
- Resistant to welding  
NR...-FP-A2-C-P3-V1
- Magnetic field resistant  
NR...-FP-A2-P3-V1

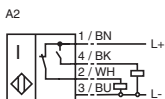
NRB50-FP-A2-C-P3-V1  
NRB50-FP-A2-P3-V1



NRN75-FP-A2-C-P3-V1  
NRN75-FP-A2-P3-V1



		NRB50-FP-A2-C-P3-V1	NRB50-FP-A2-P3-V1	NRN75-FP-A2-C-P3-V1	NRN75-FP-A2-P3-V1
Rated operating distance	50 mm	◆	◆		
	75 mm			◆	◆
Installation	embeddable	◆	◆		
	not embeddable			◆	◆
Output type	4-wire	◆	◆	◆	◆
Switching element function	PNP Anivalent	◆	◆	◆	◆
Assured operating distance	0 ... 40.5 mm	◆	◆		
	0 ... 55 mm			◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching frequency	0 ... 1 Hz	◆		◆	
	0 ... 50 Hz				◆
	0 ... 80 Hz		◆		◆
Reverse polarity protection		◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
Housing material	PBT/metal	◆	◆	◆	◆
Sensing face	PBT		◆		◆
	PBT, active surface Teflon coated	◆		◆	
Protection degree	IP68	◆	◆	◆	◆
Protection class	II	◆	◆	◆	◆



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

## "Metal faced" sensors

### Stainless steel body and sensing face

The stainless steel barrel and sensing face make "metal face" sensors our most rugged design to date. Extremely durable and reliable, they are protected against shock, vibration, contamination, abrasion, and high pressure wash downs.

"Metal Face" sensors are available in:

- cylindrical style M12
- cylindrical style M18
- cylindrical style M30.

### Markings

"Metal face" sensors are noted with an M at the 2nd position of the type identification (example: NMB5-...).

### Selectively operating sensors

These sensors distinguish between ferromagnetic and non-ferromagnetic metals. This is also a characteristic of "metal face" sensors. They are available in FE type for ferromagnetic and NFE type for non-ferromagnetic materials.

Some limit switch and -FP series sensors (see section 1.2, "Inductive sensors, standard, rectangular style") also have this capability. These sensors can be recognized by a "P" in the type identification immediately after the sensing range information.

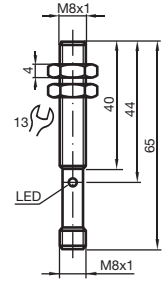
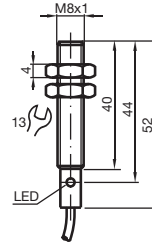




- Active surface metal
- 1.5 mm embeddable
- Resistant to welding  
NMB1,5-8GM50-E2-C-FE-V1

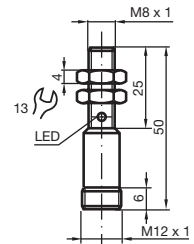
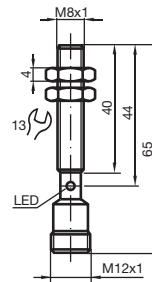
NMB1,5-8GM60-E2-FE  
NMB1,5-8GM60-E0-FE

NMB1,5-8GM65-E0-FE-V3  
NMB1,5-8GM65-E2-FE-V3



NMB1,5-8GM65-E0-FE-V1  
NMB1,5-8GM65-E2-FE-V1

NMB1,5-8GM50-E2-C-FE-V1



1.5

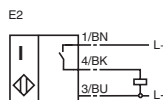
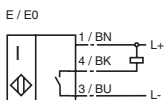
Inductive sensors with "Metal Face"



		NMB1,5-8GM50-E0-FE	NMB1,5-8GM50-E2-FE	NMB1,5-8GM50-E2-C-FE-V1	NMB1,5-8GM65-E0-FE-V3	NMB1,5-8GM65-E0-FE-V1	NMB1,5-8GM65-E2-FE-V1	NMB1,5-8GM65-E2-FE-V3
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆	◆	◆
Installation	embed. in mild steel	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆
	PNP	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{AI}$	0	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{Cu}$	0	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{V2A}$	0.6	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{S137}$	1	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 80 Hz	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, red	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
	-25 ... 75 °C (248 ... 348 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆
	V3-connector				◆			◆
	2 m, PUR cable							◆
Core cross-section	0.14 mm <sup>2</sup>	◆	◆					
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆
	stainless steel, PTFE coated			◆				
Sensing face	Stainless steel	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆

NMB1,5-8GM60-E0-FE  
NMB1,5-8GM65-E0-FE-V1  
NMB1,5-8GM65-E2-FE-V3

NMB1,5-8GM60-E2-C-FE-V1  
NMB1,5-8GM60-E2-FE  
NMB1,5-8GM65-E2-FE-V1  
NMB1,5-8GM65-E2-FE-V3



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

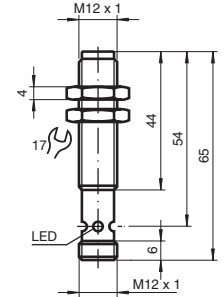
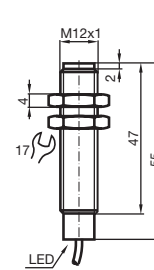


- Active surface metal
- 2 mm embeddable
- 2-wire DC  
NMB2-12GM75-Z0-FE-V1  
NMB2-12GM75-Z3-FE-V1
- Resistant to welding  
NMB2-12GM65-E2-C-FE-V1

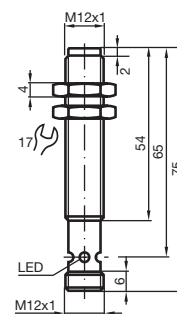


NMB2-12GM55-E0-NFE  
NMB2-12GM55-E0-FE  
NMB2-12GM55-E1-FE  
NMB2-12GM55-E1-NFE  
NMB2-12GM55-E2-FE

NMB2-12GM65-E2-CFE-V1  
NMB2-12GM65-E2-FE-V1  
NMB2-12GM65-E2-NFE-V1



NMB2-12GM75-Z0-FE-V1  
NMB2-12GM75-Z3-FE-V1



		NMB2-12GM55-E0-FE	NMB2-12GM55-E0-NFE	NMB2-12GM55-E1-FE	NMB2-12GM55-E1-NFE	NMB2-12GM55-E2-FE	NMB2-12GM65-E2-FE-V1	NMB2-12GM65-E2-NFE-V1	NMB2-12GM75-Z0-FE-V1	NMB2-12GM75-Z3-FE-V1
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP normally open	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP normally-open	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{AI}$	0	0	1	0	1	0	0	1	0	0
Reduction factor $r_{Cu}$	0	0	1.1	0	1.1	0	0	1.1	0	0
Reduction factor $r_{V2A}$	approx. 0.8	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{SB7}$	0	1	0	1	0	1	1	0	1	1
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	6 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5.5 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	≤ 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	dual-LED, yellow/green	◆	◆	◆	◆	◆	◆	◆	◆	◆
	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Core cross-section	0.34 mm <sup>2</sup>	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆

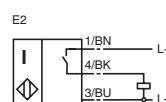
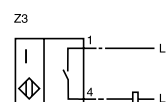
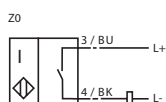
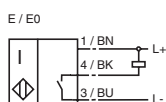
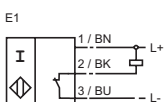
NMB2-12GM55-E1-FE  
NMB2-12GM55-E1-NFE

NMB2-12GM55-E0-NFE  
NMB2-12GM55-E0-FE

NMB2-12GM75-Z0-FE-V1

NMB2-12GM75-Z3-FE-V1

NMB2-12GM65-E2-C-FE-V1  
NMB2-12GM65-E2-FE  
NMB2-12GM65-E2-FE-V1  
NMB2-12GM65-E2-NFE-V1



Date of edition: 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

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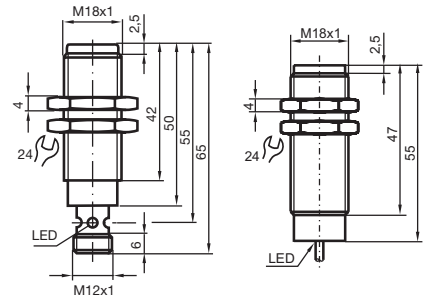
Pepperl+Fuchs Group • Tel.: Germany +49 621 776-0 • USA +1 330 4253555 • Singapore +65 67799091 • Internet <http://www.pepperl-fuchs.com>



- Active surface metal
- 5 mm embeddable
- Resistant to welding  
NMB5-18GM65-E0-C-FE-V1
- 2-wire DC  
NMB5-18GM65-Z0...

NMB5-18GM65-E2-FE-V1  
NMB5-18GM65-E2-NFE-V1  
NMB5-18GM65-Z0-FE-V1  
NMB5-18GM65-Z0-NFE-V1  
NMB5-18GM65-E0-CFE-V1

NMB5-18GM65-E0-FE  
NMB5-18GM65-E2-FE  
NMB5-18GM65-E2-NFE  
NMB5-18GM65-E1-NFE



1.5

Inductive sensors with "Metal Face"



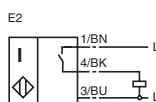
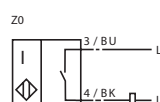
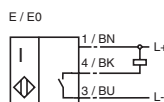
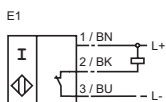
		NMB5-18GM55-E0-FE	NMB5-18GM55-E1-NFE	NMB5-18GM55-E2-FE	NMB5-18GM55-E2-NFE	NMB5-18GM65-E0-C-FE-V1	NMB5-18GM65-E2-FE-V1	NMB5-18GM65-E2-NFE-V1	NMB5-18GM65-Z0-FE-V1	NMB5-18GM65-Z0-NFE-V1
Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Break function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{AI}$		0	1	0	1	0	0	1	0	1
Reduction factor $r_{Cu}$		0	1.1	0	1.1	0	0	1.1	0	1.1
Reduction factor $r_{V2A}$	0	◆	◆	◆	◆	◆	◆	◆	◆	◆
	approx. 0.8	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{S137}$		1	0	◆	◆	◆	◆	◆	◆	0
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	6 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 2 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	no	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5.5 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 5.5 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
	-40 ... 70 °C (233 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	2 m, PUR cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
	nicht uebersetzt!	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP68	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆

NMB5-18GM55-E1-NFE

NMB5-18GM65-E0-FE  
NMB5-18GM65-E0-C-FE-V1

NMB5-18GM65-Z0-FE-V1  
NMB5-18GM65-Z0-NFE-V1

NMB5-18GM65-E2-FE-V1  
NMB5-18GM65-E2-NFE-V1  
NMB5-18GM65-E2-FE  
NMB5-18GM65-E2-NFE



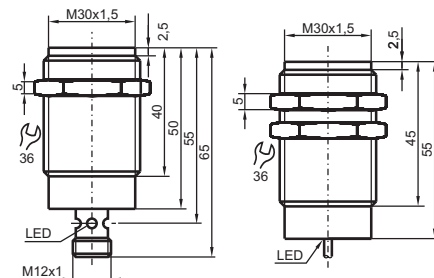
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Sensing range 8 mm
- 2-wire DC  
NMB8-30GM65-Z0-FE-V1  
NMB8-30GM65-Z0-NFE-V1



NMB8-30GM65-Z0-FE-V1  
NMB8-30GM65-Z0-NFE-V1  
NMB8-30GM65-E0-FE-V1  
NMB8-30GM65-E2-FE-V1  
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NMB8-30GM65-E0-FE  
NMB8-30GM65-E2-FE

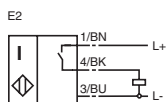
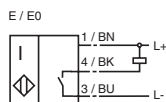
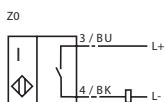


		NMB8-30GM65-Z0-FE-V1	NMB8-30GM65-Z0-NFE-V1	NMB8-30GM65-E0-FE	NMB8-30GM65-E2-FE	NMB8-30GM65-E0-FE-V1	NMB8-30GM65-E2-FE-V1	NMB8-30GM65-E2-NFE-V1
Rated operating distance	8 mm	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆
	3-wire			◆	◆	◆	◆	◆
Switching element function	DC Make function	◆	◆					
	NPN Make function			◆	◆	◆	◆	◆
	PNP Make function					◆	◆	◆
Assured operating distance	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{AI}$		0	1	0	0	0	0	1
Reduction factor $r_{Cu}$		0	1.1	0	0	0	0	1.1
Reduction factor $r_{V2A}$	approx. 0.8	◆	◆	◆	◆	◆	◆	◆
	0							
Reduction factor $r_{S137}$		1	0	1	1	1	1	0
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V			◆	◆	◆	◆	◆
	10 ... 30 V DC			◆	◆	◆	◆	◆
	6 ... 30 V	◆	◆					
No-load supply current	≤ 10 mA			◆	◆	◆	◆	◆
Reverse polarity protection				◆	◆	◆	◆	◆
Short-circuit protection				◆	◆	◆	◆	◆
Voltage drop	≤ 2 V			◆	◆	◆	◆	◆
	≤ 5.5 V	◆	◆					
Operating current	≤ 200 mA			◆	◆	◆	◆	◆
	0 ... 200 mA					◆	◆	
	100 mA	◆	◆					◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
	-40 ... 70 °C (233 ... 343 K)	◆	◆					
Connection type	V1 connector	◆	◆			◆	◆	◆
	2 m, PUR cable					◆	◆	
Core cross-section	0.5 mm <sup>2</sup>			◆	◆			
Housing material	Edelstahl	◆	◆	◆	◆	◆	◆	◆
Sensing face	Edelstahl	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP69K	◆	◆	◆	◆	◆	◆	◆

NMB8-30GM65-Z0-FE-V1  
NMB8-30GM65-Z0-NFE-V1

NMB8-30GM65-E0-FE  
NMB8-30GM65-E2-FE

NMB8-30GM65-E2-FE  
NMB8-30GM65-E2-FE-V1  
NMB8-30GM65-E2-NFE-V1



Date of edition 20.08-03-11

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

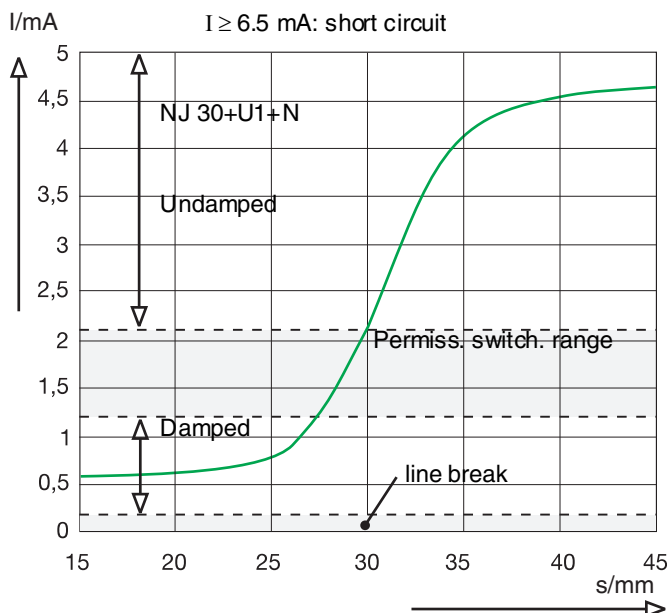
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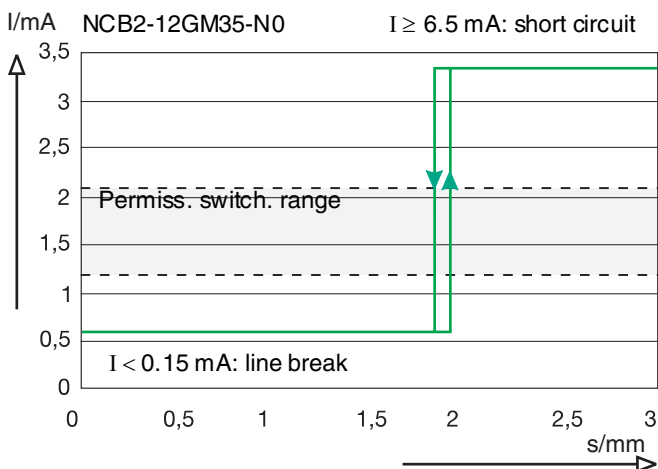
## Inductive sensors for explosive environments

### NAMUR interface

NAMUR\* proximity sensors traditionally have a constant current path characteristic.



Nowadays, it is possible to obtain binary switching in proximity sensors (simultaneous changes in the switch status of sensor and amplifier) by using the latest technology while maintaining the standard voltage and current values.



\*NAMUR: Normenarbeitsgemeinschaft für Mess- und Regelungsstechnik der chemischen Industrie (Standards Working Group for Control and Instrumentation in the Chemical Industry).

### Intrinsic safety

The characteristic voltage and current values are kept at such a low level that the NAMUR\* proximity sensor can be used in potentially explosive environments ("intrinsic" type of protection). The series is identified by the letter N at the end of the model number, sometimes in combination with a number.

The power limiting function is implemented in the respective apparatus. This means that the circuit containing a NAMUR proximity sensor is only intrinsically safe if it is supplied by a suitable isolation amplifier. The conformity of the electrical characteristics of proximity sensors and isolation amplifiers is ascertained by an "intrinsic safety test". The cable inductivity and capacitance are included in this test as they constitute energy stores.

For more information on explosion protection and intrinsic safety, please refer to our "Explosion Protection" manual.

### Sensors with safety function (see section 1.7)

In principle these proximity sensors correspond to the N types but with a special function: in the event of a fault in the sensor, the control interface, or the common connection, the output of the control interface automatically switches to the safe "Off" state. The entire system comprising sensor and control interface is approved by TÜV in accordance with DIN VDE 0660 Part 209 (Non-Contact Position Switches for Safety Functions). They are also classified under AK 5 (for cyclic switching operations) or AK 4 according to DIN V 19250 or 19251 (TÜV certificate available). These sensors conform to DIN EN 60947-5-3.

They are identified by either SN or S1N at the end of the model number. The safety function is only guaranteed when used with suitable control interfaces (please refer to our Intrinsic Safety Engineers Guide).

The note in the data sheets "only for Ne metals" for types with NO function means that this series only functions with nonferrous metals (e.g. aluminum/brass).



## 1. What is ATEX? – atmosphere explosible!

The founding treaty of the European Economic Community includes articles 95 and 137, which form the basis for two EU directives:

Directive 94/9/EC (also called ATEX 100a) dated 03/23/94 for the harmonization of legal regulations of member states for devices and protection systems intended for use in potentially explosive environments.

Applicable from 01/03/1996.

Directive 1999/92/EC dated 12/16/99 about minimum requirements for improving the health and safety of workers at risk from potentially explosive atmospheres.

Applicable since 1/28/00.

This Directive does not apply to the manufacturers of explosion-protected devices and is therefore not relevant to the catalog.

## 2. What does Directive 94/9/EC stipulate?

- Definition of device groups I and II.
- Definition of device categories (classification of devices according to hazardous areas)
- Conformity evaluation procedure (which manufacturers are allowed to produce devices in which category)
- Transitional period until 6/30/03
- As of 7/01/03, only Directive 94/9/EC will apply!

## 3. What consequences does Directive 94/9/EC have for the legal situation?

### Previous situation:

European-wide constructional requirements (type of protection)

for operating material.

National installation requirements.

### New situation:

**No** national variations!

This means:

- Zones 0, 1, 2 for areas at risk from gas explosions.
- Zones 20, 21, 22 for areas at risk from dust explosions.
- No zone classification for areas used for medical purposes.
- No national requirements for Zone 0 devices.
- Uniform European-wide installation guidelines.

## 4. New European standards:

### EN 1127-1

Basic concepts and methodology regarding explosion protection

(Primary explosion protection, zone definition)

### EN 60079-10:

Classification of hazardous area  
(dimensioning of Zones 0, 1, 2)

### EN 60079-14:

Electrical installations in explosive gas atmospheres

### ATTENTION:

This This means that there is a European-wide law governing explosion protection for gases, fumes, and vapors.

## 5. National regulations

All relevant German regulations have been accordingly amended and adjusted in view of the introduction of Directive 94/9/EC on 03/01/96.

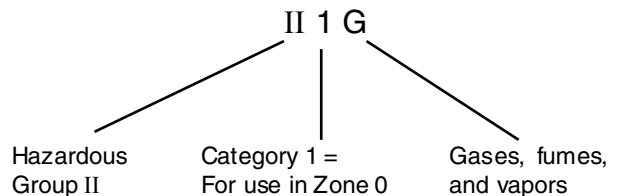
- Regulation 11. Equipment Safety Law - Explosion Protection Regulation
- ExV '96
- EX-RL
- VDE 0165 (DIN EN 60079-14)

## 6. Device requirements according to Directive 94/9/EC

The requirements concerning equipment design and construction ensure a distinct functional classification based on the following zones:

Category	Zone
1	0
2	1
3	2

If the device meets these requirements, it is marked accordingly and can then be used in the respective zone (less hazardous)



## 7. Conformity evaluation

The standard required of the manufacturer's quality assurance system is determined according to the equipment groups and categories (for which the devices are certified), the safety requirements of the equipment, and the corresponding zone certification. The manufacturer must undergo certification by an approved authority (e. g. PTB). The PTB declares that Pepperl+Fuchs maintains a quality assurance system for its production which conforms to the requirements of Directive 94/9/EC, Appendix IV. On the basis of this declaration, Pepperl+Fuchs is permitted to sell explosion protected equipment effective July 1, 2003. The production QA system covers manufacturing, final acceptance, and inspection.

## 8. What are the practical effects of Directive 94/9/EC?

3/01/96 to 6/30/03:

- Certificates ("D" certificates) will continue to be issued according to the current procedure.
- Directive 94/9/EC may be applied.
- Installations may be put into operation with devices having either old or new certificates.

As of 7/01/03:

- Existing installations may continue to be operated with devices having old certificates.
- New installations may only be put into operation and run with devices having new certificates.
- Only devices with certification according to Directive 94/9/EC may be sold.

## 9. What does Directive 94/9/EC mean for the Pepperl+Fuchs product range?





- The law provides that from 7/01/03 on, only devices having new certificates may be sold.
- Pepperl+Fuchs has had all newly approved devices certified according to the conformity assessment procedure and is adapting existing devices (with "D certificates") to Directive 94/9/EC.

**This means:**

- Pepperl+Fuchs offers a new, modern range of products.
- By law we may only supply devices with ATEX certificate after 7/01/03.
- The modified technical data must be taken into consideration when replacing old devices with new ones according to Directive 94/9/EC.
- In the case of some very old devices, it may not be possible to obtain certification according to Directive 94/9/EC.

## 10. ATEX approved products by Pepperl+Fuchs

- Slot style sensors SJ and SC:  
PTB 99 ATEX 2219 X
- Valve position sensor NCN.-...-N4 and PL.-F25.-N4...:  
TÜV 99 ATEX 1479 X
- Ring style sensors RJ... and RC...:  
PTB 99 ATEX 2128 X
- Cylindrical sensors PTB 00 ATEX 2048X
- Rectangular style sensors PTB 00 ATEX 2032X
- Sensors in control safety PTB 00ATEX 2049X

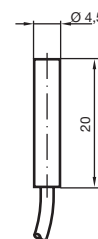
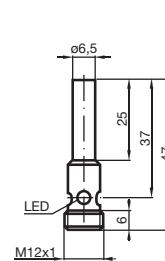
<b>Physikalisch-Technische Bundesanstalt</b>		<b>PTB</b>
Braunschweig und Berlin		
		
<b>(1) Production Quality Assessment Notification</b>		
(Translation)		
(2)	Equipment or protective systems or components intended for use in potentially explosive atmospheres - Directive 94/9/EC	
(3)	Notification Number: <b>PTB 97 ATEX Q058-1</b>	
(4)	Product group(s): Electronic circuit modules, Power supplies, Sensors each in the decisive type of protection „Intrinsic Safety“ and „Encapsulation“ Power supplies and sensors in the decisive type of protection „Flameproof Enclosure“	
A list of the EC-Type Examination Certificates covered by this notification is held by the notified body.		
(5)	Applicant: Pepperl + Fuchs GmbH Königsberger Allee 87, D-66307 Mannheim	
(6)	Actual manufacturer: Pepperl + Fuchs GmbH Königsberger Allee 87, D-66307 Mannheim	
(7)	The Physikalisch-Technische Bundesanstalt (PTB), notified body No. 0102 for Annex IV in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994 notifies to the applicant that the actual manufacturer has a production quality system which complies to the Annex IV of the Directive.	
(8)	This notification is based on the confidential audit report No. 0009014, issued the 2000-07-21. This notification is valid until 2003-07-23 and can be withdrawn if the actual manufacturer no longer satisfies to the requirements of Annex IV.	
Results of periodical reassessment of the quality system are a part of this notification.		
(9)	According to Article 10 (1) of the Directive 94/9/EC the CE-Marking shall be followed by the identification number 0102 of PTB as the notified body which is involved in the production control stage.	
Zertifizierungsstelle Explosionsschutz By order:		Braunschweig, August 02, 2000
 Dr.-Ing. U. Johannesmeier Regelungsdirektor		
		Sheet 1/1
<small>Notifications without signature and official stamp shall not be valid. The notification may be consulted only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail. Physikalisch-Technische Bundesanstalt, Bundesallee 110, D-38116 Braunschweig</small>		



- **Comfort series**
- **0.8 mm embeddable**
- **1.5 mm embeddable**
- **Usable up to SIL2 acc. to IEC 61508**  
 NJ0,8-4,5-N  
 NJ0,8-5GM-N  
 NJ1,5-6,5-N

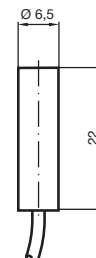
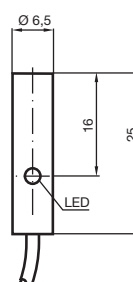
NCB1,5-6,5M25-N0-V1

NJ0,8-45-N



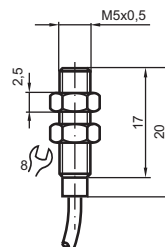
NCB1,5-6,5M25-N0

NJ1,5-6,5-N

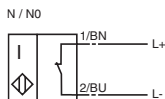


		NJ0,8-4,5-N	NJ0,8-5GM-N	NCB1,5-6,5M25-N0	NCB1,5-6,5M25-N0-V1	NJ1,5-6,5-N
Rated operating distance	0.8 mm	◆	◆			
	1.5 mm			◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆
Assured operating distance	0 ... 0.65 mm	◆	◆			
	0 ... 1.215 mm			◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆			
Current consumption						
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz			◆	◆	
	0 ... 5000 Hz	◆	◆			◆
Reverse polarity protection	protected against reverse polarity			◆	◆	
Short-circuit protection	yes			◆	◆	
Indication of the switching state	LED, yellow			◆		
	Multihole-LED, yellow			◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆
Connection type	V1-connector				◆	
	2 m, PVC cable	◆	◆	◆		◆
Core cross-section	0.14 mm <sup>2</sup>	◆	◆	◆		◆
Housing material	Stainless steel	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	1G; 2G; 1D		◆			◆
	2G	◆		◆	◆	

NJ0,8-5GMN



Date of edition: 20.08.04-04



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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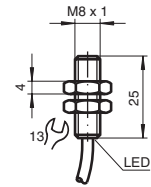
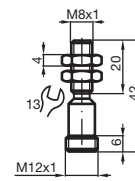
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- Comfort series
- 1.5 mm embeddable
- Usable up to SIL2 acc. to IEC 61508  
 NJ1,5-8GM-N  
 NJ1,5-8GM-N-V1

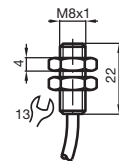
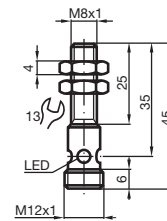
NJ1,5-8GM-N-V1

NCB1,5-8GM25-N0



NCB1,5-8GM25-N0-V1

NJ1,5-8GM-N

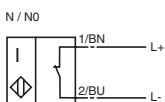


1.6

Inductive sensors for Ex environments (NAMUR)



		NJ1,5-8GM-N	NJ1,5-8GM-N-V1	NCB1,5-8GM25-N0	NCB1,5-8GM25-N0-V1
Rated operating distance	1.5 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Current consumption					
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz			◆	◆
	0 ... 5000 Hz	◆	◆		
Reverse polarity protection	protected against reverse polarity			◆	◆
Short-circuit protection	yes			◆	◆
Indication of the switching state	LED, yellow			◆	◆
	Multihole-LED, yellow				◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection type	V1-connector		◆		◆
	2 m, PVC cable	◆	◆	◆	◆
Core cross-section	0.14 mm <sup>2</sup>	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	1G; 2G	◆			
	1G; 2G; 1D				◆
	1G; 2G; 3G; 1D; 3D			◆	
	2G		◆		



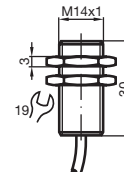
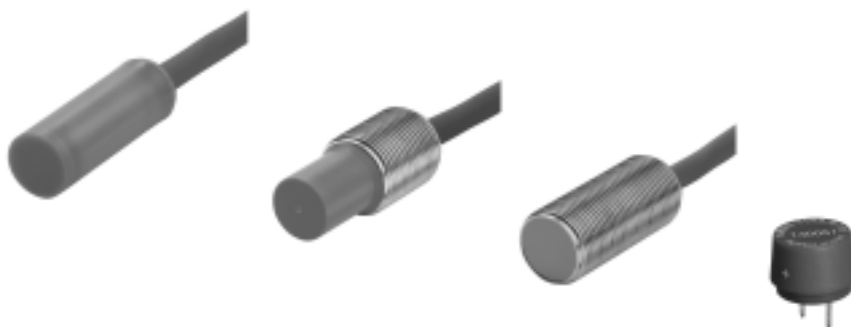
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- Comfort series
  - 2 mm embeddable
  - 5 mm not embeddable
  - Usable up to SIL2 acc. to IEC 61508
- NJ2-11-N  
NJ2-11-N-G  
NJ5-11-N-G

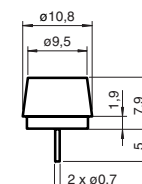
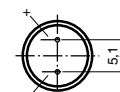
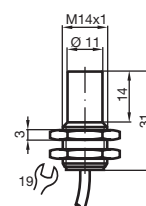
NJ2-11-N

NJ2-11-N-G



NJ5-11-N-G

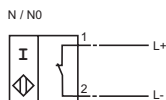
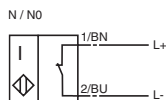
NBN5-11K8-N-V8



		NJ2-11-N	NJ2-11-N-G	NJ5-11-N	NJ5-11-N-G	NBN5-11K8-N-V8
Rated operating distance	2 mm	◆	◆			
Installation	5 mm embeddable	◆	◆			
	not embeddable			◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆			
	0 ... 4.05 mm			◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆	◆
Operating voltage	5 ... 15 V					◆
Current consumption	Measuring plate not detected					≥ 2.7 mA
	Measuring plate detected					≥ 3 mA
Switching frequency	0 ... 2000 Hz					≤ 1 mA
	0 ... 3000 Hz					≤ 1.8 mA
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	
	-25 ... 70 °C (248 ... 343 K)					◆
Connection type	soldering pins					◆
	2 m, PVC cable	◆	◆	◆	◆	
Core cross-section	0.34 mm <sup>2</sup>	◆	◆	◆	◆	
Housing material	Stainless steel		◆		◆	
	PA					◆
Sensing face	PVDF	◆	◆	◆	◆	
	PVDF					◆
Protection degree	IP67					◆
	IP68	◆	◆	◆	◆	
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	
Category	1G; 2G; 1D		◆			
	1G; 2G; 3G; 1D; 3D		◆			
	2G			◆		
	2G; 1D				◆	

NJ2-11-N  
NJ2-11-N-G  
NJ5-11-N  
NJ5-11-N-G

NBN5-11K8-N-V8



Date of edition: 2008-03-11

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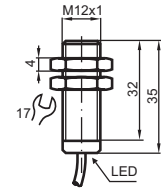
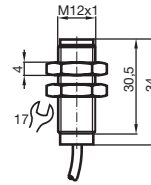
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CE  
0102

- Usable up to SIL2 acc. to IEC 61508
- Comfort series
- 2 mm embeddable
- 4 mm not embeddable

NJ2-12GK-N  
NJ4-12GK-N

NCB2-12GK35-N0  
NCN4-12GK35-N0

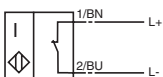


1.6

Inductive sensors for Ex environments (NAMUR)

		NJ2-12GK-N	NCB2-12GK35-N0	NJ4-12GK-N	NCN4-12GK35-N0
Rated operating distance	2 mm	◆	◆		
Installation	4 mm embeddable	◆	◆	◆	◆
	not embeddable			◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆		
	0 ... 3.24 mm			◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Current consumption	Measuring plate not detected	≥ 3 mA	◆	◆	◆
	Measuring plate detected	≤ 1 mA	◆	◆	◆
Switching frequency	0 ... 1000 Hz		◆		
	0 ... 1500 Hz			◆	
	0 ... 2000 Hz	◆			
	0 ... 800 Hz				◆
Reverse polarity protection	protected against reverse polarity		◆		◆
Short-circuit protection	yes		◆		◆
Indication of the switching state	all direction LED, yellow		◆		◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Core cross-section	0,34 mm <sup>2</sup>	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
	IP68	◆		◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	2G; 1D	◆	◆	◆	◆

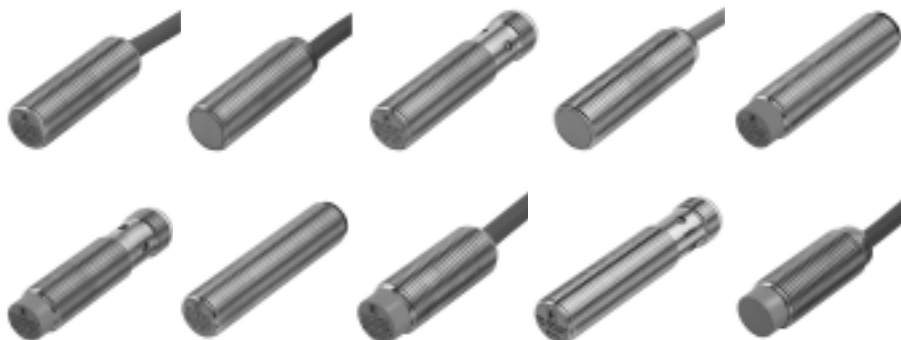
N / NO



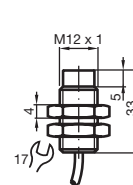
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



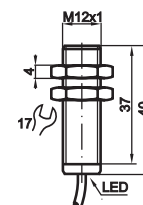
- Usable up to SIL2 acc. to IEC 61508
- Comfort series
- 2 mm embeddable
- 4 mm not embeddable
- 4 mm embeddable



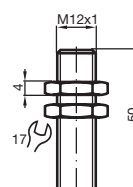
NJ4-12GM-N



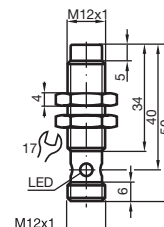
NCB4-12GM40-ND



NJ2-12GM-N-V1

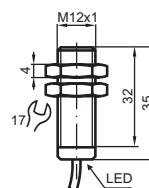


NCN4-12GM35-ND-V1

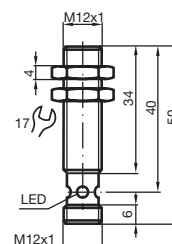


		NJ2-12GM-N	NJ2-12GM-N-V1	NCB2-12GM35-N0	NCB2-12GM35-N0-V1	NJ4-12GM-N	NJ4-12GM-N-V1	NCB4-12GM40-N0	NCB4-12GM40-N0-V1	NCN4-12GM35-N0	NCN4-12GM35-N0-V1
Rated operating distance	2 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	4 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Nominal voltage	0 ... 3.24 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Operating voltage	5 ... 25 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Current consumption	Measuring plate not detected	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≥ 2.2 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≥ 3 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Measuring plate detected	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 1 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 2000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 800 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Core cross-section	0.34 mm <sup>2</sup>	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Category	1G; 2G	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 1D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 3G; 1D; 3D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 3G; 3D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

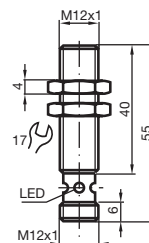
NCB2-12GM35-ND



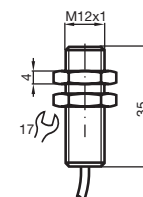
NCB2-12GM35-ND-V1



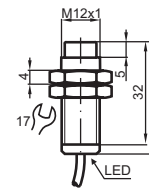
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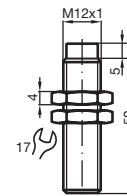
NJ2-12GM-N



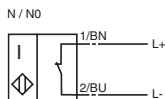
NCN4-12GM35-ND



NJ4-12GM-N-V1



Date of edition 2008-03-11



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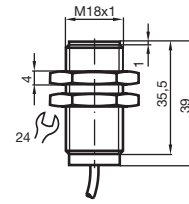
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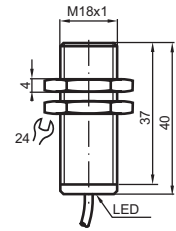


- **Comfort series**
- **5 mm embeddable**
- **8 mm not embeddable**
- **Usable up to SIL2 acc. to IEC 61508**  
 NJ5-18GK-N  
 NJ8-18GK-N

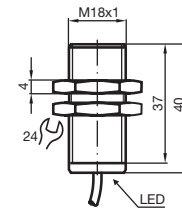
NJ5-18GK-N  
NJ8-18GK-N



NCN8-18GK40-ND



NCB5-18GK40-ND



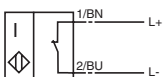
1.6

Inductive sensors for Ex environments (NAMUR)



		NJ5-18GK-N	NCB5-18GK40-ND	NJ8-18GK-N	NCN8-18GK40-ND
Rated operating distance	5 mm	◆	◆		
Installation	8 mm embeddable	◆	◆	◆	◆
	not embeddable				
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	◆		
	0 ... 6.48 mm			◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Current consumption	Measuring plate not detected	≥ 3 mA	◆	◆	◆
	Measuring plate detected	≤ 1 mA	◆	◆	◆
Switching frequency	0 ... 200 Hz			◆	
	0 ... 300 Hz				◆
	0 ... 400 Hz		◆		
	0 ... 500 Hz	◆			
Reverse polarity protection	protected against reverse polarity		◆		◆
Short-circuit protection	yes		◆		◆
Indication of the switching state	all direction LED, yellow		◆		◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Core cross-section	0.75 mm <sup>2</sup>	◆	◆	◆	◆
Housing material	PBT		◆		◆
	PBT/PPS	◆		◆	
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67		◆		◆
	IP68	◆		◆	
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	2G; 1D	◆	◆	◆	◆

N / NO

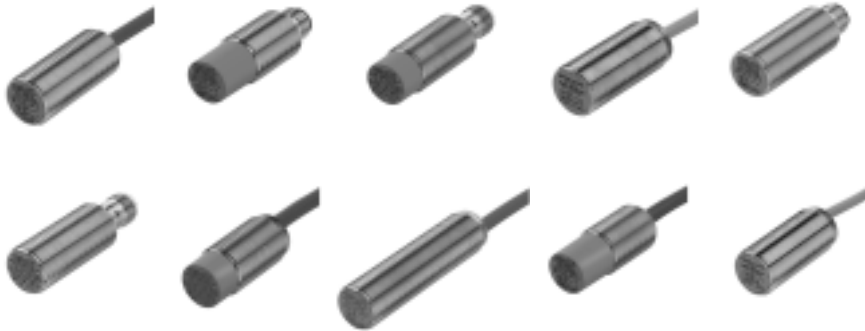


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

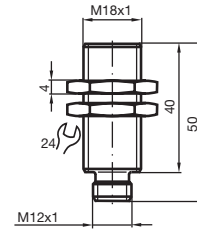




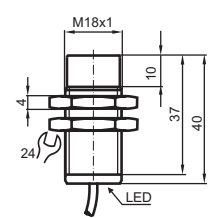
- Comfort series
- 5 mm embeddable
- 8 mm embeddable
- 8 mm not embeddable
- Usable up to SIL2 acc. to IEC 61508



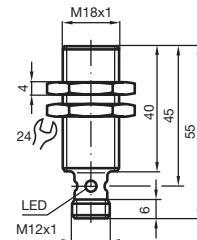
NJ5-18GM-N-V1



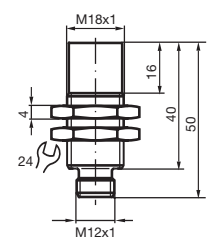
NCN8-18GM40-ND



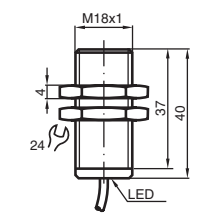
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NCB8-18GM40-ND-V1



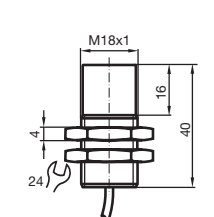
NJ8-18GM-N-V1



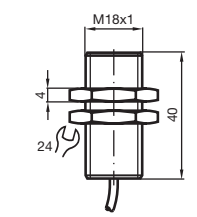
NCB8-18GM40-ND



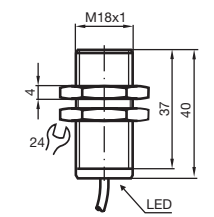
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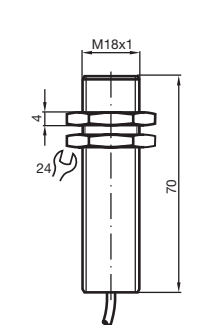
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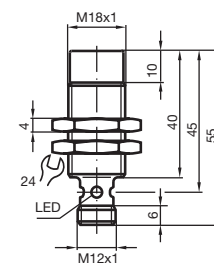
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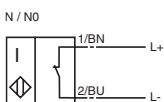
NCB5-18GM70-ND



NCN8-18GM40-ND-V1



		NJ5-18GM-N	NJ5-18GM-N-V1	NCB5-18GM40-ND	NCB5-18GM40-ND-V1	NCB5-18GM70-ND	NJ8-18GM-N	NJ8-18GM-N-V1	NCB8-18GM40-ND	NCB8-18GM40-ND-V1	NCN8-18GM40-ND	NCN8-18GM40-ND-V1
Rated operating distance	5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Current consumption		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Measuring plate not detected	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≥ 2.2 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≥ 3 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Measuring plate detected	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	≤ 1 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 1500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 200 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 300 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 400 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Core cross-section	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	-	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Category	1G; 2G	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 1D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 3G; 1D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 3G; 1D; 3D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 3G; 3D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆



Date of edition 2008-03-11

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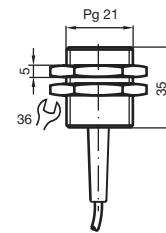
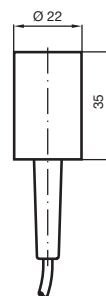
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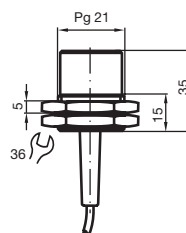
- Usable up to SIL2 acc. to IEC 61508  
NJ6-22-N  
NJ6-22-N-G  
NJ10-22-N-G
- Comfort series
- 6 mm embeddable
- 10 mm not embeddable

NJ10-22-N

NJ6-22-N-G



NJ10-22-N-G

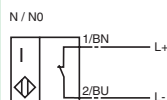


1.6

Inductive sensors for Ex environments (NAMUR)



		NJ6-22-N	NJ6-22-N-G	NJ10-22-N	NJ10-22-N-G
Rated operating distance	10 mm			◆	◆
	6 mm	◆	◆		
Installation	embeddable	◆	◆		
	not embeddable			◆	◆
Output type	2-wire			◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	◆		
	0 ... 8.1 mm			◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Current consumption					
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Core cross-section	0.75 mm <sup>2</sup>	◆	◆	◆	◆
Housing material	Stainless steel		◆		
	PBT	◆		◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	2G		◆	◆	◆
	2G; 3G; 3D	◆			

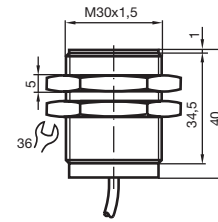


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

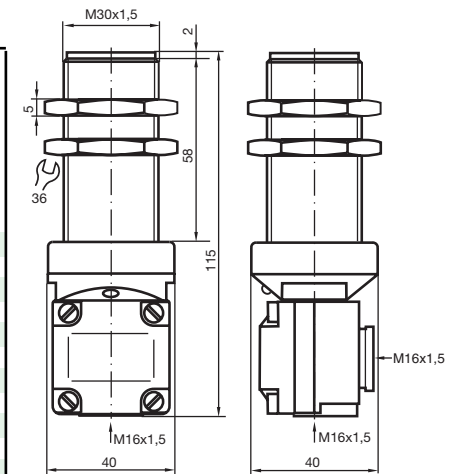


- **Comfort series**
- **10 mm embeddable / 15 mm not embeddable**
- **Usable up to SIL2 acc. to IEC 61508**  
 NJ10-30GK-N  
 NJ10-30GKK-N  
 NJ15-30GK-N  
 NJ15-30GKK-N

NJ10-30GK-N  
NJ15-30GK-N

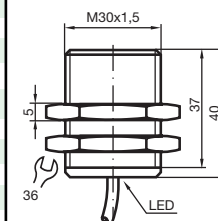


NJ10-30GKK-N  
NJ15-30GKK-N

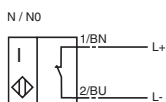


		NJ10-30GK-N	NJ10-30GKK-N	NCB10-30GK40-NO	NJ15-30GK-N	NJ15-30GKK-N	NCN15-30GK40-NO
Rated operating distance	10 mm	◆	◆	◆			
	15 mm				◆	◆	◆
Installation	embeddable	◆	◆	◆			
	not embeddable				◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm				◆	◆	◆
	0 ... 8.1 mm						◆
Nominal voltage	8 V	◆	◆	◆	◆	◆	◆
Current consumption							
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz				◆	◆	
	0 ... 300 Hz						◆
	0 ... 400 Hz						◆
Reverse polarity protection	protected against reverse polarity				◆	◆	◆
Short-circuit protection	yes				◆	◆	◆
Indication of the switching state	all direction LED, yellow				◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment				◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆
Core cross-section	up to 2.5 mm <sup>2</sup>				◆	◆	◆
	0.75 mm <sup>2</sup>	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
	IP68	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆
Category	2G				◆	◆	◆
	2G; 1D	◆	◆	◆	◆	◆	◆

NCB10-30GK40-NO



Date of edition 2008-03-11



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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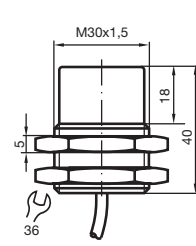
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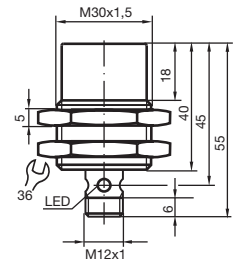


- **Comfort series**
  - **10 mm embeddable / 15 mm not embeddable**
  - **Usable up to SIL2 acc. to IEC 61508**
- NJ10-30GM-N  
 NJ10-30GM-N-V1  
 NJ15-30GM-N  
 NCB15-30GM40-NO  
 NCB15-30GM40-NO-V1

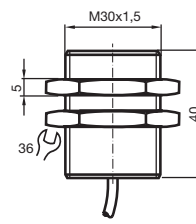
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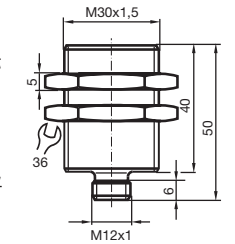
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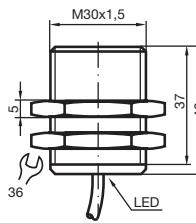
NJ10-30GM-N



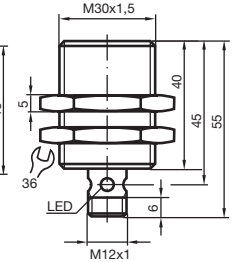
NJ10-30GM-NV1



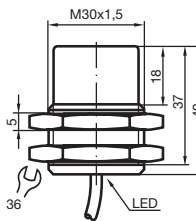
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NCB15-30GM40-NO



NCB10-30GM40-NO-V1  
NCB15-30GM40-NO-V1



NCN15-30GM40-NO

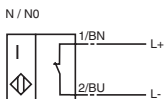


1.6

Inductive sensors for Ex environments (NAMUR)



		NJ10-30GM-N	NJ10-30GM-N-V1	NCB10-30GM40-NO	NCB10-30GM40-NO-V1	NJ15-30GM-N	NCB15-30GM40-NO	NCB15-30GM40-NO-V1	NCN15-30GM40-NO	NCN15-30GM40-NO-V1
Rated operating distance	10 mm	◆	◆	◆	◆					
	15 mm					◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆					
	not embeddable								◆	◆
	quasi embedd.									
Output type	2-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 8.1 mm					◆	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Current consumption	Measuring plate not detected								◆	◆
									≥ 22 mA	≥ 3 mA
									◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Switching frequency	0 ... 100 Hz							◆	◆
	0 ... 300 Hz	◆	◆							
	0 ... 450 Hz								◆	◆
	0 ... 500 Hz								◆	◆
	0 ... 650 Hz								◆	◆
Reverse polarity protection	protected against reverse polarity			◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	yes			◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow			◆	◆				◆	◆
	Multihole-LED, yellow								◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector			◆	◆				◆	◆
Core cross-section	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	-									
Housing material	0.75 mm <sup>2</sup>	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP65			◆	◆					
	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆	◆	◆
Category	1G; 2G	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1G; 2G; 1D									
	1G; 2G; 3G; 1D								◆	◆
	1G; 2G; 3G; 1D; 3D								◆	◆
	1G; 2G; 3G; 3D								◆	◆



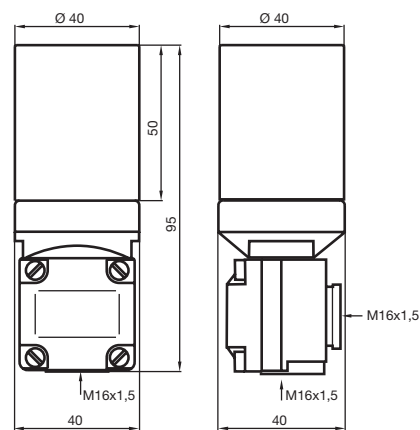
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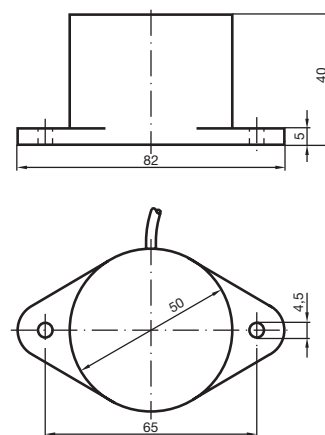
- **Comfort series**
- **25 mm not embeddable**  
NJ25-50-N
- **20 mm not embeddable**  
NJ20-40-N



NJ20-40-N



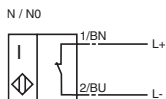
NJ25-50-N



		NJ20-40-N	NJ25-50-N
Rated operating distance	20 mm	◆	
	25 mm		◆
Installation	not embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	
	0 ... 20.25 mm		◆
Nominal voltage	8 V	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Switching frequency	0 ... 100 Hz	◆	
	0 ... 250 Hz		◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	terminal compartment	◆	◆
	2 m, PVC cable		◆
Core cross-section	up to 2.5 mm <sup>2</sup>	◆	
	0.75 mm <sup>2</sup>		◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	2G	◆	◆

1.6 Inductive sensors for Ex environments (NAMUR)

Date of edition: 2008-03-11



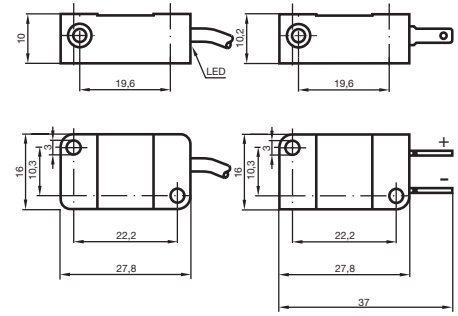
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



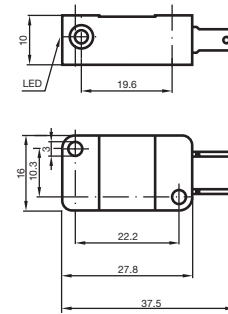
- Usable up to SIL2 acc. to IEC 61508
- Comfort series
- 2 mm embeddable
- 4 mm not embeddable

NCB2-V3-N0  
NCN4-V3-N0

NCN4-V3-N0-V5



NCB2-V3-N0-V5

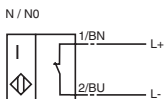


Inductive sensors for Ex environments (NAMUR)

1.6



		N CB2-V3-N0	NCB2-V3-N0-V5	NCN4-V3-N0	NCN4-V3-N0-V5
Rated operating distance	2 mm	◆	◆		
Installation	4 mm embeddable	◆	◆		
	not embeddable			◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆		
	0 ... 3.24 mm			◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Current consumption	Measuring plate not detected	≥ 3 mA	◆	◆	◆
	Measuring plate detected	≤ 1 mA	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection type	Faston 4.8 mm		◆		◆
	110 mm, cable PVC	◆		◆	
Core cross-section	-		◆		◆
	0.14 mm <sup>2</sup>	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆	◆



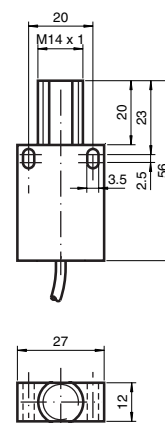
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



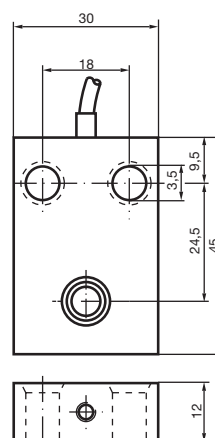
- Comfort series
- 0.8 mm embeddable
- 1.5 mm not embeddable
- 2,5 mm not embeddable
- 6 mm embeddable
- 10 mm not embeddable



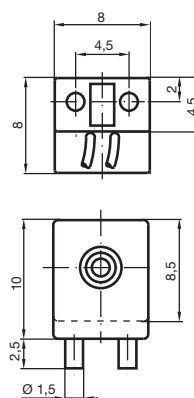
NJ2,5-F-N



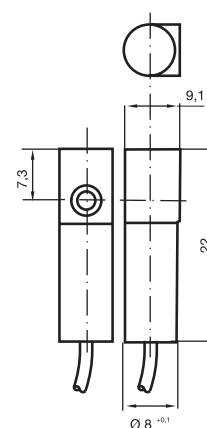
NJ10-F-N  
NJ6-F-N



NJ1,5-F-N

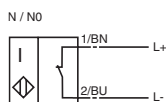


NJ08-F-N



		NJ0,8-F-N	NJ1,5-F-N	NJ2,5-F-N	NJ6-F-N	NJ10-F-N
Rated operating distance		0.8 mm	1.5 mm	2.5 mm	6 mm	10 mm
Installation	embeddable	◆				
	not embeddable		◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆
Assured operating distance	0 ... 0.64 mm	◆				
	0 ... 1.22 mm		◆			
	0 ... 2.03 mm			◆		
	0 ... 4.8 mm				◆	
	0 ... 8.1 mm					◆
Nominal voltage	8 V	◆	◆	◆	◆	◆
Operating voltage	5 ... 25 V	◆				
Current consumption						
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz			◆		
	0 ... 3000 Hz					◆
	0 ... 5000 Hz				◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆
Connection type	0.5 m, flexible lead LIFYW		◆			
	2 m, PUR cable			◆	◆	◆
	2 m, PVC cable	◆				
Core cross-section	0.06 mm <sup>2</sup>		◆			
	0.14 mm <sup>2</sup>	◆				
	0.34 mm <sup>2</sup>			◆	◆	◆
Housing material	Stainless steel	◆				
	PBT		◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
	IP68		◆			
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	1G; 2G			◆		
	2G	◆			◆	◆
	2G; 1D		◆			

Date of edition: 2008-03-11



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

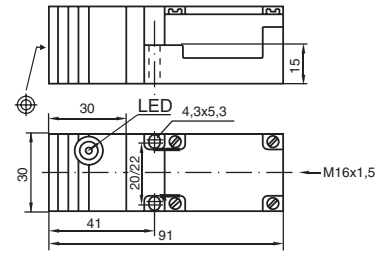
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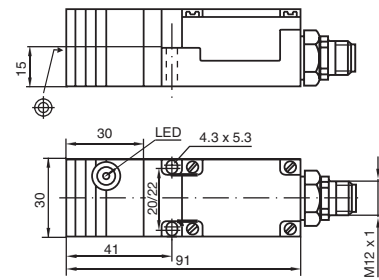
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- Comfort series
- 15 mm not embeddable

NCN15-M1K-N0



NCN15-M1K-N0-V1

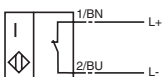


1.6

Inductive sensors for Ex environments (NAMUR)

		NCN15-M1K-N0	NCN15-M1K-N0-V1
Rated operating distance	15 mm	◆	◆
Installation	not embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆
Nominal voltage	8 V	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	no	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	terminal compartment	◆	◆
	V1-connector		◆
Core cross-section	up to 2.5 mm <sup>2</sup>	◆	
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 1D	◆	◆

N / NO



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

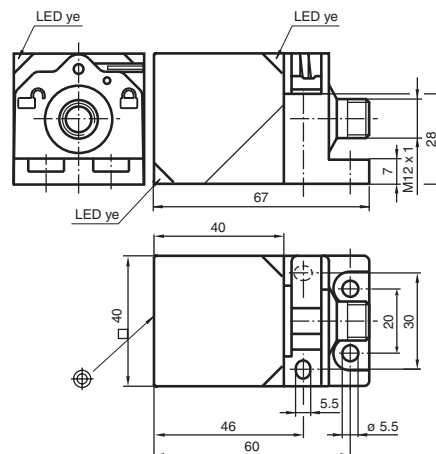




- Quick mounting shutter
- Usable up to SIL2 acc. to IEC 61508
- Comfort series
- 20 mm embeddable  
NCB20-L2-N0-V1
- 40 mm not embeddable  
NCN40-L2-N0-V1

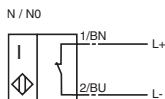


NCB20-L2-N0-V1  
NCN40-L2-N0-V1



		NCB 20-L2-N0-V1	NCN 40-L2-N0-V1
Rated operating distance	20 mm	◆	
	40 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	
	0 ... 32.4 mm		◆
Nominal voltage	8 V	◆	◆
Current consumption			
Measuring plate not detected	≥ 2.2 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆
	0 ... 300 Hz	◆	
Reverse polarity protection	yes	◆	◆
Short-circuit protection	yes	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	V1-connector	◆	◆
Housing material	PA-GF35	◆	◆
Sensing face	PA-GF35	◆	◆
Protection degree	IP69K	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 3G; 3D	◆	◆

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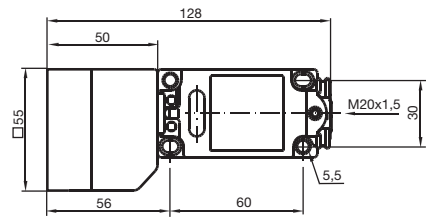
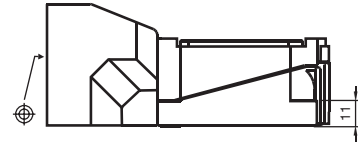
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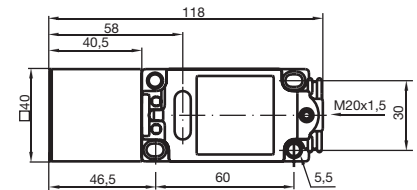
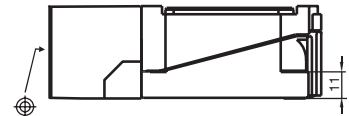


- **Comfort series**
- **Only for non-ferrous metals**  
NJ30P+U1+1N
- **Usable up to SIL3 acc. to IEC61508**  
NJ6S1+U1+N1

NJ30P+U1+1N  
NJ40+U1+N

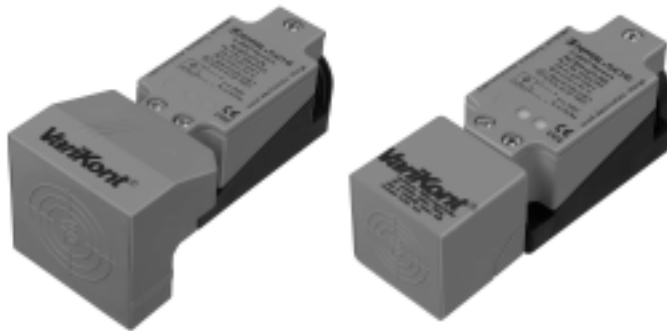


NJ15+U1+N  
NJ20+U1+N  
NJ30+U1+N  
NJ40+U1+N



1.6

Inductive sensors for Ex environments (NAMUR)

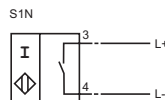
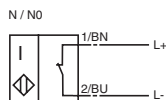
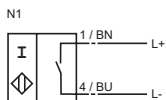


		NJ6S1+U1+N1	NJ15+U1+N	NJ20+U1+N	NJ30+U1+N	NJ30P+U1+1N	NJ40+U1+N
Rated operating distance		6 mm	15 mm	20 mm	30 mm	30 mm	40 mm
Installation	embeddable	◆	◆				
	not embeddable			◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆	◆
Switching element function	NAMUR NC		◆	◆	◆	◆	◆
	NAMUR NO	◆				◆	
Assured operating distance	0 ... 12.15 mm		◆				
	0 ... 16.2 mm			◆			
	0 ... 24.3 mm				◆	◆	
	0 ... 32.4 mm						◆
	0 ... 4.86 mm	◆					
Nominal voltage	8 V	◆	◆	◆	◆	◆	◆
Current consumption							
Measuring plate not detected	≥ 3 mA		◆	◆	◆	◆	◆
	≤ 1 mA	◆					◆
Measuring plate detected	≥ 3 mA	◆				◆	
	≤ 1 mA		◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆					◆
	0 ... 150 Hz		◆	◆	◆	◆	
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆	◆
	-25 ... 70 °C (248 ... 343 K)						◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆
Core cross-section	up to 2.5 mm <sup>2</sup>	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆	◆	◆	◆
	2G						◆

NJ30P+U1+1N

NJ15+U1+N  
NJ20+U1+N  
NJ30+U1+N  
NJ40+U1+N

NJ6S1+U1+N1

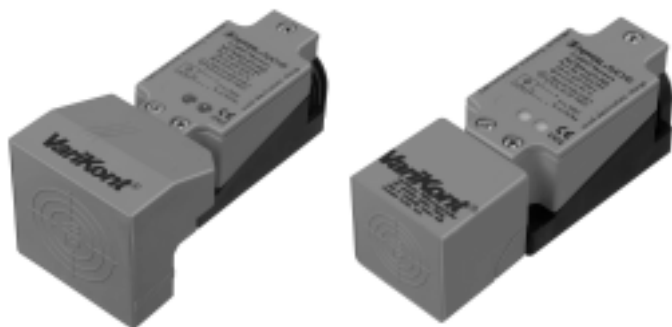


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

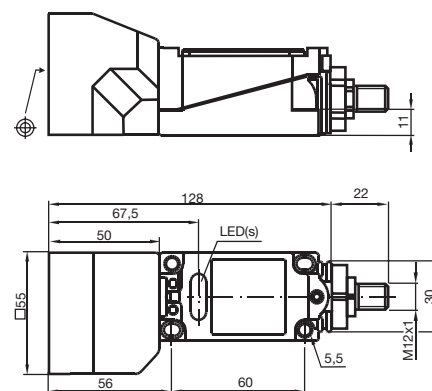
Date of edition 20.08.03-11



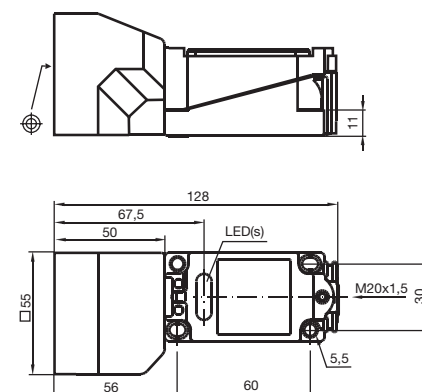
- Comfort series
- 15 mm embeddable
- 20 mm not embeddable
- 40 mm not embeddable
- 30 mm not embeddable



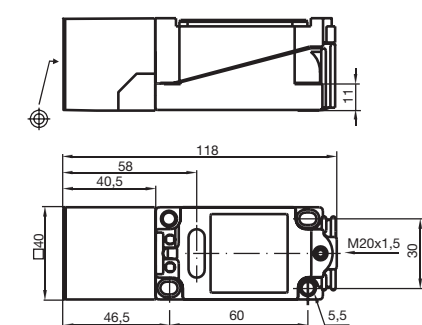
NCN40-U1-IN0-V1



NCN40-U1-N0

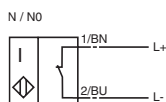


NCB15-U1-IN0  
NCN20-U1-IN0  
NCN30-U1-IN0



		N CB15+U1 + N0	N CN20+U1 + N0	N CN30+U1 + N0	N CN40+U1 + N0	NCN40+ U1 +N0-V1
Rated operating distance		15 mm	20 mm	30 mm	40 mm	40 mm
Installation	embeddable	◆				
	not embeddable		◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆				
	0 ... 16.2 mm		◆			
	0 ... 24.3 mm			◆		
	0 ... 32.4 mm				◆	◆
Nominal voltage	8 V	◆	◆	◆	◆	◆
Current consumption	Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆
	Measuring plate detected	≤ 1 mA	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz				◆	◆
	0 ... 150 Hz			◆		
	0 ... 250 Hz				◆	
	0 ... 400 Hz					◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆
	Connector M12 x 1					◆
Core cross-section	up to 2.5 mm <sup>2</sup>	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆	◆	◆
	1G; 2G; 1D; 3D		◆	◆	◆	◆

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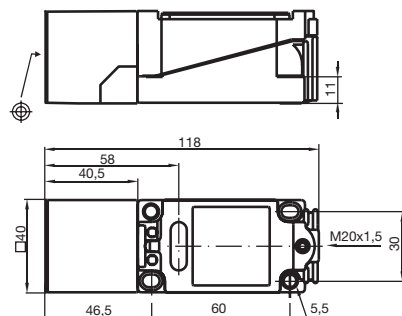
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- Usable up to SIL3 acc. to IEC61508
- 15 mm embeddable  
NJ15S+U1+N
- 20 mm not embeddable  
NJ20S+U1+N

NJ15S+U1+N  
NJ20S+U1+N

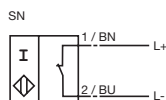


1.6

Inductive sensors for Ex environments (NAMUR)



		NJ15S+U1+N	NJ20S+U1+N
Rated operating distance	15 mm	◆	
	20 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	
	0 ... 16.2 mm		◆
Nominal voltage	8 V	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆
Ambient temperature	-40 ... 100 °C (233 ... 373 K)	◆	◆
Connection type	terminal compartment	◆	◆
Core cross-section	up to 2.5 mm <sup>2</sup>	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 1D	◆	◆



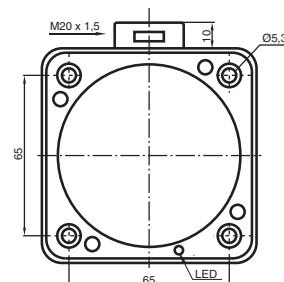
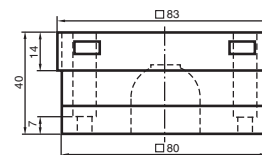
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



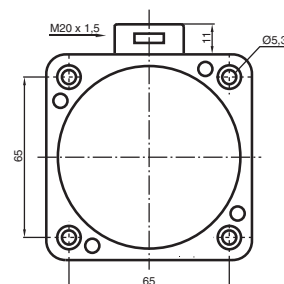
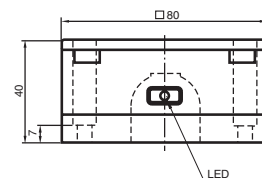
- **Comfort series**
- **40 mm embeddable**  
NCB40-FP-N0-P1  
NCB40-FP-N0-P1-V1
- **50 mm not embeddable**  
NCN50-FP-N0-P1



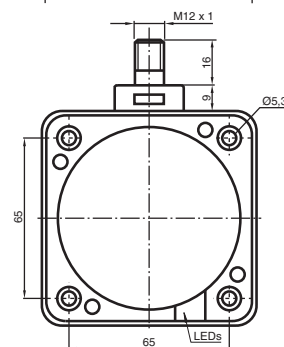
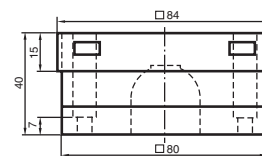
NCB40-FP-N0-P1



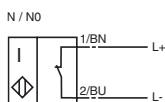
NCN50-FP-N0-P1



NCB40-FP-N0-P1-V1



		NCB40-FP-N0-P1	NCB40-FP-N0-P1-V1	NCN50-FP-N0-P1
Rated operating distance	40 mm	◆	◆	
Installation	50 mm embeddable	◆	◆	◆
	not embeddable			◆
Output type	2-wire	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆
Assured operating distance	0 ... 32 mm	◆	◆	
	0 ... 40.5 mm			◆
F	100 mm	◆	◆	
	240 mm			◆
Nominal voltage	8 V	◆	◆	◆
Current consumption	Measuring plate not detected	≥ 3 mA	◆	◆
	Measuring plate detected	≤ 1 mA	◆	◆
Switching frequency	0 ... 80 Hz	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
	V1-connector		◆	
Core cross-section	up to 2.5 mm <sup>2</sup>	◆		◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆



Date of edition: 20.08-03-11

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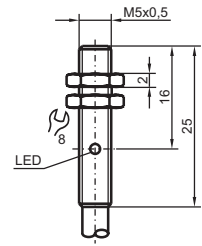
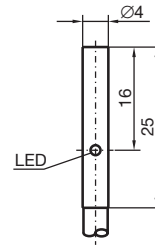
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- Basic series
- 0.8 mm embeddable



NBB0,8-4M25-E2-3G-3D

NBB0,8-5GM25-E2-3G-3D  
NBB0,8-5GM25-E3-3D



1.6

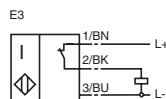
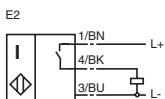
Inductive sensors for Ex environments (3G, 3D)



		NBB0,8-4M25-E2-3G-3D	NBB0,8-5GM25-E2-3G-3D	NBB0,8-5GM25-E3-3D
Rated operating distance	0.8 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	PNP Break function	◆	◆	◆
	PNP Make function	◆	◆	◆
Assured operating distance	0 ... 0.648 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆
Switching frequency	0 ... 3000 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆
Off-state current	0 ... 0.1 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	3D	◆	◆	◆
	3G; 3D	◆	◆	◆

NBB0,8-4M25-E2-3G-3D  
NBB0,8-5GM25-E2-3G-3D

NBB0,8-5GM25-E3-3D



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Date of edition 20.08.03-20

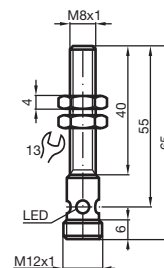
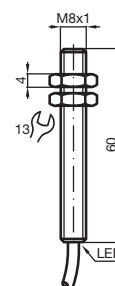


- **Basic series**
- **1.5 mm embeddable**  
NBB1,5...
- **2 mm embeddable**  
NBB2...

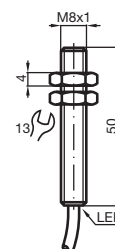


NBB1,5-8GM60-A2-3G-3D

NBB2-8GM40-E2-V1-3G-3D



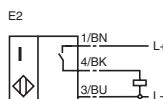
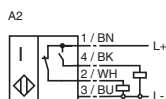
NBB2-8GM50-E2-3G-3D



		NBB1,5-8GM60-A2-3G-3D	NBB2-8GM40-E2-V1-3G-3D	NBB2-8GM50-E2-3G-3D
Rated operating distance	1.5 mm	◆		
	2 mm		◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire		◆	◆
	4-wire	◆		
Switching element function	PNP	◆		
	Antivalent			
	PNP		◆	◆
	Make function			
Assured operating distance	0 ... 1.215 mm	◆		
	0 ... 1.62 mm		◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆
	≤ 20 mA		◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆		
Indication of the switching state	LED, yellow	◆		◆
	Multihole-LED, yellow		◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector		◆	
	2 m, PVC cable	◆		◆
Housing material	brass, nickel-plated	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	3G; 3D	◆	◆	◆

NBB1,5-8GM60-A2-3G-3D

NBB2-8GM40-E2-V1-3G-3D  
NBB2-8GM50-E2-3G-3D



Date of edition 20.08-03-20

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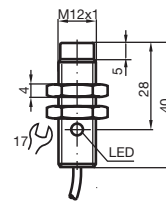
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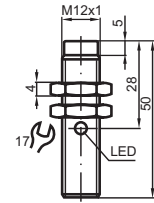


- 2 mm embeddable  
NJ2...  
NBB2...
- 4 mm not embeddable  
NJ4...
- 4 mm embeddable  
NBB4...

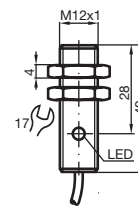
NJ4-12GM40-E2-3G-3D



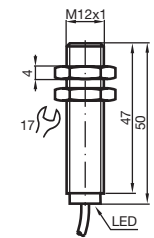
NJ4-12GM40-E2-V1-3G-3D



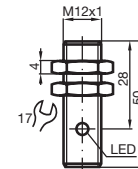
NL2-12GM40-E2-3G-3D



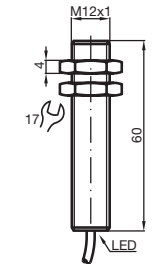
NBB4-12GM50-E2-3D



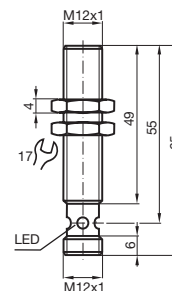
NL2-12GM40-E2-V1-3G-3D



NBB2-12GM60-A2-3G-3D



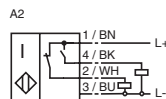
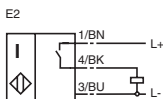
NBB4-12GM50-E2-V1-3D



		NJ2-12GM40-E2-3G-3D	NJ2-12GM40-E2-V1-3G-3D	NBB2-12GM60-A2-3G-3D	NJ4-12GM40-E2-3G-3D	NJ4-12GM40-E2-V1-3G-3D	NBB4-12GM50-E2-3D	NBB4-12GM50-E2-V1-3D
Rated operating distance	2 mm	◆	◆	◆				
	4 mm				◆	◆	◆	◆
Installation	embeddable	◆	◆	◆			◆	◆
	not embeddable							
Output type	3-wire	◆	◆		◆	◆	◆	◆
	4-wire			◆				
Switching element function	PNP	◆	◆		◆	◆	◆	◆
	Antivalent			◆				
	Make function				◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆				
	0 ... 3.24 mm				◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V				◆	◆	◆	◆
No-load supply current	≤ 11 mA	◆	◆					
	≤ 15 mA				◆	◆	◆	◆
	≤ 20 mA							
Switching frequency	0 ... 1000 Hz			◆				
	0 ... 2000 Hz				◆	◆		
	0 ... 3000 Hz						◆	◆
Reverse polarity protection		◆	◆					
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆		◆	◆	◆	◆
	0 ... 200 mA				◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow						◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆				◆	◆
	2 m, PUR cable	◆	◆					
	2 m, PVC cable			◆			◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated						◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆
Category	3D	◆	◆	◆	◆	◆	◆	◆
	3G; 3D	◆	◆	◆	◆	◆	◆	◆

NBB4-12GM50-E2-3D  
NBB4-12GM50-E2-V1-3D  
NL2-12GM40-E2-3G-3D  
NL2-12GM40-E2-V1-3G-3D  
NJ4-12GM40-E2-3G-3D  
NJ4-12GM40-E2-V1-3G-3D

NBB2-12GM60-A2-3G-3D



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Date of edition 20.08.03-20



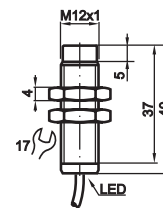
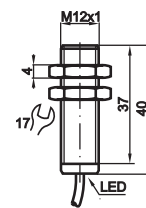


- **2 mm embeddable**  
NCB2...  
NBB2...
- **4 mm not embeddable**  
NCN4-12GM40-Z0-3G-3D

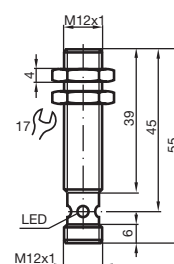


NBB2-12GM40-Z0-3D  
NCB2-12GM40-Z0-3D  
NCB2-12GM40-Z1-3D

NCN4-12GM40-Z0-3G-3D



NCB2-12GM40-Z0-V1-3G-3D

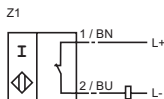
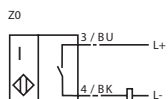
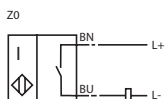


		NBB2-12GM40-Z0-3D	NCB2-12GM40-Z0-3D	NCB2-12GM40-Z0-V1-3G-3D	NCB2-12GM40-Z1-3D	NCN4-12GM40-Z0-3G-3D
Rated operating distance	2 mm	◆	◆	◆	◆	◆
Installation	4 mm	◆	◆	◆	◆	◆
	embeddable	◆	◆	◆	◆	◆
Output type	not embeddable	◆	◆	◆	◆	◆
	2-wire	◆	◆	◆	◆	◆
Switching elementfunction	DC Break function	◆	◆	◆	◆	◆
	DC Make function	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆	◆	◆	◆
	0 ... 3.24 mm	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	5 ... 60 V	◆	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆	◆	◆
	0 ... 800 Hz	◆	◆	◆	◆	◆
Reverse polarity protection	tolerant	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 5 V	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆	◆
	all direction LED, yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 .. 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆
	2 m, PUR cable	◆	◆	◆	◆	◆
Housing material	2 m, PVC cable	◆	◆	◆	◆	◆
	Stainless steel	◆	◆	◆	◆	◆
Sensing face	brass, nickel-plated	◆	◆	◆	◆	◆
	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	3D	◆	◆	◆	◆	◆
	3G; 3D	◆	◆	◆	◆	◆

NBB2-12GM40-Z0-3D  
NCB2-12GM40-Z0-3D  
NCN4-12GM40-Z0-3G-3D

NCB2-12GM40-Z0-V1-3G-3D

NCB2-12GM40-Z1-3D



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- 5 mm embeddable
- 8 mm embeddable
- 8 mm not embeddable

1.6

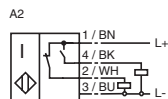
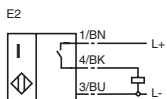
Inductive sensors for Ex environments (3G, 3D)



		NJ5-18GM50-E2-3G-3D	NJ5-18GM50-E2-V1-3G-3D	NBB5-18GM60-A2-V1-3D	NBB8-18GM50-E2-3G-3D	NBB8-18GM50-E2-V1-3G-3D	NBB8-18GM60-A2-V1-3D	NJ8-18GM50-E2-3G-3D	NJ8-18GM50-E2-V1-3G-3D	NBN8-18GM60-A2-V1-3D
Rated operating distance	5 mm	◆	◆	◆						
Installation	8 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆	◆
	3-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	4-wire	◆	◆	◆	◆	◆	◆	◆	◆	◆
	PNP Antivalent	◆	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	PNP Make function	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 4.05 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	0 ... 6.48 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆
	DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ [mA]	9	9	20	15	15	25	9	9	20
Switching frequency	0 ... 1000 Hz	◆	◆					◆	◆	
	0 ... 1500 Hz	◆	◆							
	0 ... 500 Hz			◆	◆	◆	◆			
	0 ... 700 Hz									◆
	0 ... 800 Hz									◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Multihole-LED, yellow				◆	◆	◆			
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆	◆	◆	◆
	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆	◆	◆
Category	3G; 3D	◆	◆	◆	◆	◆	◆	◆	◆	◆

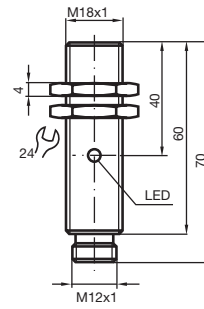
NBB8-18GM50-E2-3G-3D  
 NBB8-18GM50-E2-V1-3G-3D  
 NJ5-18GM50-E2-3G-3D  
 NJ5-18GM50-E2-V1-3G-3D  
 NBB8-18GM50-E2-3G-3D  
 NBB8-18GM50-E2-V1-3G-3D

NBB5-18GM60-A2-V1-3D  
 NBB8-18GM60-A2-V1-3D  
 NBN8-18GM60-A2-V1-3D

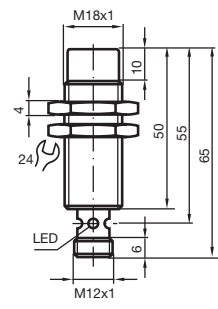


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

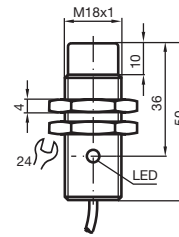
NBB5-18GM60-A2-V1-3D



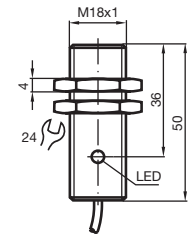
NJ8-18GM50-E2-V1-3G-3D



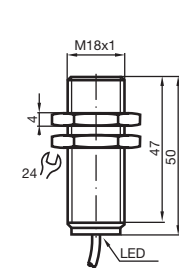
NJ5-18GM50-E2-3G-3D



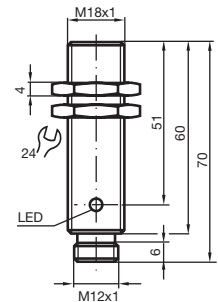
NJ5-18GM50-E2-3G-3D



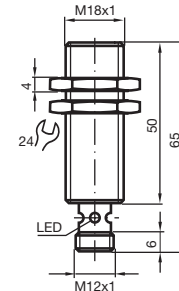
NBB8-18GM50-E2-3G-3D



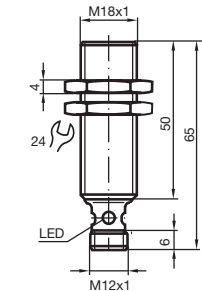
NBB8-18GM60-A2-V1-3D



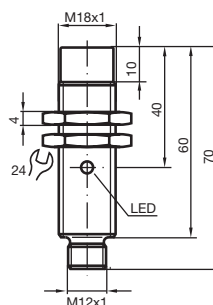
NJ5-18GM50-E2-V1-3G-3D



NBB8-18GM50-E2-V1-3G-3D



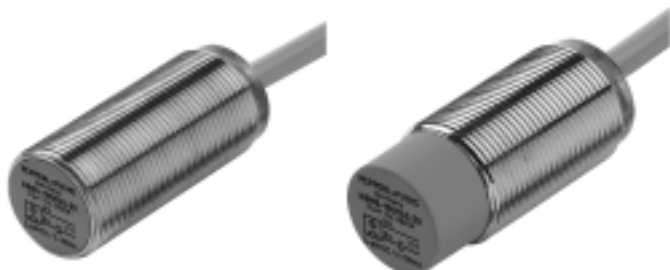
NBN8-18GM60-A2-V1-3D



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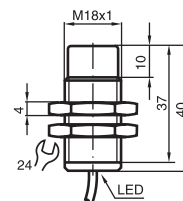
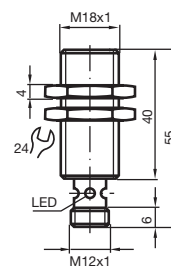


- **5 mm embeddable**  
NCB5...  
NBB5...
- **8 mm not embeddable**  
NCN8-18GM40-Z0-3G-3D

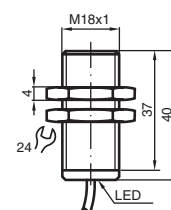


NCB5-18GM40-Z0-V1-3G-3D

NCN8-18GM40-Z0-3G-3D



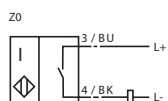
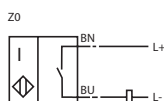
NBB5-18GM40-Z0-3G-3D  
NCB5-18GM40-Z0-3G-3D



		NBB5-18GM40-Z0-3G-3D	NCB5-18GM40-Z0-3G-3D	NCB5-18GM40-Z0-V1-3G-3D	NCN8-18GM40-Z0-3G-3D	
Rated operating distance	5 mm	◆	◆	◆		
Installation	8 mm				◆	
	embeddable	◆	◆	◆		
	not embeddable				◆	
Output type	2-wire	◆	◆	◆	◆	
Switching element function	DC Make function	◆	◆	◆	◆	
Assured operating distance	0 ... 4.05 mm	◆	◆	◆		
Kind of voltage	0 ... 6.5 mm				◆	
	DC	◆	◆	◆	◆	
	Operating voltage	5 ... 60 V	◆	◆	◆	◆
	Switching frequency	0 ... 300 Hz				◆
Reverse polarity protection	0 ... 350 Hz		◆	◆		
	0 ... 500 Hz	◆				
	tolerant		◆	◆	◆	
Short-circuit protection	pulsing	◆	◆	◆	◆	
Voltage drop	≤ 5 V	◆	◆	◆	◆	
Operating current	2 ... 100 mA	◆	◆	◆	◆	
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	
Indication of the switching state	Multihole-LED, yellow				◆	
	all direction LED, yellow	◆	◆	◆	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	
Connection type	V1-connector			◆		
	2 m, PUR cable		◆		◆	
	2 m, PVC cable	◆				
Housing material	Stainless steel		◆	◆	◆	
	brass, nickel-plated	◆				
Sensing face	PBT	◆	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆	
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	
Category	3G; 3D	◆	◆	◆	◆	

NBB5-18GM40-Z0-3G-3D  
NCB5-18GM40-Z0-3G-3D  
NCN8-18GM40-Z0-3G-3D

NCB5-18GM40-Z0-V1-3G-3D



Date of edition: 20.08.03-20

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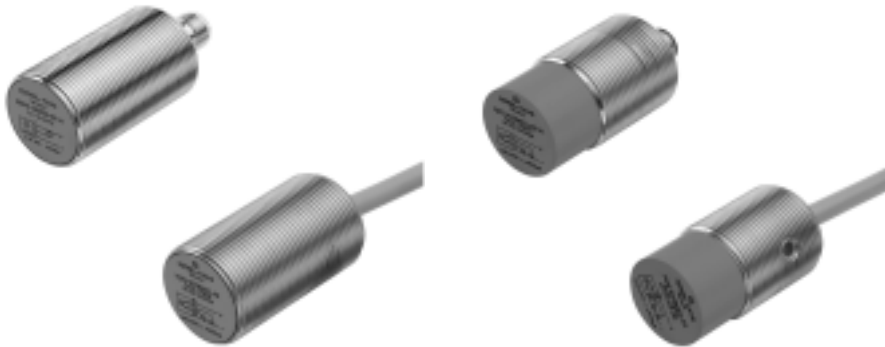
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- **10 mm embeddable**  
NJ10...
- **15 mm embeddable**  
NBB15...
- **15 mm not embeddable**  
NJ15...

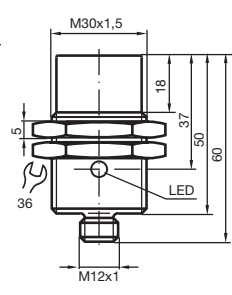
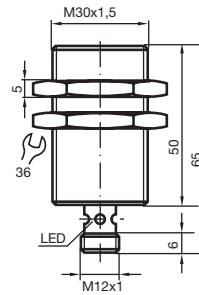
1.6

Inductive sensors for Ex environments (3G, 3D)



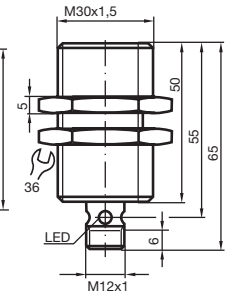
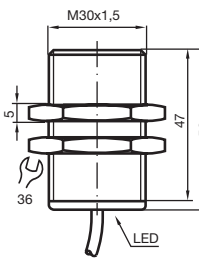
NJ1 0-30GM50-E2-V1-3D

NJ15-30GM50-E2-V1-3G-3D



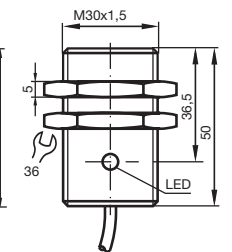
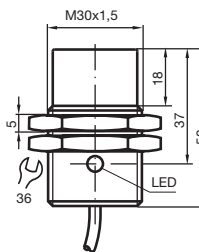
NBB15-30GM50-E2-3G-3D

NBB15-30GM50-E2-V1-3G-3D



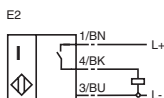
NJ1 5-30GM50-E2-3G-3D

NJ10-30GM50-E2-3G-3D



		NJ10-30GM50-E2-3G-3D	NJ10-30GM50-E2-V1-3D	NJ15-30GM50-E2-3G-3D	NJ15-30GM50-E2-V1-3G-3D	NBB15-30GM50-E2-3G-3D	NBB15-30GM50-E2-V1-3G-3D
Rated operating distance	10 mm	◆	◆				
	15 mm			◆	◆	◆	◆
Installation	embeddable	◆	◆				
	not embeddable			◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	PNP      Make function	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆	◆	◆	◆
	0 ... 8.1 mm	◆	◆				
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆
	10 ... 60 V	◆	◆				
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆
	≤ 9 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 200 Hz	◆	◆	◆	◆	◆	◆
	0 ... 500 Hz	◆	◆				
	0 ... 650 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆	◆	◆	◆
	≤ 3 V					◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 µA at 25 °C					◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆		
	Multihole-LED, yellow					◆	◆
	all direction LED, yellow					◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆
	brass, nickel-plated					◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆
Category	3D			◆	◆		
	3G; 3D	◆	◆	◆	◆	◆	◆

- NBB15-30GM50-E2-3G-3D
- NBB15-30GM50-E2-V1-3G-3D
- NJ1 0-30GM50-E2-3G-3D
- NJ1 0-30GM50-E2-V1-3D
- NJ1 5-30GM50-E2-3G-3D
- NJ1 5-30GM50-E2-V1-3G-3D



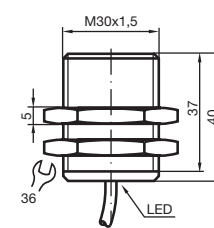
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-20

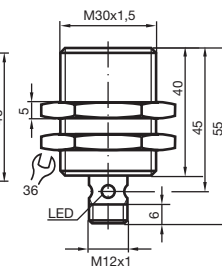
- **10 mm embeddable**  
NCB10...  
NBB10...
- **15 mm not embeddable**  
NCN15-30GM40-Z0-3G-3D



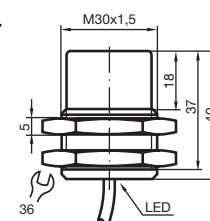
NBB10-30GM40-Z0-3G-3D  
NCB10-30GM40-Z0-3G-3D  
NCB10-30GM40-Z1-3G-3D



NCB10-30GM40-Z0-V1-3G-3D



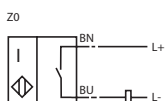
NCN15-30GM40-Z0-3G-3D



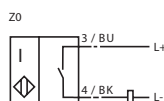
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Rated operating distance	10 mm	◆	◆	◆	◆	◆
Installation	15 mm					◆
	embeddable	◆	◆	◆	◆	◆
	not embeddable					◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	DC Break function				◆	
	DC Make function	◆	◆	◆		◆
Assured operating distance	0 ... 12.2 mm					◆
	0 ... 8.1 mm	◆	◆	◆	◆	
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	5 ... 60 V	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz					◆
	0 ... 150 Hz	◆	◆	◆	◆	
Reverse polarity protection	tolerant	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 5 V	◆	◆	◆	◆	◆
Operating current	2 ... 100 mA	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow				◆	
	all direction LED, yellow	◆	◆		◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	V1-connector			◆		
	2 m, PUR cable		◆		◆	◆
Housing material	2 m, PVC cable	◆			◆	◆
	Stainless steel		◆	◆	◆	◆
	brass, nickel-plated	◆				
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	3G; 3D	◆	◆	◆	◆	◆

1.6 Inductive sensors for Ex environments (3G, 3D)

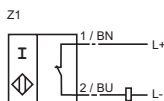
NBB10-30GM40-Z0-3G-3D  
NCB10-30GM40-Z0-3G-3D  
NCN15-30GM40-Z0-3G-3D



NCB10-30GM40-Z0-V1-3G-3D



NCB10-30GM40-Z1-3G-3D



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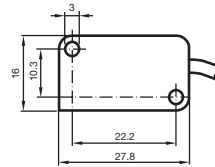
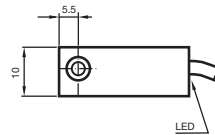
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- **Basic series**
- **2 mm embeddable**  
NBB2...
- **3 mm embeddable**  
NBB3...
- **4 mm not embeddable**  
NBN4...

NBB2-V3-E2-3G-3D  
NBB2-V3-E3-3G-3D  
NBB3-V3-Z4-3D  
NBN4-V3-E2-3G-3D

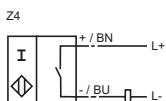


1.6

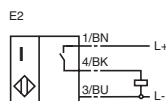
Inductive sensors for Ex environments (3G, 3D)

		NBB2-V3-E2-3G-3D	NBB2-V3-E3-3G-3D	NBB3-V3-Z4-3D	NBN4-V3-E2-3G-3D
Rated operating distance	2 mm	◆	◆		
	3 mm			◆	
	4 mm				◆
Installation	embeddable	◆	◆	◆	
	not embeddable				◆
Output type	2-wire			◆	
	3-wire	◆	◆		◆
Switching element function	DC Make function			◆	
	PNP Break function		◆		
	PNP Make function	◆			◆
Assured operating distance	0 ... 1.62 mm	◆	◆		
	0 ... 2.4 mm			◆	
	0 ... 3.24 mm				◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
	5 ... 60 V			◆	
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆		
	0 ... 2000 Hz			◆	
	0 ... 500 Hz				◆
Reverse polarity protection	all connections	◆	◆	◆	◆
Short-circuit protection	no			◆	
	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆		◆
	≤ 5 V			◆	
Operating current	0 ... 100 mA	◆	◆		◆
	4 ... 100 mA			◆	
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆		◆
	0 ... 1 mA typ. 0.7 mA			◆	
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	0.1 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	3D			◆	
	3G; 3D	◆	◆		◆

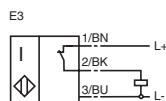
NBB3-V3-Z4-3D



NBB2-V3-E2-3G-3D  
NBN4-V3-E2-3G-3D



NBB2-V3-E3-3G-3D



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

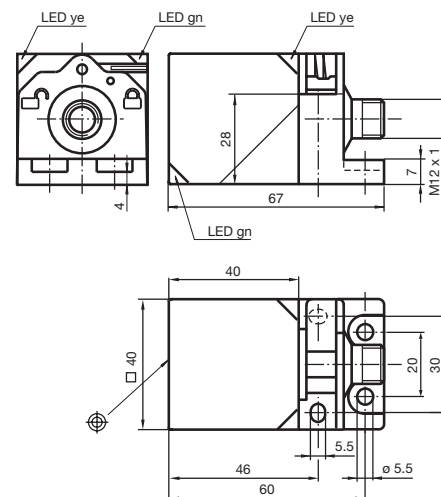
Date of edition 20.08.03-20



- Quick mounting shutter
- 4-way LED indicator
- Basic series
- 20 mm embeddable  
NBB20-L2-A2-V1-3G-3D
- 40 mm not embeddable  
NBN40-L2-A2-V1-3G-3D

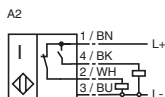


NBB20-L2-A2-V1-3G-3D  
NBN40-L2-A2-V1-3G-3D



		NBB20-L2-A2-V1-3G-3D	NBN40-L2-A2-V1-3G-3D
Rated operating distance	20 mm	◆	
	40 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	4-wire	◆	◆
Switching element function	PNP Antivalent	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	
	0 ... 32.4 mm		◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 20 mA	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 2 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Protection class	II	◆	◆
UL approval	cULus Listed, General Purpose	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆
Connection type	V1-connector	◆	◆
Housing material	PA-GF35	◆	◆
Sensing face	PA-GF35	◆	◆
Protection degree	IP69K	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3G; 3D	◆	◆

NBB20-L2-A2-V1-3G-3D  
NBN40-L2-A2-V1-3G-3D



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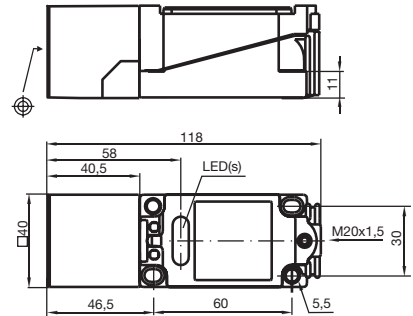
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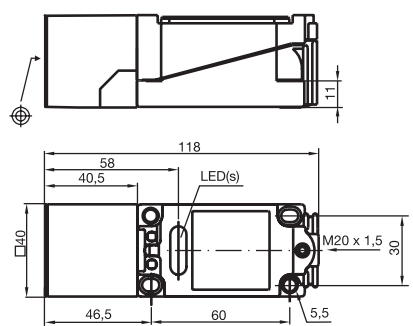


- 15 mm embeddable  
NJ15...
- 20 mm embeddable  
NJ20...
- 30 mm not embeddable  
NJ30...
- 40 mm not embeddable  
NJ40...

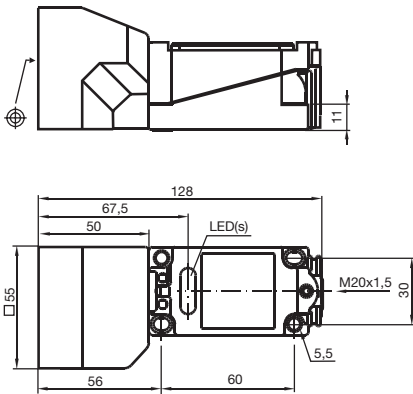
NJ15-U1+A2-3D  
NJ15-U1+E2-3G-3D  
NJ20-U1+A2-3D  
NJ20-U1+E2-3G-3D



NJ20-U1+E2-3G-3D  
NJ30-U1+A2-3D



NJ30-U1+A2-3D  
NJ40-U1+E2-3G-3D



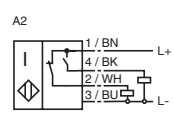
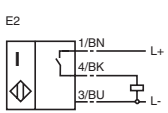
1.6 Inductive sensors for Ex environments (3G, 3D)



		NJ15+U1+E2-3G-3D	NJ15+U1+A2-3D	NJ20+U1+E2-3G-3D	NJ20+U1+A2-3D	NJ30+U1+E2-3G-3D	NJ30+U1+A2-3D	NJ40+U1+E2-3G-3D	NJ40+U1+A2-3D
Rated operating distance	[mm]	15	15	20	20	30	30	40	40
Installation	embeddable	◆	◆	◆	◆				
	not embeddable					◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆				
	4-wire					◆	◆	◆	◆
Switching element function	PNP	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent								
	Make function	◆	◆	◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆						
	0 ... 16.2 mm			◆					
	0 ... 24.3 mm					◆	◆		
	0 ... 32.4 mm							◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 28 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆	◆	◆	◆
Category	3D	◆	◆	◆	◆	◆	◆	◆	◆
	3G; 3D	◆	◆	◆	◆	◆	◆	◆	◆

NJ15-U1+E2-3G-3D  
NJ20-U1+E2-3G-3D  
NJ30-U1+E2-3G-3D  
NJ40-U1+E2-3G-3D

NJ15-U1+A2-3D  
NJ20-U1+A2-3D  
NJ30-U1+A2-3D  
NJ40-U1+A2-3D



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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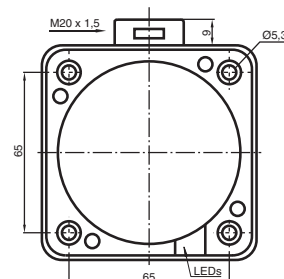
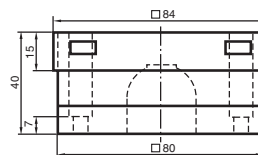




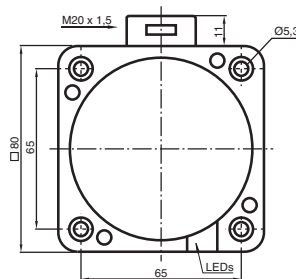
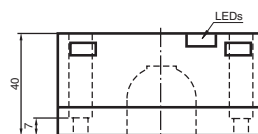
- **Comfort series**
- **40 mm embeddable**  
NCB40...
- **50 mm embeddable**  
NCB50...
- **50 mm not embeddable**  
NCN50...



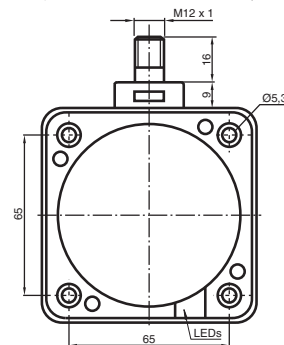
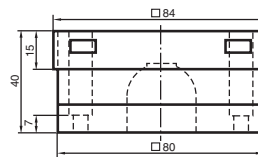
NCB50-FP-A2-P1-3G-3D



NCB40-FP-A2-P1-3G-3D  
NCN50-FP-A2-P1-3G-3D



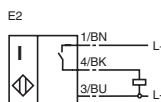
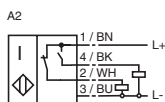
NCB50-FP-E2-P1-V1-3G-3D



		NCB40-FP-A2-P1-3G-3D	NCB50-FP-E2-P1-V1-3G-3D	NCB50-FP-A2-P1-3G-3D	NCN50-FP-A2-P1-3G-3D
Rated operating distance	40 mm	◆			
Installation	50 mm embeddable	◆	◆	◆	◆
	not embeddable				◆
Output type	3-wire		◆		
	4-wire	◆		◆	◆
Switching element function	PNP NO	◆	◆		
	PNP Antivalent			◆	◆
Assured operating distance	0 ... 32.4 mm	◆			
	0 ... 40.5 mm		◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching frequency	0 ... 80 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment	◆		◆	◆
	V1-connector		◆		◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
	IP68		◆		◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	3G; 3D	◆	◆	◆	◆

NCB40-FP-A2-P1-3G-3D  
NCB50-FP-A2-P1-3G-3D  
NCN50-FP-A2-P1-3G-3D

NCB50-FP-E2-P1-V1-3G-3D



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## Inductive sensors with safety function

### Concept

SN or S1N inductive sensors are combined with suitable control units to provide defined output signals in the event a system component fails.

They have long been used to meet functional safety requirements in mechanical engineering as well as in process industries.

### Benefits

- implementation of applications up to SIL 3
- available in slot, rectangular, and cylindrical styles
- depending on design, they can be used in extreme cold (to 40 oC)

### Isolated switch amplifiers for up to SIL 3

For applications up to SIL 3 using the SN or S1N series, the following units are available:

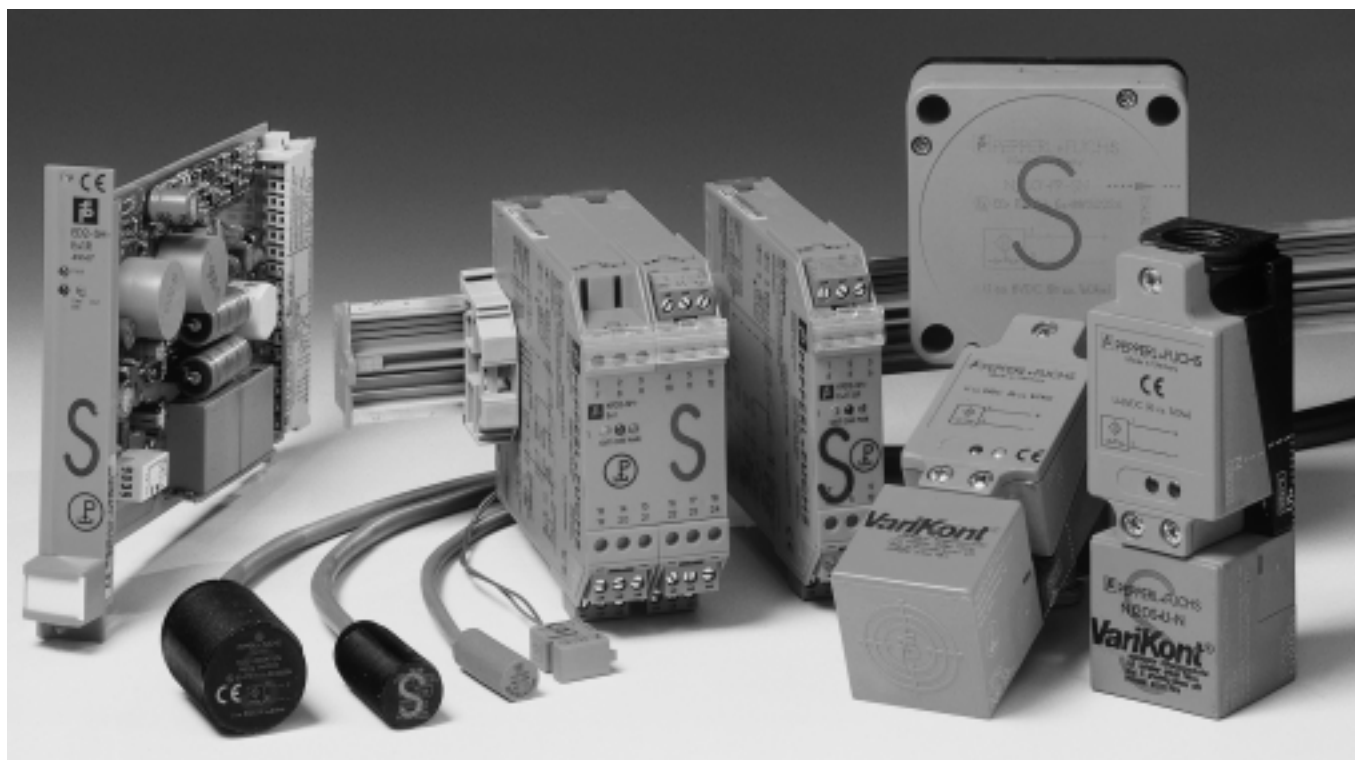
- KFD2-SH-Ex1
- KFD2-SH-Ex1.T.OP
- KHA6-SH-Ex1

Please see our website for their descriptions.

<http://www.pepperl-fuchs.com>

1.7 Test reports from the TÜV according to VDE 0660/209 and EN 954 and the values described in the IEC 61508 (failure rate, Safe Failure Fraction SFF, etc) are available. These sensors allow the implementation of single-channel applications up to SIL 2 (when using a standard NAMUR control circuit) or SIL 3 (when using a suitable control unit such as the KFD2-SH-Ex1).

Sensors based on NAMUR interface are available in cylindrical, rectangular, and slot style.

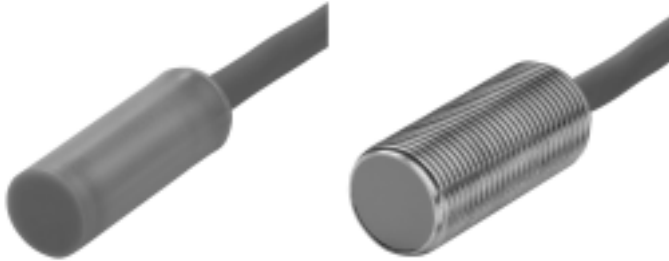
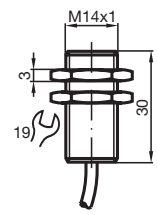


- 2 mm embeddable
- Usable up to SIL3 acc. to IEC61508

NJ2-11-SN

NJ2-11-SN-G

CE  
0102

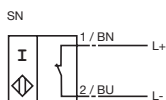


		NJ2-11-SN	NJ2-11-SN-G
Rated operating distance	2 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	◆
Reduction factor $r_{A1}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	5 ... 25 V	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 3000 Hz	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Ambient temperature	-40 ... 100 °C (233 ... 373 K)	◆	◆
Connection type	2 m, silicone cable	◆	◆
Housing material	Stainless steel	◆	◆
	PVDF	◆	
Sensing face	PVDF	◆	◆
Protection degree	IP68	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 1D	◆	◆

1.7

Inductive sensors with safety function

NJ2-11-SN  
NJ2-11-SN-G



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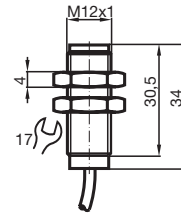
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- Usable up to SIL3 acc. to IEC61508
- 2 mm embeddable  
NJ2-12GK-SN
- 4 mm not embeddable  
NJ4-12GK-SN

NJ2-12GK-SN  
NJ4-12GK-SN



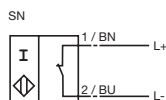
1.7

Inductive sensors with safety function



		NJ2-12GK-SN	NJ4-12GK-SN
Rated operating distance	2 mm	◆	
	4 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 1.62 mm	◆	
	0 ... 3.24 mm		◆
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	5 ... 25 V <sup>1)</sup>	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆
	0 ... 2000 Hz	◆	
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Ambient temperature	-40 ... 100 °C (233 ... 373 K)	◆	
	-50 ... 100 °C (223 ... 373 K)		◆
Connection type	2 m, silicone cable	◆	◆
Housing material	PP	◆	◆
Sensing face	PP	◆	◆
Protection degree	IP68	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 1D	◆	
	1G; 2G; 3G; 1D; 3D		◆

NJ2-12GK-SN  
NJ4-12GK-SN

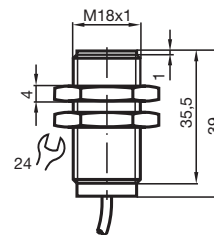


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- Usable up to SIL3 acc. to IEC61508
- 3 mm embeddable in ST37 / 1.0037  
NJ3-18GK-S1N
- 5 mm embeddable  
NJ5-18GK-SN
- 8 mm not embeddable  
NJ8-18GK-SN

NJ3-18GK-S1N  
NJ5-18GK-SN  
NJ8-18GK-SN

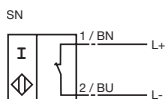
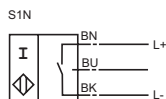


1.7 Inductive sensors with safety function

		NJ3-18GK-S1N	NJ5-18GK-SN	NJ8-18GK-SN
Rated operating distance	3 mm	◆		
	5 mm		◆	
	8 mm			◆
Installation	embeddable		◆	
	embed. in mild steel	◆		
Output type	not embeddable			◆
	2-wire	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆
	NAMUR NO	◆		
Assured operating distance	0 ... 2.4 mm	◆		
	0 ... 4.05 mm		◆	
	0 ... 6.48 mm			◆
Reduction factor $r_{AI}$	0.4		◆	◆
	1	◆		
Reduction factor $r_{Cu}$	0.3		◆	◆
	1	◆		
Reduction factor $r_{V2A}$	0	◆		
	0.85		◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Switching frequency	0 ... 200 Hz	◆		◆
	0 ... 500 Hz		◆	
Current consumption				
Measuring plate not detected	≥ 3 mA		◆	◆
	≤ 1 mA	◆		
Measuring plate detected	≥ 3 mA	◆		
	≤ 1 mA		◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆		
	-40 ... 100 °C (233 ... 373 K)		◆	◆
Connection type	2 m, silicone cable	◆	◆	◆
Housing material	Hostalen PPN, black	◆		◆
	PP		◆	
Sensing face	???			◆
	Hostalen PPN, black	◆		
Protection degree	PP		◆	
	IP68	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆		
	1G; 2G; 3G; 1D; 3D		◆	◆

NJ3-18GK-S1N

NJ5-18GK-SN  
NJ8-18GK-SN



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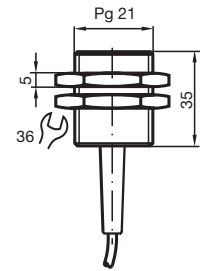
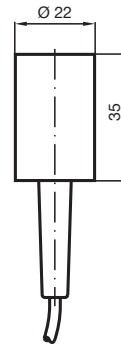
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- 6 mm embeddable
- Usable up to SIL3 acc. to IEC61508

NJ6-22-SN

NJ6-22-SN-G



CE  
0102

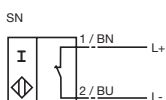


1.7

Inductive sensors with safety function

		NJ6-22-SN	NJ6-22-SN-G
Rated operating distance	6 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	◆
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	5 ... 25 V	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Ambient temperature	-40 ... 100 °C (233 ... 373 K)	◆	◆
Connection type	2 m, silicone cable	◆	◆
Housing material	Stainless steel	◆	◆
	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 1D	◆	◆

NJ6-22-SN  
NJ6-22-SN-G

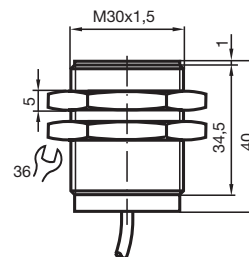


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- Usable up to SIL3 acc. to IEC61508
- 5 mm embeddable in ST37 / 1.0037  
NJ5-30GK-S1N
- 10 mm embeddable  
NJ10-30GK-SN
- 15 mm not embeddable  
NJ15-30GK-SN

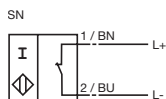
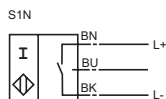
NJ10-30GK-SN  
NJ15-30GK-SN  
NJ5-30GK-S1N



		NJ5-30GK-S1N	NJ10-30GK-SN	NJ15-30GK-SN
Rated operating distance	10 mm		◆	
	15 mm			◆
	5 mm	◆		
Installation	embeddable		◆	
	embed. in mild steel	◆		
	not embeddable			◆
Output type	2-wire	◆	◆	◆
Switching elementfunction	NAMUR NC		◆	◆
	NAMUR NO	◆		
Assured operating distance	0 ... 12.15 mm			◆
	0 ... 4.05 mm	◆		
Reduction factor $r_{AI}$	0 ... 8.1 mm		◆	
	0.4		◆	◆
Reduction factor $r_{Cu}$	1	◆		
	0.3		◆	◆
Reduction factor $r_{V2A}$	1	◆		
	0	◆		
Kind of voltage	0.85		◆	◆
Operating voltage	DC	◆	◆	◆
Nominal voltage	5 ... 25 V			◆
Switching frequency	8 V	◆	◆	◆
	0 ... 100 Hz			◆
	0 ... 150 Hz	◆		
	0 ... 300 Hz		◆	
Current consumption				
	Measuring plate not detected	≥3 mA		◆
		≤1 mA	◆	
	Measuring plate detected	≥3 mA	◆	◆
	≤1 mA		◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆		
	-40 ... 100 °C (233 ... 373 K)			◆
	-50 ... 100 °C (223 ... 373 K)		◆	
Connection type	2 m, silicone cable	◆	◆	◆
Housing material	PP	◆	◆	◆
Sensing face	PP	◆	◆	◆
Protection degree	IP68	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	
	1G; 2G; 3G; 1D; 3D			◆

NJ5-30GK-S1N

NJ10-30GK-SN  
NJ15-30GK-SN



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Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

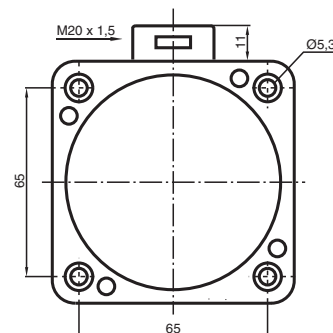
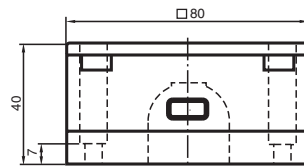
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NJ40-FPSN-P1

- 40 mm not embeddable
- Usable up to SIL3 acc. to IEC61508

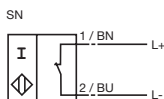


1.7

Inductive sensors with safety function

		NJ40-FP-SN-P1
Rated operating distance	40 mm	◆
Installation	not embeddable	◆
Output type	2-wire	◆
Switching element function	NAMUR NC	◆
Assured operating distance	0 ... 32.4 mm	◆
Reduction factor $r_{AI}$	0.4	◆
Reduction factor $r_{CU}$	0.3	◆
Reduction factor $r_{V2A}$	0.85	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Switching frequency	0 ... 100 Hz	◆
Current consumption		
Measuring plate not detected	$\geq 3$ mA	◆
Measuring plate detected	$\leq 1$ mA	◆
Ambient temperature	-40 ... 100 °C (233 ... 373 K)	◆
Connection type	terminal compartment	◆
Housing material	PBT	◆
Sensing face	PBT	◆
Protection degree	IP68	◆
Use in the hazardous area	see instruction manuals	◆
Category	2G; 1D	◆

NJ40-FPSN-P1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-20



## Extended temperature range sensors

Sensors with extended temperature ranges are available for applications where the standard temperature range of  $-25\text{ °C} \dots +70\text{ °C}$ , for which the standard Pepperl+Fuchs switches were designed, is no longer sufficient.

Pepperl+Fuchs produces four versions of these sensors:

Increased ambient temperature	Connection
$0\text{ °C} \dots +200\text{ °C}$ (oscillator and amplifier separate)	NAMUR
$-40\text{ °C} \dots +150\text{ °C}$	NAMUR
$-25\text{ °C} \dots +100\text{ °C}$	three-wire/four-wire DC and AC
$0\text{ °C} \dots +250\text{ °C}$ (oscillator and amplifier separate)	Four-core wire DC

Although PTB, which is used for standard sensors, remains suitable up to a temperature of  $100\text{ °C}$ , Pepperl+Fuchs uses Ryton® for temperatures up to  $150\text{ °C}$ . Ryton is a crystalline polyphenylene sulphide which remains dimensionally stable up to  $200\text{ °C}$ .



Since silicon-based components are destroyed at temperatures over  $150\text{ °C}$ , the control interface electronics are separated from the LC resonant circuit (detector).

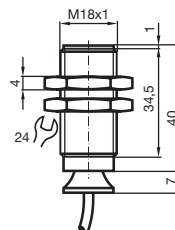
In the NCN25-F35-... series, the resonant circuit is installed in a stainless steel housing. The active face is a cup made of polytetrafluoroethylene (PTFE - Teflon) and the cable between the detector and oscillator is insulated with PTFE.

Extended temperature range sensors are identified with a T at the end of their type code or by the maximum ambient temperature rating (e.g. ... -250).



- **Temperature range**  
-40 ... 150 °C
- **5 mm embeddable**  
NJ5-18GK-N-150
- **8 mm not embeddable**  
NJ8-18GK-N-150

NJ5-18GK-N-150  
NJ8-18GK-N-150

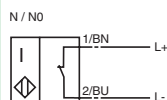


1.8

Inductive sensors with special characteristics (high temperature sensors)

		NJ5-18GK-N-150	NJ8-18GK-N-150
Rated operating distance	5 mm	◆	
	8 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 4.05 mm	◆	
	0 ... 6.48 mm		◆
Reduction factor $r_{A1}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 200 Hz	◆	◆
	0 ... 500 Hz	◆	
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Ambient temperature	-40 ... 150 °C (233 ... 423 K)	◆	◆
Connection type	2 m, SIHF-cable	◆	◆
Housing material	PPS	◆	◆
Sensing face	PPS	◆	◆
Protection degree	IP65	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G	◆	◆

NJ5-18GK-N-150  
NJ8-18GK-N-150

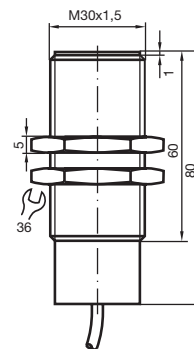
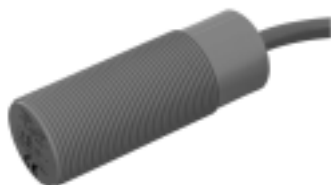


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



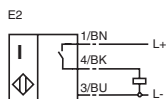
- **Temperature range**  
-25 ... 100 °C
- **10 mm embeddable**  
NJ10-30GK-E2-T
- **15 mm not embeddable**  
NJ15-30GK-E2-T

NJ10-30GK-E2-T  
NJ15-30GK-E2-T



		NJ10-30GK-E2-T	NJ15-30GK-E2-T
Rated operating distance	10 mm	◆	
	15 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	3-wire	◆	◆
Switching element function	PNP      Make function	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	◆
	0 ... 8.1 mm	◆	
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 20 mA	◆	◆
Switching frequency	0 ... 300 Hz	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	2 m, PUR cable	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆

NJ10-30GK-E2-T  
NJ15-30GK-E2-T



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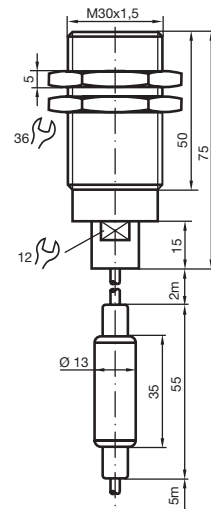
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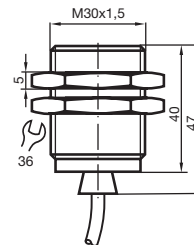


- Temperature range 0 ... 200 °C  
NJ4-30GM-N-200
- 4 mm embeddable
- Temperature range -25 ... 150 °C
- 15 mm not embeddable  
NJ15-30GK-N-150

NJ4-30GM-N-200



NJ15-30GK-N-150

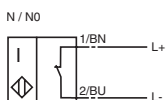


1.8

Inductive sensors with special characteristics (high temperature sensors)

		NJ4-30GM-N-200	NJ15-30GK-N-150
Rated operating distance	15 mm		◆
Installation	4 mm embeddable	◆	
	not embeddable		◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 12.15 mm		◆
	0 ... 3.04 mm	◆	
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 100 Hz		◆
	0 ... 1000 Hz	◆	
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Ambient temperature	0 ... 200 °C (273 ... 473 K)	◆	
	-25 ... 150 °C (248 ... 423 K)		◆
Connection type	2 m, SIHF-cable		◆
	5 m, SIHF-cable	◆	
Housing material	Stainless steel	◆	
Sensing face	PPS		◆
	PPS	◆	◆
Protection degree	IP65	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G	◆	◆

NJ15-30GK-N-150  
NJ4-30GM-N-200



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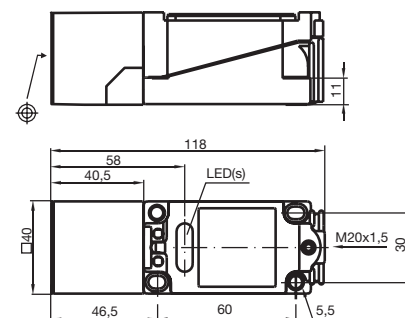
Date of edition 20.08.03.20



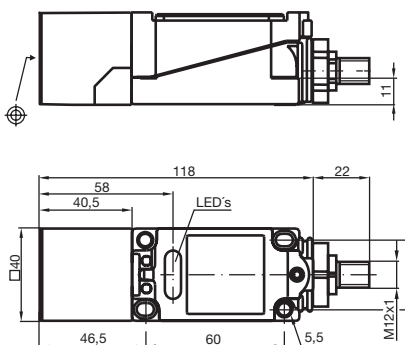
- Temperature range -25 ... 100 °C
- 15 mm embeddable
- 20 mm not embeddable
- 30 mm not embeddable
- 40 mm not embeddable



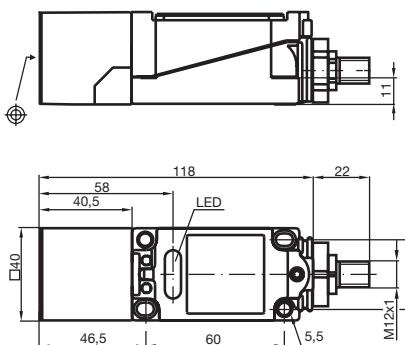
NJ15-U1-A2-T  
 NJ15-U1-A-T  
 NJ20-U1-A2-T  
 NJ20-U1-A-T  
 NJ30-U1-A2-T  
 NJ40-U1-A2-T



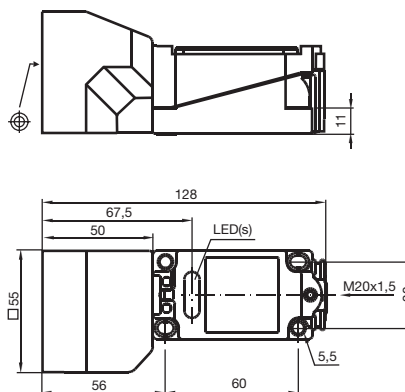
NJ15-U1-A2-T-V1



NJ20-U1-A2-T-V1  
 NJ20-U1-E2-T-V1  
 NJ30-U1-A2-T-V1

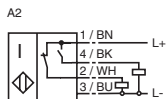


NJ40-U1-A2-T

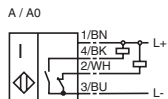


		NJ15+U1+A2-T	NJ15+U1-A-T	NJ15+U1+A2-T-V1	NJ20+U1+E2-T-V1	NJ20+U1-A-T	NJ20+U1+A2-T-V1	NJ30+U1+A2-T	NJ40+U1+A2-T
Rated operating distance	[mm]	15	15	15	20	20	20	30	40
Installation	embeddable	◆	◆	◆	◆	◆	◆	◆	◆
	not embeddable								
Output type	3-wire				◆	◆	◆	◆	◆
	4-wire								
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent		◆						
	PNP	◆	◆	◆	◆	◆	◆	◆	◆
	Antivalent		◆						
	PNP	◆	◆	◆	◆	◆	◆	◆	◆
	Make function								
Assured operating distance	0 ... 12.15 mm	◆	◆	◆					
	0 ... 16.2 mm				◆	◆	◆		
	0 ... 24.3 mm							◆	◆
	0 ... 32.4 mm								◆
Reduction factor $r_{AI}$	0.4	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆	◆	◆	◆	◆	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 300 Hz								
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆	◆	◆	◆
	V1-connector								
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆	◆	◆	◆	◆
Mass	130 g				◆				

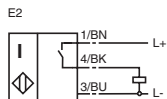
NJ15-U1-A2-T  
 NJ15-U1-A2-T-V1  
 NJ20-U1-A2-T  
 NJ20-U1-A2-T-V1  
 NJ30-U1-A2-T  
 NJ30-U1-A2-T-V1  
 NJ40-U1-A2-T



NJ15-U1-A-T  
 NJ20-U1-A-T



NJ20-U1-E2-T-V1



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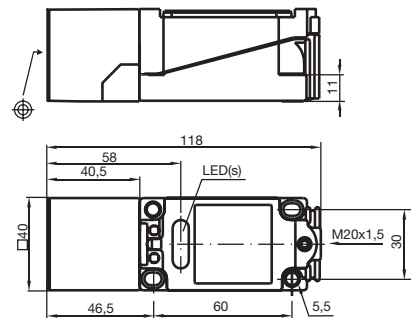
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- **Temperature range**  
-25 ... 100 °C
- **15 mm embeddable**  
NJ15+U1+W-T
- **20 mm not embeddable**  
NJ20+U1+W-T

NJ15+U1+W-T  
NJ20+U1+W-T



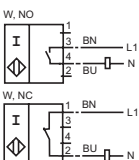
1.8

Inductive sensors with special characteristics (high temperature sensors)



		NJ15+U1+W-T	NJ20+U1+W-T
Rated operating distance	15 mm	◆	
	20 mm		◆
Installation	embeddable	◆	
	not embeddable		◆
Output type	2-wire	◆	◆
Switching element function	AC Make/Break function	◆	◆
Assured operating distance	0 ... 12.15 mm	◆	
	0 ... 16.2 mm		◆
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	AC	◆	◆
Operating voltage	20 ... 253 V <sup>1)</sup>	◆	◆
Switching frequency	0 ... 25 Hz	◆	◆
Voltage drop	≤ 7 V	◆	◆
Operating current	10 ... 500 mA	◆	◆
Off-state current	0 ... 3 mA typ.	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆

NJ15+U1+W-T  
NJ20+U1+W-T



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

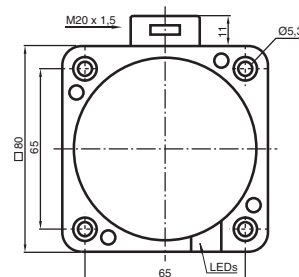
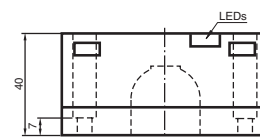
Date of edition 20.08.03-20



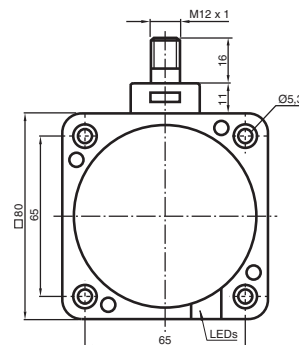
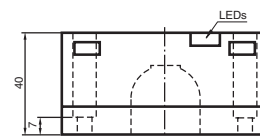
- **Comfort series**
- **Temperature range**  
-25 ... 100 °C
- **40 mm embeddable**  
NCB40...
- **40 mm not embeddable**  
NCN40-FP-W-T-P1



NCB40-FP-A2-T-P1  
NCN40-FP-W-T-P1



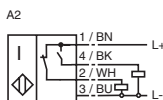
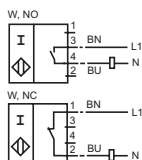
NCB40-FP-A2-T-P1-V1



		NCB40-FP-A2-T-P1	NCB40-FP-A2-T-P1-V1	NCN40-FP-W-T-P1
Rated operating distance	40 mm	◆	◆	◆
Installation	embeddable	◆	◆	
	not embeddable			◆
Output type	2-wire			◆
	4-wire	◆	◆	
Switching element function	AC Make/Break function			◆
	PNP Antivalent	◆	◆	
Assured operating distance	0 ... 32.4 mm	◆	◆	◆
Reduction factor $r_{AI}$	0.25	◆	◆	
	0.4			◆
Reduction factor $r_{Cu}$	0.23	◆	◆	
	0.3			◆
Reduction factor $r_{V2A}$	0.85	◆	◆	◆
Kind of voltage	AC			◆
	DC	◆	◆	
Operating voltage	10 ... 30 V	◆	◆	
	20 ... 253 V			◆
No-load supply current	≤20 mA	◆	◆	
Switching frequency	0 ... 20 Hz	◆	◆	◆
	0 ... 80 Hz	◆	◆	
Reverse polarity protection		◆	◆	
Short-circuit protection	no			◆
	pulsing	◆	◆	
Voltage drop	≤3 V	◆	◆	
	≤5 V typ. 4V			◆
Operating current	0 ... 200 mA	◆	◆	
	5 ... 500 mA			◆
Off-state current	0 ... 0.5 mA	◆	◆	
	0.3 ... 1 mA typ. 0.7 mA			◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	
	-40 ... 100 °C (233 ... 373 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
	V1-connector		◆	
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

NCN40-FP-W-T-P1

NCB40-FP-A2-T-P1  
NCB40-FP-A2-T-P1-V1



Date of edition 20.08-03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Subject to reasonable modifications due to technical advances.

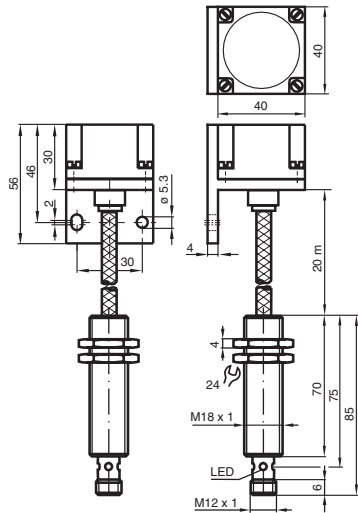
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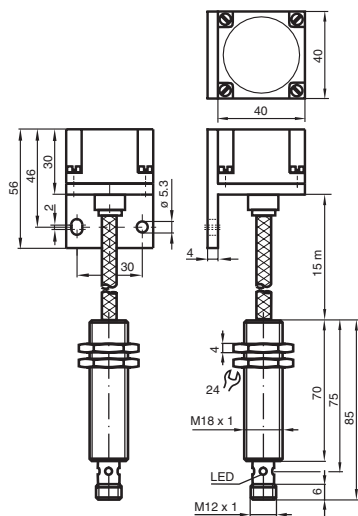


- Extreme additional temperature range of sensor component, 0 ... 250 °C
- Appropriate for conveyor chains
- Cable between sensor and amplifier with metal case

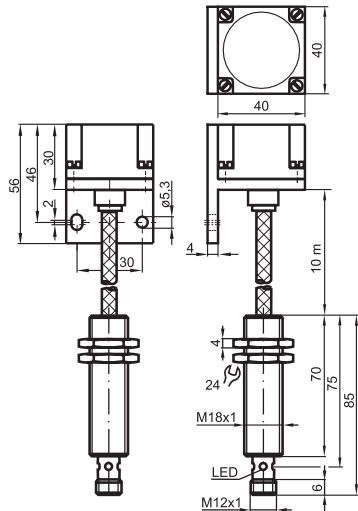
NCN20-F35-A2-250-20M-V1



NCN25-F35-A2-250-15M-V1



NCN20-F35-A2-250-10M-V1

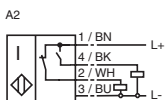


1.8 Inductive sensors with special characteristics (high temperature sensors)



		NCN20-F35-A-2-250-10M-V1	NCN20-F35-A-2-250-20M-V1	NCN25-F35-A-2-250-15M-V1	NCN25-F35-A2-250-V1
Rated operating distance	20 mm	◆	◆		
Installation	25 mm	◆	◆	◆	◆
	embeddable				
	not embeddable			◆	◆
Output type	4-wire	◆	◆	◆	◆
Switching element function	PNP Antivalent	◆	◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆	◆	◆	◆
	0 ... 20 mm			◆	◆
Reduction factor $r_{AI}$	0.5	◆	◆	◆	◆
Reduction factor $r_{Cu}$	0.5	◆	◆	◆	◆
Reduction factor $r_{V2A}$	0.6 ... 1	◆	◆	◆	◆
Mounting angle	AI	◆	◆	◆	◆
Amplifier housing	Stainless steel	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆
Switching frequency	0 ... 20 Hz	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Indication of the switching state	Multihole-LED, yellow	◆	◆	◆	◆
UL approval	cULus Listed, General Purpose Class 2 power source	◆	◆	◆	◆
Ambient temperature	0 ... 250 °C (273 ... 523 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
Housing material	PTFE / AI / V2A	◆	◆	◆	◆
Sensing face	PTFE (Teflon)	◆	◆	◆	◆
Protection degree	amplifier IP67 sensor IP40	◆	◆	◆	◆

NCN20-F35-A2-250-10M-V1  
NCN20-F35-A2-250-20M-V1  
NCN25-F35-A2-250-15M-V1  
NCN25-F35-A2-250-V1



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

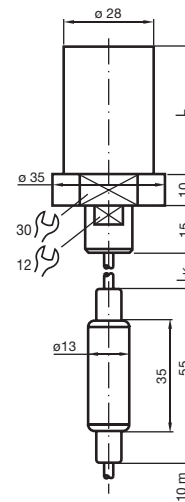
Date of edition 20.08.03-20



- Temperature range  
0 ... 200 °C
- 4 mm embeddable

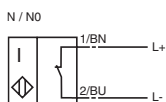


NJ4-N-H31



		NJ4-N-H31
Rated operating distance	4 mm	◆
Installation	embeddable	◆
Output type	2-wire	◆
Switching element function	NAMUR NC	◆
Assured operating distance	0 ... 3.04 mm	◆
Reduction factor $r_{AI}$	0.4	◆
Reduction factor $r_{Cu}$	0.3	◆
Reduction factor $r_{V2A}$	0.85	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Switching frequency	1000 Hz	◆
Measuring plate not detected	$\geq 3$ mA	◆
Measuring plate detected	$\leq 1$ mA	◆
Ambient temperature	0 ... 200 °C (273 ... 473 K)	◆
Connection type	10 m, PVC cable	◆
Housing material	Stainless steel	◆
Sensing face	PPS	◆
Protection degree	IP65	◆
Cable length $L_K$	0,5 / 0,75 / 1 / 2 / 3 / 4 / 6 / 8 / 10 [m]	◆

NJ4-N-H31



Date of edition: 20.08.03-20

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Subject to reasonable modifications due to technical advances.

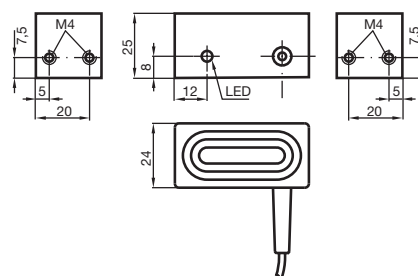
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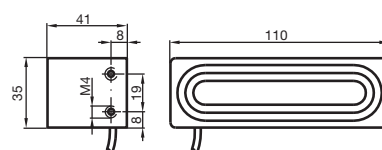


- **Comfort series**
- **7 mm embeddable**  
FJ7-N
- **6 mm embeddable**  
FJ6-110-N

FJ7-N



FJ6-110-N

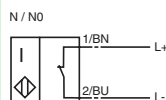


1.8

Inductive sensors with special characteristics (high temperature sensors)

		FJ6-110-N	FJ7-N
Rated operating distance	6 mm	◆	
	7 mm		◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMJR NC	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	
	0 ... 5.67 mm		◆
Reduction factor $r_{AI}$	0.4	◆	◆
Reduction factor $r_{CU}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	◆
Switching frequency	0 ... 200 Hz	◆	◆
	0 ... 280 Hz	◆	
Current consumption			
Measuring plate not detected	$\geq 3$ mA	◆	◆
Measuring plate detected	$\leq 1$ mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	2 m, PUR cable	◆	◆
Housing material	brass, zinc plated	◆	◆
Sensing face	POM	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	2G	◆	
	2G; 3D		◆

FJ6-110-N  
FJ7-N



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

## High pressure sensors

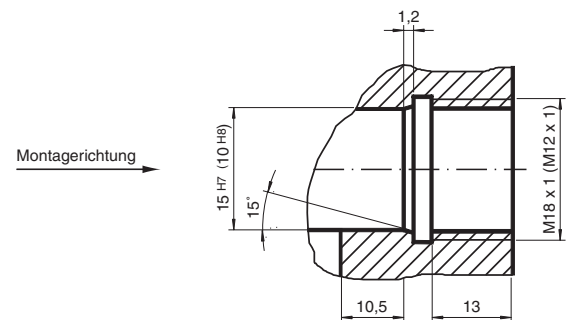


High pressure sensors are suitable for use in hydraulic actuators and similar equipment.

The maximum operating pressure to the active surface is 350 bar (M18) or 500 bar (M12).

Pressure resistance is obtained by using a ceramic sensor head inserted in a stainless steel housing. There is also a groove in the housing for an O-ring.

### Installation dimensions:





- Comfort series
- 1.5 mm embeddable
- Operating pressure 500 bar, peak pressure 800 bar

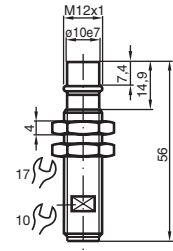
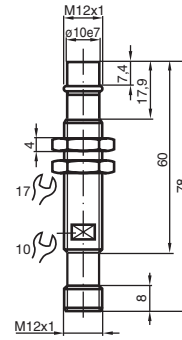
1.8

Inductive sensors with special characteristics (pressure resistant sensors)



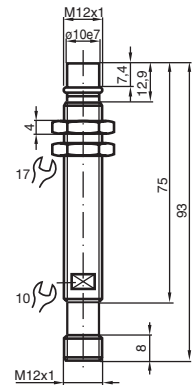
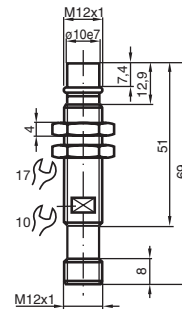
NCB1,5-12GM70-E2-D-V1

NCB1,5-12GM65-E2-D-V1



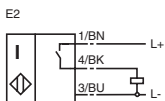
NCB1,5-12GM60-E2-D-V1

NCB1,5-12GM85-E2-D-V1



		NCB1,5-12GM45-E2-D-V1	NCB1,5-12GM60-E2-D-V1	NCB1,5-12GM70-E2-D-V1	NCB1,5-12GM85-E2-D-V1
Rated operating distance	1.5 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP      Make function	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Operating pressure statically	500 bar	◆	◆	◆	◆
Operating pressure dynamically	800 bar	◆	◆	◆	◆
Ambient temperature	-25 ... 80 °C (248 ... 353 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆
Sensing face	Ceramic	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆

NCB1,5-12GM85-E2-D-V1  
 NCB1,5-12GM60-E2-D-V1  
 NCB1,5-12GM70-E2-D-V1  
 NCB1,5-12GM85-E2-D-V1



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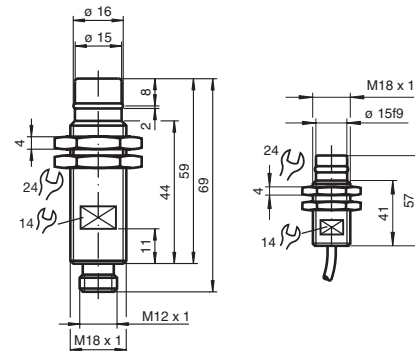
Date of edition 20.08.03-20

- Comfort series
- 1.5 mm embeddable
- Compression proof up to 350 bar, dynamic on active surface



NCB1,5-18GM60-E2-D-V1  
NCB1,5-18GM60-E2-D-V1-3G-3D

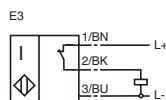
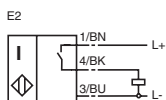
NCB1,5-18GM60-E2-D  
NCB1,5-18GM60-E2-D-3G-3D  
NCB1,5-18GM60-E3-D



		NCB1,5-18GM60-E2-D	NCB1,5-18GM60-E2-D-3G-3D	NCB1,5-18GM60-E2-D-V1	NCB1,5-18GM60-E2-D-V1-3G-3D	NCB1,5-18GM60-E3-D
Rated operating distance	1.5 mm	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆
Switching element function	PNP Break function	◆	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.22 mm	◆	◆	◆	◆	◆
Reduction factor $r_{AI}$	0.3	◆	◆	◆	◆	◆
Reduction factor $r_{Cu}$	0.2	◆	◆	◆	◆	◆
Reduction factor $r_{V2A}$	0.5	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆
Operating pressure dynamically	350 bar	◆	◆	◆	◆	◆
Ambient temperature	-35 ... 80 °C (238 ... 353 K)	◆	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆
Sensing face	Epoxy (black)	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	3G; 3D	◆	◆	◆	◆	◆

NCB1,5-18GM60-E2-D  
NCB1,5-18GM60-E2-D-3G-3D  
NCB1,5-18GM60-E2-D-V1  
NCB1,5-18GM60-E2-D-V1-3G-3D

NCB1,5-18GM60-E3-D



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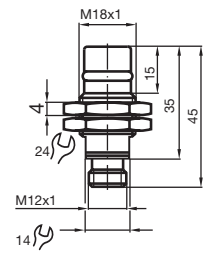
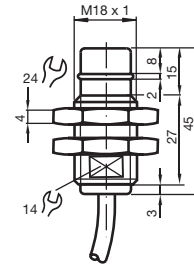
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- Comfort series
- 1.5 mm embeddable
- Compression proof up to 350 bar, dynamic on active surface
- Usable up to SIL2 acc. to IEC 61508  
NJ1,5-18GM-N-D-V1

NJ1,5-18GM-N-D

NJ1,5-18GM-N-D-V1

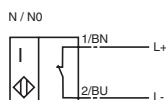


1.8

Inductive sensors with special characteristics (pressure resistant sensors)

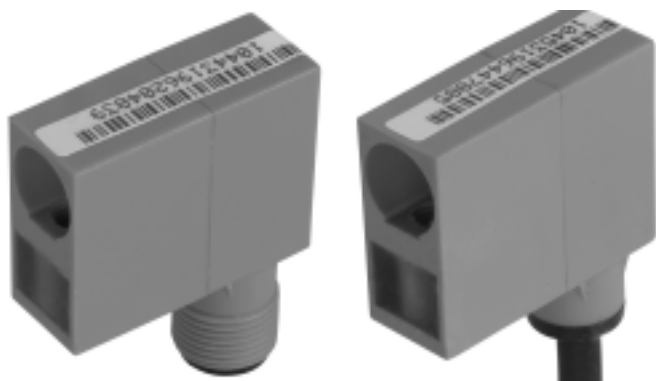
		NJ1,5-18GM-N-D	NJ1,5-18GM-N-D-V1
Rated operating distance	1.5 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
Assured operating distance	0 ... 0.81 mm	◆	◆
	0 ... 1.22 mm		◆
Reduction factor $r_{A1}$	0.4	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆
Reduction factor $r_{V2A}$	0.56	◆	◆
	0.85		◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 400 Hz		◆
	0 ... 800 Hz	◆	
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Operating pressure dynamically	350 bar	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	
	-25 ... 85 °C (248 ... 358 K)		◆
Connection type	V1-connector		◆
	2 m, PVC cable	◆	
Housing material	Stainless steel	◆	◆
Sensing face	Epoxy (black)	◆	
	Ceramic		◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	2G; 1D		◆

NJ1,5-18GM-N-D  
NJ1,5-18GM-N-D-V1



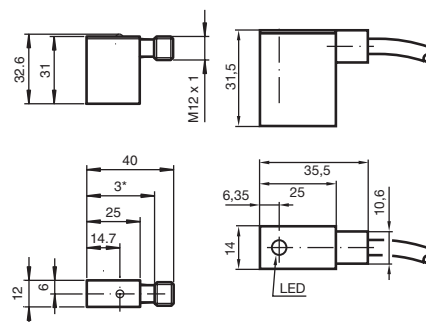
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Comfort series
- 1.5 mm with switching tappet



NU1,5-F2-E2-V1

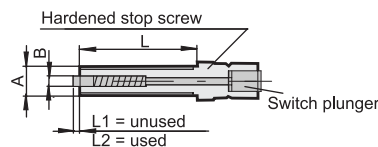
NU1,5-F2-E2



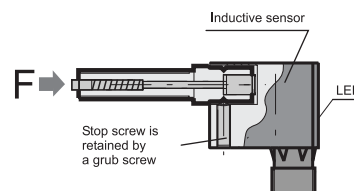
		NU1,5-F2-E2	NU1,5-F2-E2-V1
Rated operating distance	1.5 mm	◆	◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Make function	◆	◆
Assured operating distance	0 ... 1.215 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Indication of the switching state	LED, red	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	V1-connector	◆	◆
	2 m, PUR cable	◆	◆
Housing material	PA	◆	◆
Protection degree	IP67	◆	◆

The inductive proximity sensor with plug-in acknowledgement elements is designed for applications where the simple installation of an adjustable mechanical stop with electronic acknowledgement is required. Heavy duty fine threaded stop screws serve as finely adjustable end stops. The state of the acknowledgement element is indicated by the built-in LED on the proximity sensor.

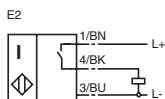
Accessories:  
Stop screws (Acknowledgement elements)



Type	A	B	L	L1	L2	Load
AS 08/15	M 8 x 1	6	15	3,5	2	2 000 N
AS 08/40	M 8 x 1	6	40	3,5	2	2 000 N
AS 10/50	M 10 x 1	7	50	2,5	1	9 500 N
AS 12/60	M 12 x 1	9	60	2	0,5	20 500 N
AS 12/80	M 12 x 1	9	80	2	0,5	20 500 N



NU1,5-F2-E2  
NU1,5-F2-E2-V1



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Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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Speed monitors

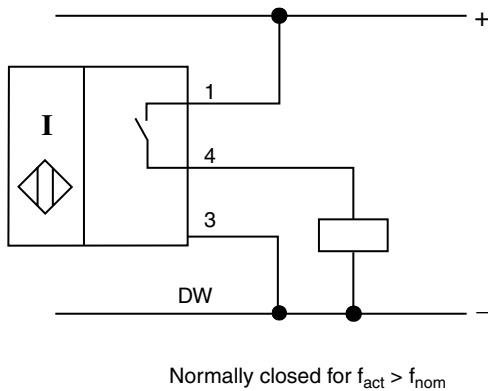


1.8

Inductive sensors with special characteristics (speed monitors)

Speed monitors are sensors in which both the damping status and the act of exceeding or falling short of a reference frequency is signalled. The reference frequency is adjusted with a built-in potentiometer. If the actual frequency  $f_{actual}$  measured by the sensor is smaller than  $f_{nom}$  the output is switched off (open). If the measured actual frequency  $f_{actual}$  is greater than  $f_{nom}$  the output is switched on (closed).

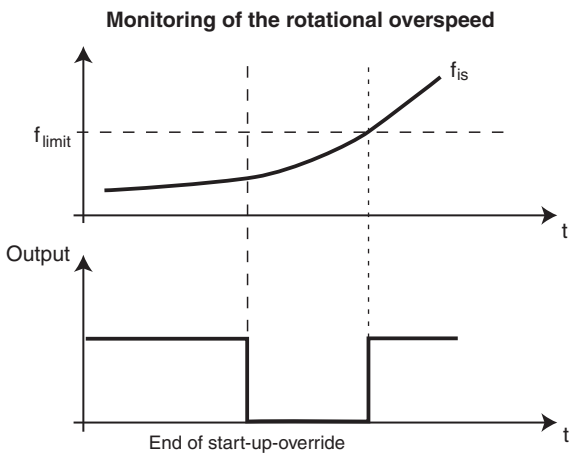
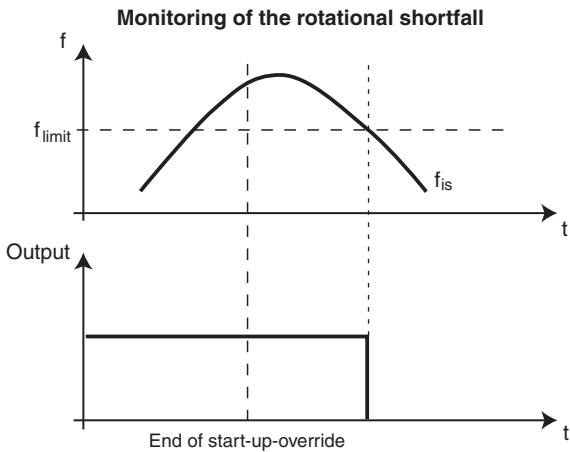
The advantage of this operating mode is that the response time is reduced to the smallest possible value, i.e.  $1/f_{actual}$ .



Speed monitors are available for the following frequency and rotational speed ranges:

- 0.1 Hz ... 1 Hz, i.e. 6 min<sup>-1</sup> ... 60 min<sup>-1</sup>,
- 1 Hz ... 10 Hz, i.e. 60 min<sup>-1</sup> ... 600 min<sup>-1</sup>,
- 10 Hz ... 100 Hz, i.e. 600 min<sup>-1</sup> ... 6000 min<sup>-1</sup>.

Speed monitors are equipped with a startup override: once the operating voltage is applied, the output is switched on for the duration of the start-up override.

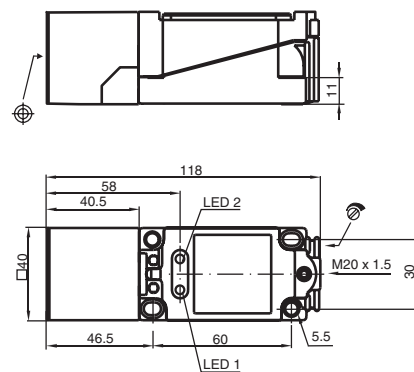






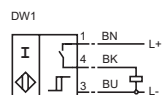
- Start-up override time = approx. 30 s
- Rotational speed controller
- 15 mm embeddable  
NJ15...
- 30 mm not embeddable  
NJ30...
- up to 100 Hz

NJ15+U1+DW1-1  
NJ15+U1+DW1-10  
NJ15+U1+DW1-100  
NJ30+U1+DW1-1  
NJ30+U1+DW1-10



		NJ15+U1+DW1-1	NJ15+U1+DW1-10	NJ15+U1+DW1-100	NJ30+U1+DW1-1	NJ30+U1+DW1-10
Rated operating distance	15 mm	◆	◆	◆		
	30 mm				◆	◆
Installation	embeddable	◆	◆	◆		
	not embeddable				◆	◆
Output type	3-wire	◆	◆	◆		
Switching element function	DC 0.1 ... 1 Hz	◆			◆	
	DC 1 ... 10 Hz		◆			◆
	DC 10 ... 100 Hz			◆		
Assured operating distance	0 ... 12.15 mm	◆	◆	◆		
	0 ... 24.3 mm				◆	◆
Reduction factor $r_{AI}$	0.4	◆	◆	◆	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆	◆	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	15 ... 60 V	◆	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆
Indication of the switching state	LED 1: yellow	◆	◆	◆	◆	◆
Vaporisation display	LED 2: yellow	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆

NJ15+U1+DW1-1  
NJ15+U1+DW1-10  
NJ15+U1+DW1-100  
NJ30+U1+DW1-1  
NJ30+U1+DW1-10



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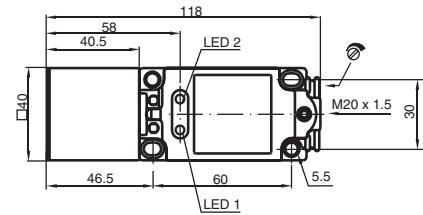
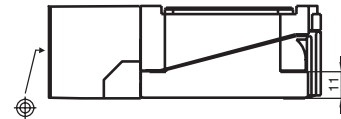
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- Rotational speed controller
- 15 mm embeddable
- Start-up override time = approx. 30 s
- up to 100 Hz



NJ15-U1+DW2-1  
 NJ15-U1+DW2-10  
 NJ15-U1+DW2-100



1.8

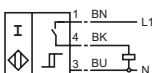
Inductive sensors with special characteristics (speed monitors)



		NJ15+U1+DW2-1	NJ15+U1+DW2-10	NJ15+U1+DW2-100
Rated operating distance	15 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	AC 0.1 ... 1 Hz	◆		
	AC 10 ... 10 Hz		◆	
	AC 10 ... 100 Hz			◆
Assured operating distance	0 ... 12.15 mm	◆	◆	◆
Reduction factor $r_{AI}$	0.4	◆	◆	◆
Reduction factor $r_{Cu}$	0.3	◆	◆	◆
Reduction factor $r_{V2A}$	0.85	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	20 ... 253 V <sup>1)</sup>	◆	◆	◆
Short-circuit protection	no	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1000 mA	◆	◆	◆
Operating current	0 ... 150 mA	◆	◆	◆
Off-state current	0 ... 0.8 mA typ.	◆	◆	◆
Indication of the switching state	LED 1: yellow	◆	◆	◆
Vaporisation display	LED 2: yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Note	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V	◆	◆	◆

NJ15-U1+DW2-1  
 NJ15-U1+DW2-10  
 NJ15-U1+DW2-100

DW2



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

## Inductive analog output sensors

### General

Inductive analog output sensors are able to convert the distance of a metallic object into a proportional output signal, whereby no other switch operations occur. This makes them especially suited for measuring and control applications.

### Output function

Unlike ordinary inductive sensors that can only detect the presence of a metallic object beyond a specific switching distance  $s_n$  (figure 1), inductive analog output sensors detect the position of metallic objects over their entire operating range and provide the measurement roughly proportional to the distance in the form of a current signal between 0 mA and 20 mA (Fig. 2).

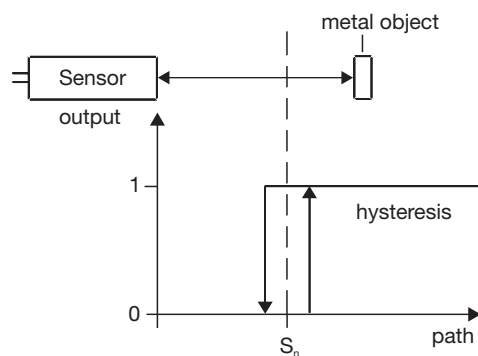


Figure 1

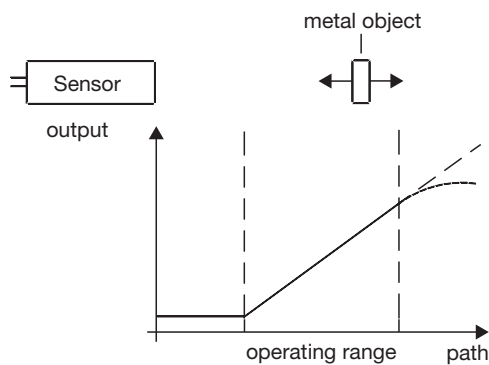


Figure 2

### Mode of operation

Analog sensors operate in a similar way to inductive proximity sensors in that a magnetic alternating field is emitted by the active face of the sensor. This causes eddy currents to be produced whenever an electrically conductive object approaches. This loss of energy causes a drop in the quality factor of the coil in the sensor, whereby the damping of the coil becomes stronger the closer the object comes to the active face.

The special design of the oscillator allows the damping of the resonant circuit with distance (i. e. the change in quality factor) to be converted to an almost linear measuring signal which is supplied as a current signal after amplification and correction (Fig. 3).

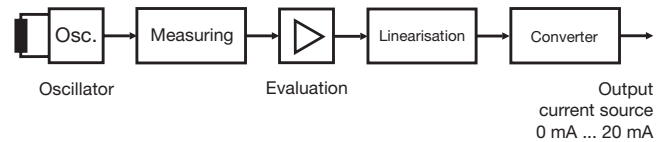


Figure 3

The curves and characteristics indicated in the data sheets are based on a ferromagnetic target (St 37), since this produces the highest operating range. Metals with different permeability or electrical conductivity values produce restricted operating ranges roughly corresponding to the reduction factors of these metals when used with sensors.

Fig. 4 shows the characteristic of an analog sensor in an M18 housing (embeddable) for targets consisting of different materials. Here we can see that the useful operating range diminishes with the decreasing permeability or increasing electrical conductivity of the target. This is due to the minimal change in quality factor of the resonant circuit.

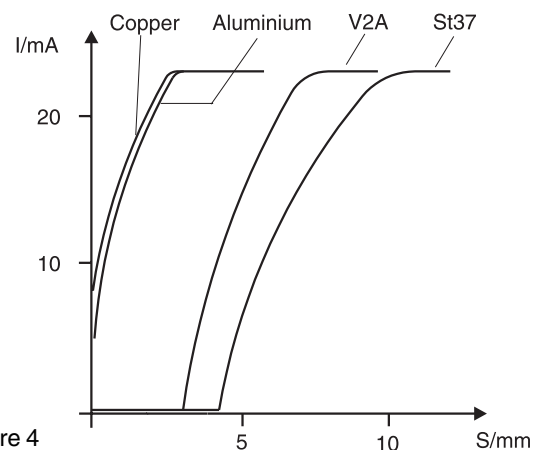


Figure 4

When using an object made of ST 37, the following sensing ranges are available where the output signal is proportional to the distance (i.e. a linear function of the distance):

- IA 5(2 ... 5 mm)
- IA 6(0 ... 6 mm)
- IA 8(3 ... 8 mm)
- IA 40(15 ... 40 mm)

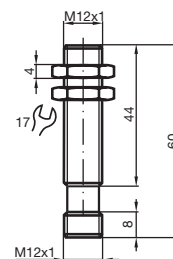
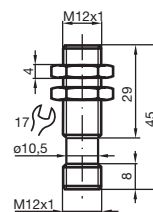
**Inductive positioning systems PMI can be found in chapter 7 starting on Page 597**



- Inductive analogue transmitter
- 0...6 mm quasi-embeddable
- Analogue output 0 V ... 10 V/4 mA ... 20 mA  
IA6-12GM50-IU-V1
- Analogue output 0 V ... 5 V  
IA6-12GM35-U-V1

IA6-12GM35-U-V1

IA6-12GM50-IU-V1



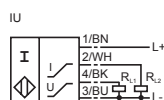
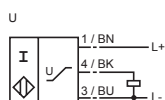
1.8

Inductive sensors with special characteristics (analogue output)

		IA6-12GM35-U-V1	IA6-12GM50-IU-V1
Measurement range	0 ... 6 mm	◆	◆
Installation	quasi embedd.	◆	◆
Output type	4-wire	◆	◆
Switching element function	analogue, current or voltage output	◆	◆
	Analogue voltage output	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
	15 ... 30 V	◆	◆
No-load supply current	≤ 10 mA	◆	◆
Reverse polarity protection	yes	◆	◆
Short-circuit protection	yes	◆	◆
Output voltage	0 ... 10 V	◆	◆
	0 ... 5 V	◆	◆
Output rated operating current	4 ... 20 mA	◆	◆
Limit frequency (3dB)	1000 Hz	◆	◆
Temperature drift	± 5 % (0 ... 70 °C)	◆	◆
	± 10 % (-25 ... 0 °C)	◆	◆
Load resistor	voltage output: > 500 Ω	◆	◆
	voltage output: > 500 Ω	◆	◆
	current output: < 500 Ω	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	V1-connector	◆	◆
Housing material	brass, chromium plated	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

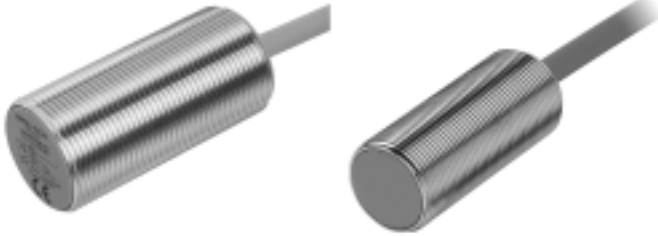
IA6-12GM35-U-V1

IA6-12GM50-IU-V1



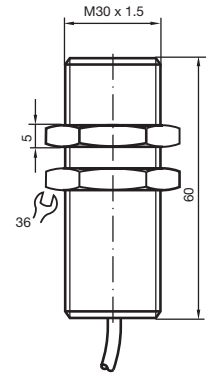
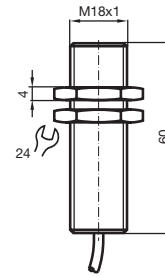
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Inductive analogue transmitter
- Output 0 mA ... 20 mA
- Embeddable mountable



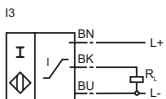
IA5-18GM-I3

IA8-30GM-I3



		IA5-18GM-I3	IA8-30GM-I3
Measurement range	2 ... 5 mm	◆	
	3 ... 8 mm		◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	analog current output	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	15 ... 30 V	◆	◆
No-load supply current	≤ 10 mA	◆	◆
Output signal	0 ... 20 mA	◆	◆
Temperature drift	±1%/°K (of range)	◆	◆
Repeat accuracy	0 ... 15 µm		◆
	0 ... 6 µm	◆	
0 ... 20 mA	≤ 3.5 A/s		◆
	≤ 5.1 A/s	◆	
20 ... 0 mA	≤ 3.3 A/s		◆
	≤ 4 A/s	◆	
Load resistor	0 ... 500 Ohm	◆	◆
Ambient temperature	-10 ... 70 °C (263 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	brass, nickel-plated	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

IA5-18GM-I3  
IA8-30GM-I3



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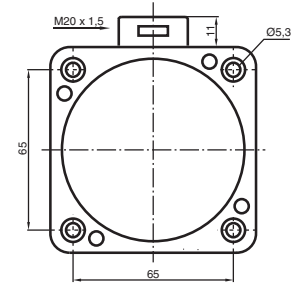
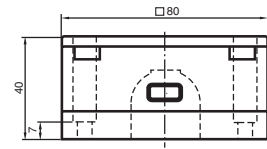
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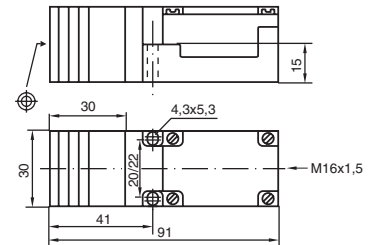
- Inductive analogue transmitter
- Output 0 mA ... 20 mA
- Not embeddable mountable



IA40-FP-13-P1

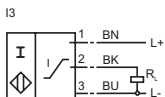


IA8-M1K-13



		IA8-M1K-13	IA40-FP-13-P1
Measurement range	15 ... 40 mm	◆	◆
	3 ... 8 mm	◆	
Installation	not embeddable	◆	◆
	for non-embedded mounting	◆	
Output type	3-wire	◆	◆
Switching element function	analogue current output	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	15 ... 30 V	◆	◆
No-load supply current	≤ 8 mA	◆	◆
Output signal	0 ... 20 mA	◆	◆
Temperature drift	±1%/K (of range)	◆	◆
Repeat accuracy	0 ... 6 μm	◆	◆
0 ... 20 mA	≤ 12 A/s	◆	◆
	≤ 3.2 A/s	◆	
20 ... 0 mA	≤ 3.9 A/s	◆	
	≤ 5.1 A/s	◆	
Load resistor	0 ... 500 Ohm	◆	◆
Ambient temperature	-10 ... 70 °C (263 ... 343 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

IA40-FP-13-P1  
IA8-M1K-13



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Date of edition 20.08.03-20

Inductive sensors with special characteristics (analogue output)

1.8

## Intelligent sensors for AS-Interface



The trend in automation technology is moving away from the use of cable harnesses and conduits towards the use of bus systems. This is due to a desire to "save copper" (cables, distributors, terminals, cable tubing, etc.) and to introduce major simplifications to the design ("electronic" wiring blocks), installation (unshielded two-wire cables), and maintenance (diagnostic properties) of a system. AS-Interface was designed for simplicity, flexibility, and reliability. This is accomplished by using an unshielded two-wire cable (also reliable for redundant piercing) which transfers both data and power from one bus component to another.

### Intelligent sensors for AS-Interface

In previous systems using conventional wiring, the detection of a sensor malfunction was often difficult and associated with lengthy system down-times.

In modern systems, specially integrated circuits help sensors develop their own "intelligence" and enhance their functionality. These sensors are then able to monitor themselves and their own leads and exchange data with a primary unit (e. g. PLC). As many as 31 (specification 2.0) or 62 (specification 2.1) AS-Interface sensors can be connected per master on one line.

### Pre-failure indication

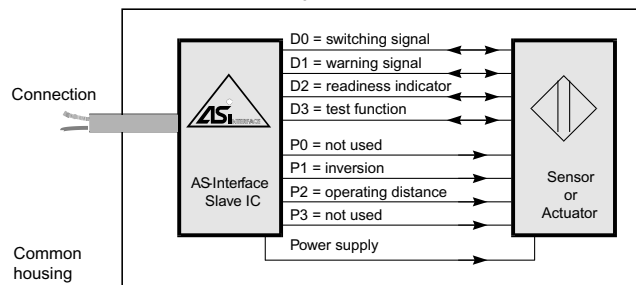
In practice, inductive sensors are adjusted so that the distance between the detected object and the active face is about 50 % of the nominal sensing range  $s_n$ . The sensor is guaranteed to function error free within the specified sensing range of  $s_a = (0 \text{ to } 0.81) \cdot s_n$ . A pre-fault indicator bit (data bit 1) is set whenever the detected object is between  $s_a$  and  $s_r$  (actual sensing range). This makes it possible to detect a faulty adjustment early before a detection error occurs.

The preset value of data bit 1 is "1", which means "normal status". When the pre-fault indicator is set, the value of this data bit is "0". This value remains present until the sensor is fully damped or the target has approached more closely than  $s_a$  and has then moved away again, i. e.  $s_r + \text{hysteresis}$ .

### On/off delay

The switching state can be delayed by  $t = 15 \text{ ms}$  using the parameter bits.

### AS-Interface Proximity Switch



### Oscillator monitoring

Since the coil is at the very front of inductive sensors, they are often prone to damage due to mechanical effects. A special function monitors the coil and reports to the primary system immediately in case of an error.

### Parameters

The switching function can be programmed by bus command via a parameter (NO, normally open, or NC, normally closed).

### Designs

Intelligent sensors for AS-Interface are available in the following designs:

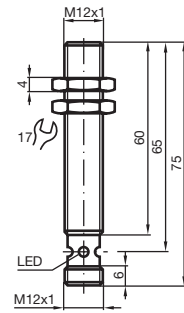
- Cylindrical (from M12 to M30), embeddable and non-embeddable, in stainless steel housing with V1 connector with multiple LED
- Rectangular
  - limit switch connectable via terminal compartment
  - limit switch L connectable via M12 device connector
  - limit switch M connectable via terminal compartment
  - FP connectable via terminal compartment
- surface mount F design with 2 m round cable



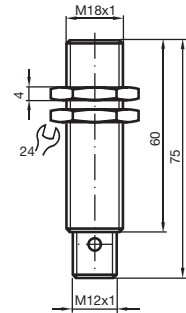
- A/B slave with extended addressing possibility for up to 62 slaves
- NO/NC selectable
- ON/Off delay (disconnectable)
- Stability control warning
- Installation help
- Oscillator monitoring



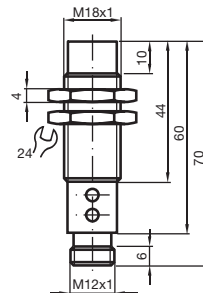
NCB4-12GM60-B3B-V1



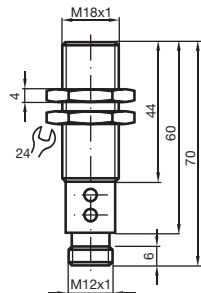
NBB8-18GM60-B3B-V1



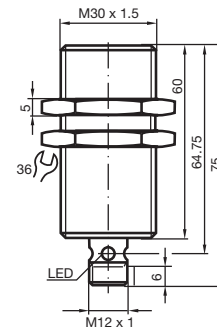
NCB5-18GM60-B3B-V1



NCB5-18GM60-B3B-V1



NBB15-30GM60-B3B-V1



		NCB4-12GM60-B3B-V1	NCB5-18GM60-B3B-V1	NBB8-18GM60-B3B-V1	NCN8-18GM60-B3B-V1	NBB15-30GM60-B3B-V1
Rated operating distance		4 mm	5 mm	8 mm	8 mm	15 mm
Installation	embeddable	◆	◆	◆	◆	◆
	not embeddable					◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NO/NC programmable	◆	◆	◆	◆	◆
Assured operating distance	0 ... 12.15 mm					◆
	0 ... 3.24 mm	◆				
	0 ... 4.05 mm		◆			
	0 ... 6.48 mm			◆	◆	
Reduction factor $r_{AI}$		0.23	0.2	0.4	0.42	0.4
Reduction factor $r_{Cu}$	0.15		◆			
	0.21	◆				
	0.4			◆	◆	◆
Reduction factor $r_{V2A}$	0.62		◆			
	0.7	◆		◆	◆	◆
	0.72				◆	◆
Reduction factor $r_{Brass}$	0.5			◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-i bus system	◆	◆	◆	◆	◆
Switching frequency	0 ... 100 Hz		◆			
	0 ... 200 Hz			◆		
	0 ... 500 Hz				◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆	◆
Operating voltage display	dual-LED, green		◆			◆
Indication of the switching state	dual-LED, yellow	◆		◆		◆
	dual-LED, yellow/red		◆		◆	
Fault indication	dual-LED, red	◆		◆		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆		◆		◆
	-25 ... 70 °C (248 ... 343 K)		◆		◆	
Connection type	V1-connector	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆
	brass, nickel-plated			◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆

B3B



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

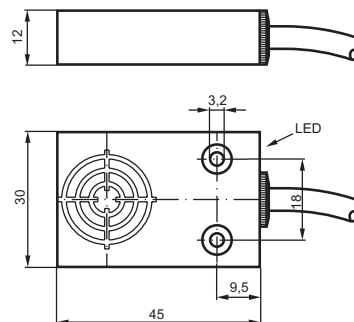




- Basic series
- 6 mm embeddable
- NO/NC selectable
- Protection degree IP67
- Oscillator monitoring



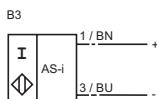
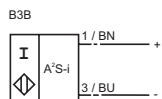
NBB6-F-B3  
NBB6-F-B3B



		NBB6-F-B3	NBB6-F-B3B
Rated operating distance	6 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	NO/NC programmable	◆	◆
Assured operating distance	0 ... 4.86 mm	◆	◆
Reduction factor $r_{A1}$	0.28	◆	◆
Reduction factor $r_{Cu}$	0.25	◆	◆
Reduction factor $r_{V2A}$	0.75	◆	◆
Kind of voltage	DC	◆	◆
Rated operational voltage	26.5 ... 31.6 V from AS-Interface	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-i bus system	◆	◆
Operating current	20 mA	◆	◆
Switching frequency	$\geq 500$ (P3=0), $\geq 500$ (P3=0), $\geq 100$ (P3=1)	◆	◆
LED POWER	AS-i voltage; LED green	◆	◆
LED IN	switching state (input); LED yellow	◆	◆
LED OUT	Dual LED yellow/red yellow: switching state red: error mode	◆	◆
Ambient temperature	-25 .. 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Mass	90 g	◆	◆

NBB6-F-B3B

NBB6-F-B3



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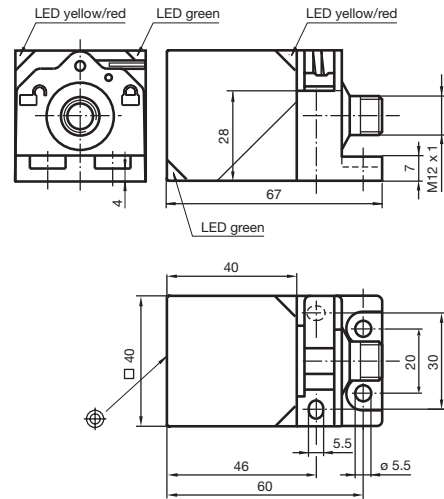
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- A/B slave with extended addressing possibility for up to 62 slaves
- Sensor head bi-directional and rotatable
- NO/NC selectable
- Oscillator monitoring
- ON/Off delay (disconnectable)

NBB20-L2-B3B-V1  
 NBN30-L2-B3B-V1  
 NBN40-L2-B3B-V1



1.8

Inductive sensors with special characteristics (sensors with AS-Interface)

		NBB 20-L2-B3B-V1	NBN 30-L2-B3B-V1	NBN 40-L2-B3B-V1
Rated operating distance	20 mm	◆		
	30 mm		◆	
	40 mm			◆
Installation	embeddable	◆		
	not embeddable		◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	NO/NC programmable	◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆		
	0 ... 24.3 mm		◆	
	0 ... 32.4 mm			◆
Reduction factor $r_{Al}$	0.3		◆	◆
	0.33	◆		
Reduction factor $r_{Cu}$	0.3		◆	◆
	0.31	◆		
Reduction factor $r_{V2A}$	0.74	◆		
	0.75		◆	◆
Reduction factor $r_{Brass}$	0.38		◆	
	0.41	◆		
Kind of voltage	DC	◆	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-i bus system	◆	◆	◆
Switching frequency	0 ... 100 Hz		◆	
	0 ... 150 Hz	◆		
	0 ... 50 Hz			◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Operating voltage display	LED, green	◆		◆
	LED green		◆	
Indication of the switching state	dual-LED, yellow/red	◆	◆	
	LED, yellow			◆
Fault indication	dual-LED, yellow/red	◆	◆	
	LED, red			◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector	◆	◆	◆
Housing material	PA 6 Grivory GVN-35H	◆	◆	◆
Sensing face	PA 6 Grivory GVN-35H	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Mass	210 g	◆	◆	◆

B3B

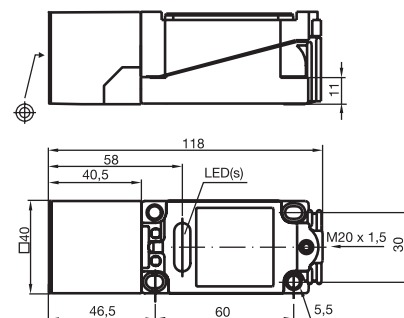


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



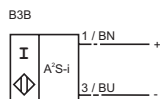
- NO/NC programmable
- Position of the sensor head adjustable
- Oscillator monitoring
- ON/Off delay (disconnectable)
- A/B slave with extended addressing possibility for up to 62 slaves

NBB20+ U1 +B3B  
 NBN30+ U1 +B3B  
 NBN40+ U1 +B3B



		NBB20+ U1 +B3B	NBN30+ U1 +B3B	NBN40+ U1 +B3B
Rated operating distance	20 mm	◆		
	30 mm		◆	
	40 mm			◆
Installation	embeddable	◆		
	not embeddable		◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	NO/NC programmable	◆	◆	◆
Assured operating distance	0 ... 16.2 mm	◆		
	0 ... 24.3 mm		◆	
Reduction factor $r_{Al}$	0 ... 32.4 mm			◆
	0.4	◆		
Reduction factor $r_{Cu}$	0.5		◆	◆
	0.35	◆		
Reduction factor $r_{V2A}$	0.45		◆	◆
	0.85	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-i bus system	◆	◆	◆
Switching frequency	0 ... 150 Hz	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Fault indication	LED, red	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

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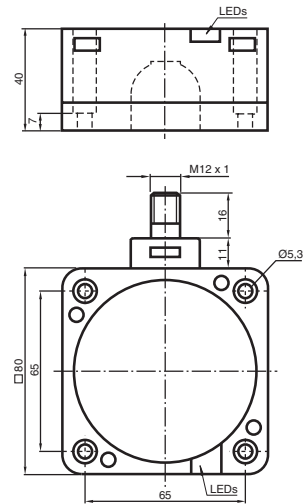
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- A/B slave with extended addressing possibility for up to 62 slaves
- NO/NC selectable
- ON/Off delay (disconnectable)
- Oscillator monitoring

NBB40-FP-B3B-P1-V1



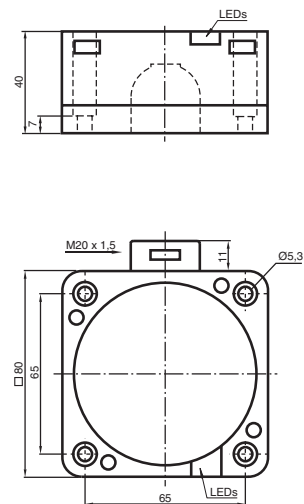
1.8

Inductive sensors with special characteristics (sensors with AS-Interface)



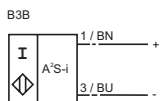
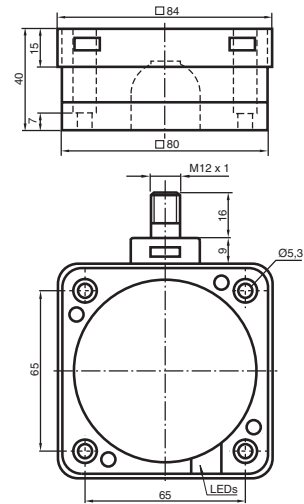
		NBB 40-FP-B3B-P1-V1	NBB 50-FP-B3B-P1-V1	NBN 50-FP-B3B-P1-V1	NBN50-FP-B3B-P3
Rated operating distance	40 mm	◆			
	50 mm		◆	◆	◆
Installation	embeddable	◆	◆		
	not embeddable			◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NO/NC programmable	◆	◆	◆	◆
Assured operating distance	0 ... 32.4 mm	◆			
	0 ... 40.5 mm		◆	◆	◆
Reduction factor $r_{A1}$	0.25	◆			
	0.38		◆		
	0.4			◆	◆
Reduction factor $r_{Cu}$	0.23	◆			
	0.3			◆	◆
	0.35		◆		
Reduction factor $r_{V2A}$	0.83		◆		
	0.85	◆		◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-i bus system	◆	◆	◆	◆
Switching frequency	0 ... 80 Hz	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆
Operating voltage display	LED green	◆	◆	◆	◆
Indication of the switching state	LED yellow	◆	◆	◆	◆
Fault indication	LED red	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	terminal compartment				◆
	V1-connector	◆	◆	◆	
Housing material	PBT	◆	◆	◆	
	PBT/metal				◆
Sensing face	PBT	◆	◆	◆	
Protection degree	IP67	◆	◆	◆	◆

NBN50-FP-B3B-P3



NBB50-FP-B3B-P1-V1

NBN50-FP-B3B-P1-V1



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## Valve positioners

Product flow control valves are used in large numbers in all fields of process engineering. In the majority of applications, these valves are controlled by a 90° shaft rotation whose final position is normally reported to the control system.

For this purpose, standard housings according to VDI/VDE 3845 (valves interfaces, valve positioners, and positioner accessories) are used that contain the check back proximity switches. These housings have the following advantages:

- standardization
- well protected
- integrated terminals for switches and valve controls.

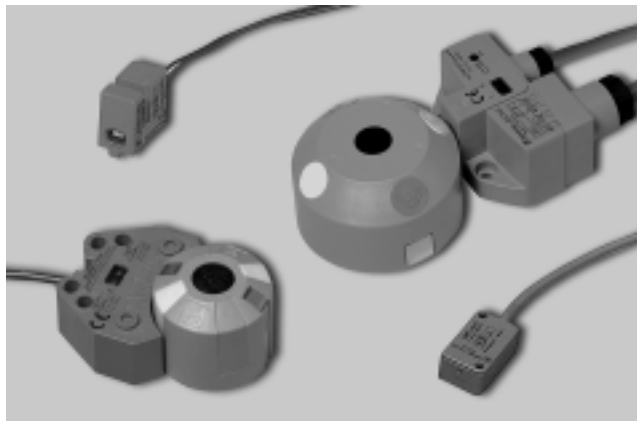
A large number of sensors are integrated into these housings.

Pepperl+Fuchs has specially designed sensors for this application (LED location, cable length and diameter). These are listed in the following table

Type	Note
SC3,5-NO SC3,5-G-NO SB3,5-E2 SB3,5-G-E2	135 mm cable length with sleeves LED opposite the cable, M 2 thread (only for SC3,5-G-NO and SB3,5-G-E2)
NCB2-12GM35-NO NBB2-12GM40-E2 NBB2-12GM40-Z0 NCN4-12GM35-NO NBN4-12GM40-E2 NBN4-12GM40-Z0 NCB5-18GM40-NO	LED axially positioned in transparent cover, visible in all directions, housing length 35 mm or 40 mm
NBB2-V3-E2 NBB3-V3-Z4 NCB2-V3-NO NCN4-V3-NO	Micro switch design V3 cable length 100 mm

In recent years more and more so-called open solutions are being used. This means that check back switches are no longer mounted in housings but directly on the actuator. This has the following advantages:

- quick installation
- easy replacement
- highly compact



Pepperl+Fuchs carries several product lines of dual proximity sensors and accessories for this application:

### Dual sensors

Proximity sensors for mounting in standard housings or directly on the actuator NCN3-F25-..., NBN3-F25-..., with compatible mounting hole positions according to VDI/VDE 3845.

Models NCN3-F25-N4-K and NBN3-F25-E8-K are equipped with a 4-pin cage clamp terminal strip which allows the control cable to be directly connected to the sensor. The sensors are also available on print circuit boards ready for connection. The main advantage of this combination is that the standard housing manufacturers do not need to concern themselves with electromechanics. Depending on the version, this board allows the control valve to be connected to the control cable without an additional terminal box. Plug connectors simplify the disassembly of the actuator. This board is also available as a bus version (PL1-F25-B3-S) with integrated AS-interface. The states of the sensors, the control commands for the pilot valve, and the power supply are all transmitted via a two-wire cable.

Proximity sensors for use directly on the actuator NCN3-F31-..., NBN3-F31-... with compatible mounting hole positions according to VDI/VDE 3845. The shape of the proximity sensor has been optimized to simplify mounting on actuators of different sizes. The entire range of variations approved by VDI/VDE 3845 is covered by a single housing design and two different actuating elements.

This housing has room for two connections: system cable and control valve. It can be equipped with various types of connectors: V1, V16, V18 connectors, terminal compartment, and cable. The following electrical versions are currently available: NAMUR, two and three-wire DC and AS-Interface, each with or without control valve connection. With the ...-F31K series, we offer a solution for open construction with a terminal compartment connection.

### Accident prevention

The specifications of the Accident Prevention Regulation were observed for all open systems throughout the product design process (TÜV certificate available).



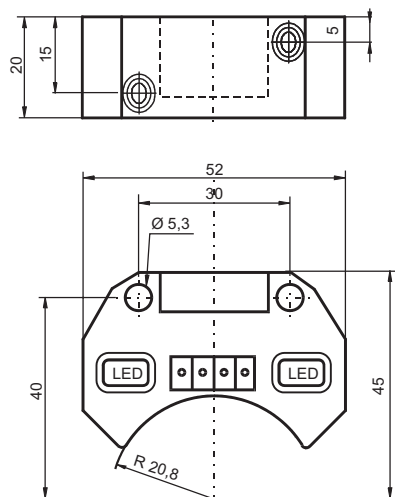
- Satisfies machinery directive
- For installation in housing
- Direct mounting on standard actuators  
NBN3-F25-E8-5M
- Pluggable cage clamp terminals  
NBN3-F25-E8-K

1.9

Inductive sensors for valve positioners

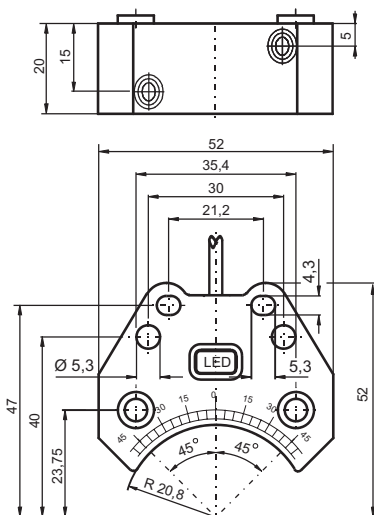


NBN3-F25-E8-K

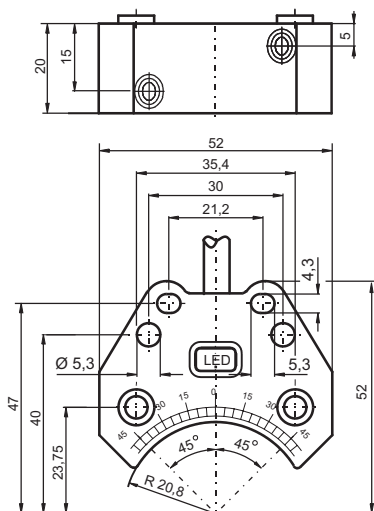


		NBN3-F25-E8-0,14	NBN3-F25-E8-5M	NBN3-F25-E8-K
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 .. 343 K)	◆	◆	◆
Connection type	MINI-COMBICON	◆	◆	◆
	180 mm, PVC cable	◆	◆	◆
	5 m, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Note	Mounted on mechanical drive	◆	◆	◆
	Installation in housing	◆	◆	◆

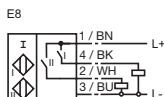
NBN3-F25-E8-014



NBN3-F25-E8-5M



NBN3-F25-E8-5M  
NBN3-F25-E8-014  
NBN3-F25-E8-K

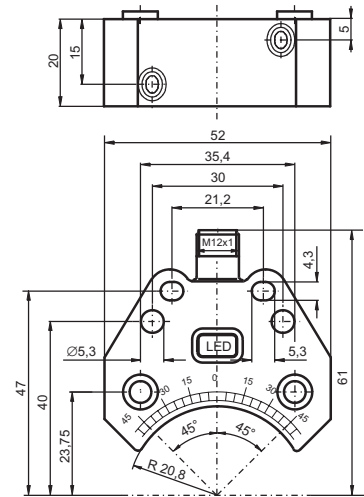


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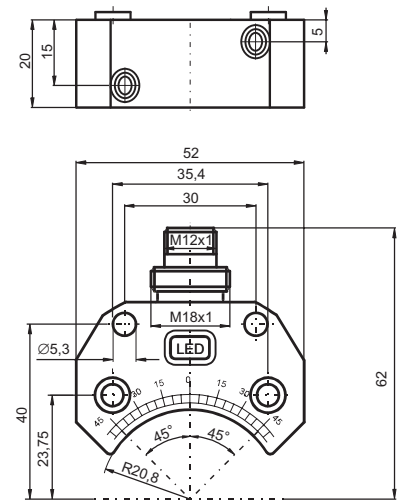
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- Satisfies machinery directive

NBN3-F25-E8-V1

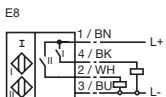


NBN3-F25F-E8-V1



		NBN3-F25-E8-V1	NBN3-F25F-E8-V1
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Dual Make function	◆	◆
Assured operating distance	0 ... 2.3 mm	◆	◆
	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 25 mA	◆	◆
Reverse polarity protection	all connections	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	V1-connector	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
Note	Mounted on mechanical drive	◆	◆
	Installation in housing	◆	◆

NBN3-F25-E8-V1  
NBN3-F25F-E8-V1



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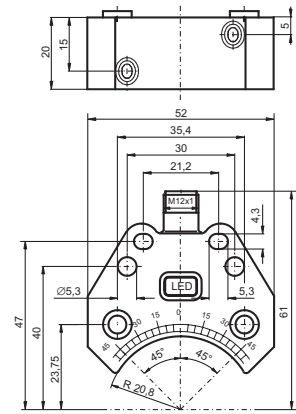
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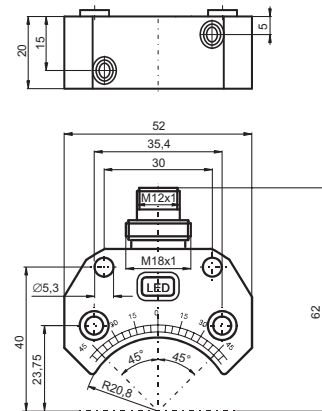
- Satisfies machinery directive
- For installation in housing  
NBN3-F25-Z8-0,14  
NBN3-F25F-Z8-V1



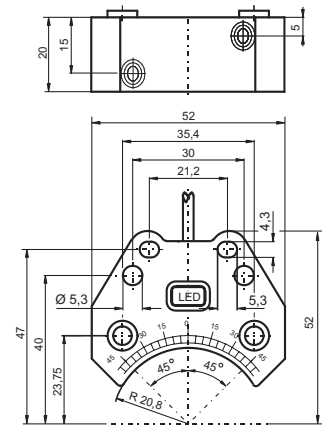
NBN3-F25-Z8-V1



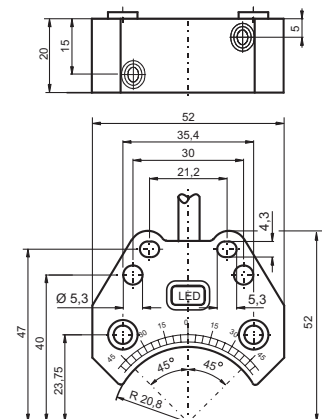
NBN3-F25F-Z8-V1



NBN3-F25-Z8-0,14



NBN3-F25-Z8-5M



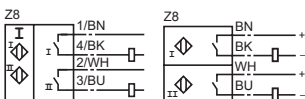
1.9

Inductive sensors for valve positioners

		NBN3-F25-Z8-0,14	NBN3-F25-Z8-5M	NBN3-F25F-Z8-V1	NBN3-F25-Z8-V1
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	Binary NO	◆	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	6 ... 60 V	◆	◆	◆	◆
Reverse polarity protection	tolerant	◆	◆	◆	◆
Short-circuit protection	no	◆	◆	◆	◆
Voltage drop	≤ 5 V	◆	◆	◆	◆
Operating current	4 ... 100 mA	◆	◆	◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 .. 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
	180 mm, PVC cable	◆			
	5 m, PVC cable		◆		
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Note	Mounted on mechanical drive	◆	◆	◆	◆
	Installation in housing	◆		◆	

NBN3-F25-Z8-V1  
NBN3-F25-Z8-0,14  
NBN3-F25-Z8-V1

NBN3-F25-Z8-5M



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-20

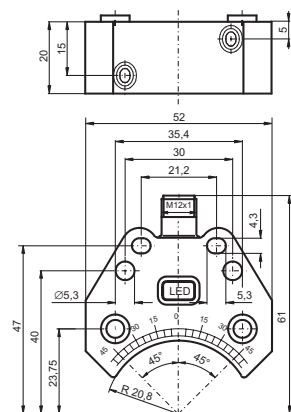




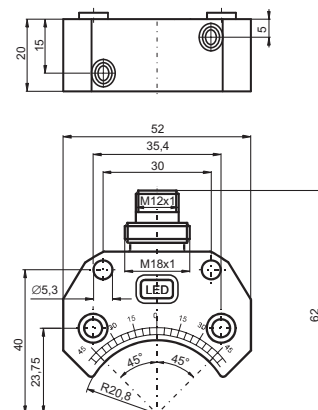
- Satisfies machinery directive
- For installation in housing
- Direct mounting on standard actuators  
NBN3-F25-E8-0,14-3D  
NBN3-F25-E8-3D-5M



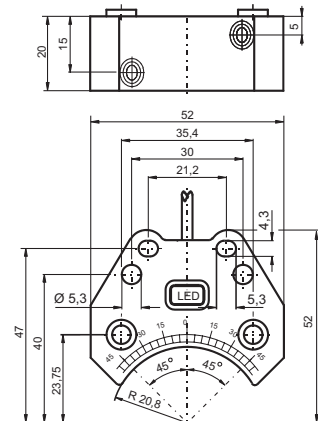
NBN3-F25-E8-V1-3D



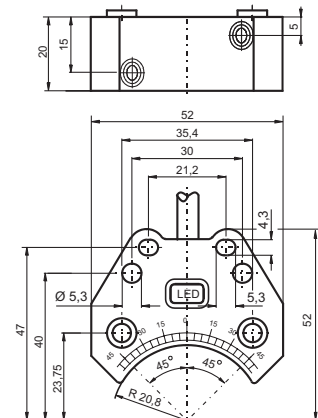
NBN3-F25F-E8-V1-3D



NBN3-F25-E8-Q14-3D

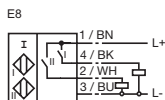


NBN3-F25-E8-3D-5M



		NBN3-F25-E8-0,14-3D	NBN3-F25-E8-3D-5M	NBN3-F25-E8-V1-3D	NBN3-F25F-E8-V1-3D
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆	◆
Assured operating distance	0 ... 2.3 mm	◆	◆	◆	◆
	0 ... 2.43 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	V1-connector	◆	◆	◆	◆
	180 mm, PVC cable	◆	◆	◆	◆
	5 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Note	Mounted on mechanical drive	◆	◆	◆	◆
	Installation in housing	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	3D	◆	◆	◆	◆

NBN3-F25-E8-Q14-3D  
NBN3-F25-E8-3D-5M  
NBN3-F25-E8-V1-3D  
NBN3-F25F-E8-V1-3D



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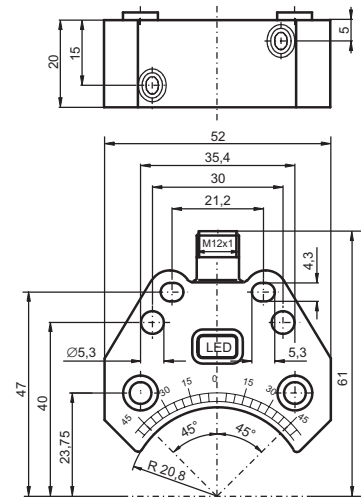


- Satisfies machinery directive
- EC-Type Examination Certificate TUV99 ATEX 1479X
- For installation in housing
- Direct mounting on standard actuators
- Pluggable cage clamp terminals

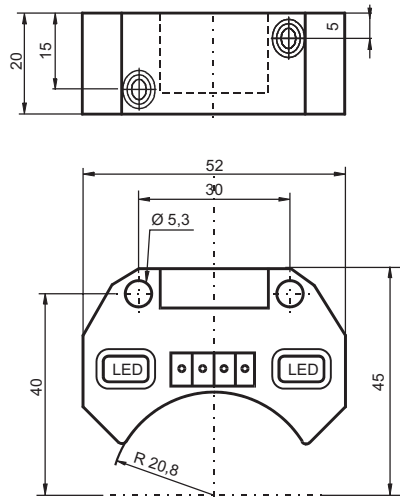
NCN3-F25-N4-K



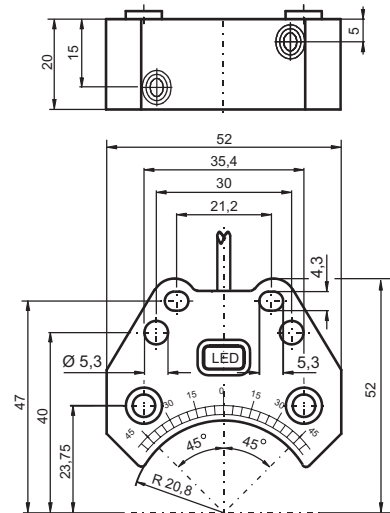
NCN3-F25-N4-V1



NCN3-F25-N4-K

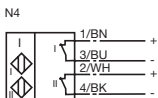


NCN3-F25-N4-Q,14



		NCN3-F25-N4-0,14	NCN3-F25-N4-K	NCN3-F25-N4-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	yes pulsing	◆	◆	◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection type	MINI-COMBICON V1-connector	◆	◆	◆
	180 mm, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP20	◆	◆	◆
Note	IP67	◆	◆	◆
	Mounted on mechanical drive	◆	◆	◆
	Installation in housing	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 3G; 3D	◆	◆	◆
	2G	◆	◆	◆

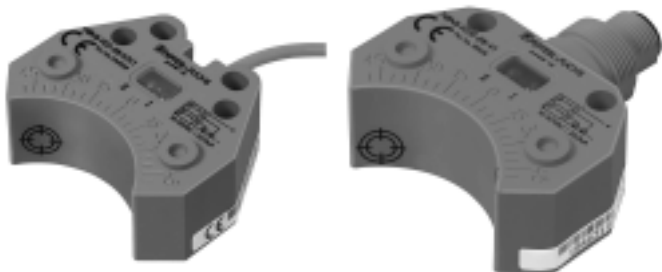
NCN3-F25-N4-Q,14  
NCN3-F25-N4-K  
NCN3-F25-N4-V1



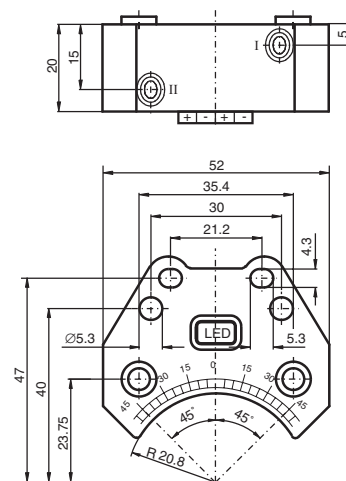
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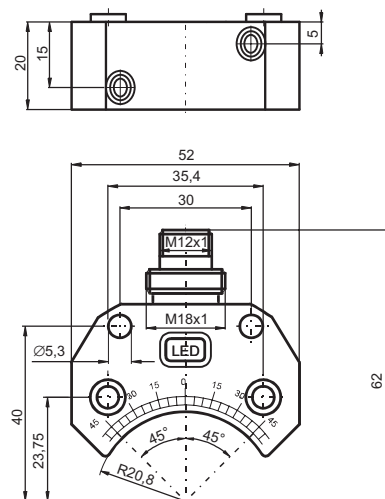
- For installation in housing
- Direct mounting on standard actuators
- Satisfies machinery directive  
NCN3-F25-N4-V84
- EC-Type Examination Certificate  
TUV99 ATEX 1479X  
NCN3-F25-N4-V84



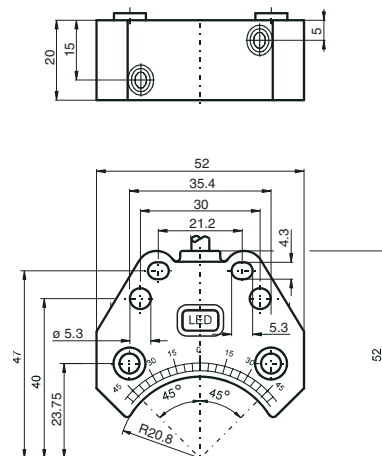
NCN3-F25-N4-V84



NCN3-F25F-N4-V1



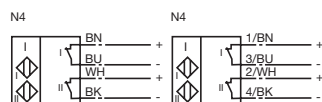
NCN3-F25-N4-K1-V1



		NCN3-F25-N4-K1-V1	NCN3-F25-N4-V84	NCN3-F25F-N4-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable not embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
	8.2 V	◆	◆	◆
No-load supply current	≤ 3 mA	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	yes short-circuit proof	◆	◆	◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection type	Contact plugs and soldering surfaces	◆	◆	◆
	V1-connector	◆	◆	◆
	V1 plug cartridge	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP00 (solder pins), IP20 (completely fitted); according to EN 60529	◆	◆	◆
	IP67	◆	◆	◆
Note	Mounted on mechanical drive Bopla PG screwed connection	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G	◆	◆	◆
	1G; 2G; 3G; 3D	◆	◆	◆

NCN3-F25-N4-V84

NCN3-F25F-N4-V1  
NCN3-F25-N4-K1-V1



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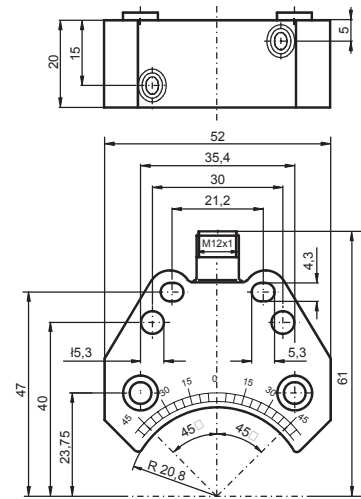
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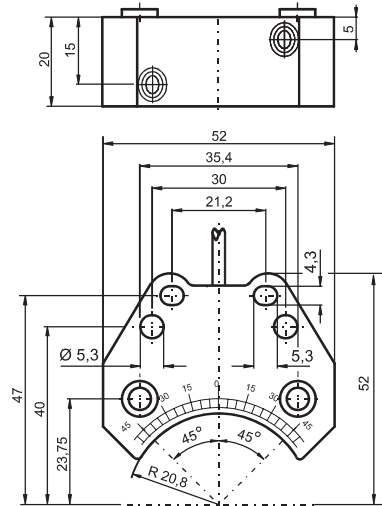


- Usable up to SIL3 acc. to IEC61508
- EC-Type Examination Certificate TUV99 ATEX 1479X
- For installation in housing
- NCN3-F25-SN4-0,14
- Direct mounting on standard actuators

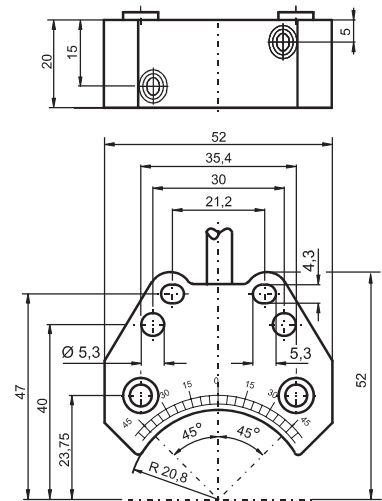
NCN3-F25-SN4-V1



NCN3-F25-SN4-0,14

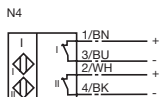


NCN3-F25-SN4-5M



		NCN3-F25-SN4-5M	NCN3-F25-SN4-0,14	NCN3-F25-SN4-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆
Reverse polarity protection	no	◆	◆	◆
Short-circuit protection	no	◆	◆	◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
	-25 ... 100 °C (248 ... 373 K) (fixed cable)	◆	◆	◆
Connection type	V1-connector			◆
	180 mm, PVC cable		◆	
	5 m, PVC cable	◆		
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Note	Mounted on mechanical drive	◆		
	Installation in housing		◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 3G	◆	◆	◆

NCN3-F25-SN4-5M  
 NCN3-F25-SN4-0,14  
 NCN3-F25-SN4-V1



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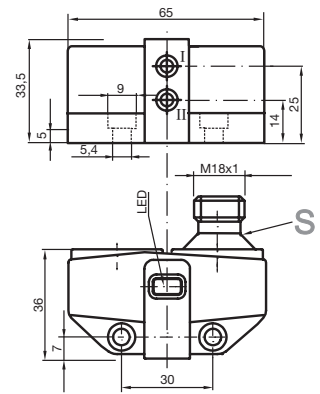
1.9 Inductive sensors for valve positioners



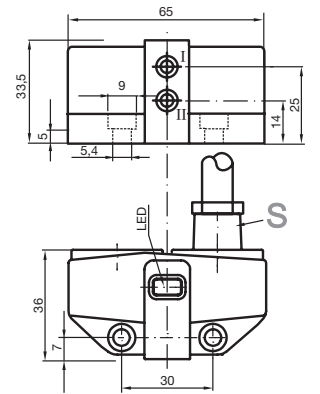
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



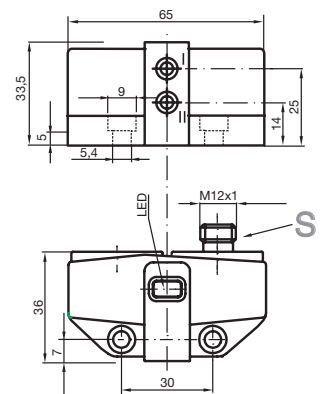
NBN3-F31-E8-V18



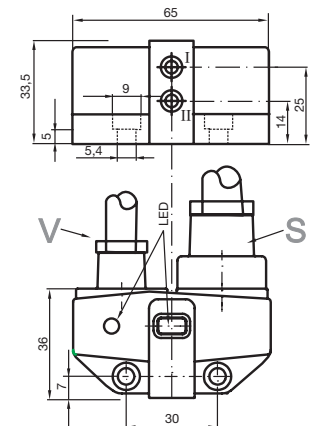
NBN3-F31-E8-K



NBN3-F31-E8-V1

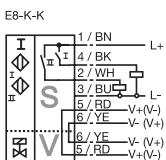


NBN3-F31-E8-KK

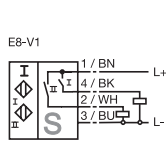


		NBN3-F31-E8-K	NBN3-F31-E8-K-K	NBN3-F31-E8-V1	NBN3-F31-E8-V18
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆	◆
Assured operating distance	0 ... 243 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆
Off-state current	0 ... 0.1 mA typ. 20 µA at 25 °C	◆	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection (system side)	V1-connector			◆	
	V18-connector				◆
	5 m, PVC cable	◆	◆		
Connection (valve side)	0.5 m, PVC cable		◆		
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

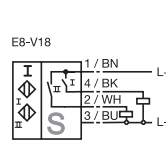
NBN3-F31-E8-KK



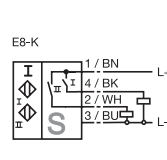
NBN3-F31-E8-V1



NBN3-F31-E8-V18



NBN3-F31-E8-K



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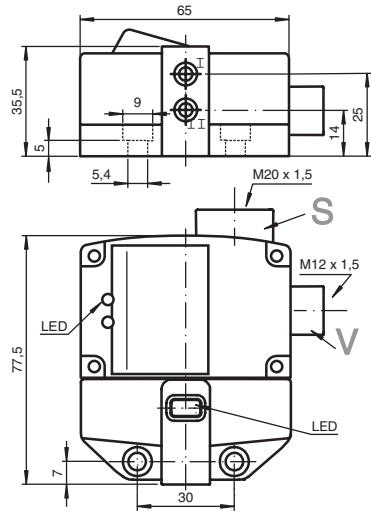
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive

1.9

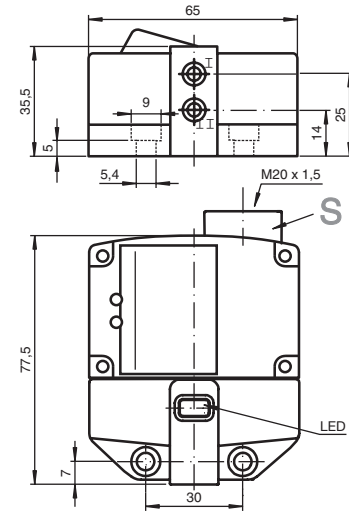
Inductive sensors for valve positioners



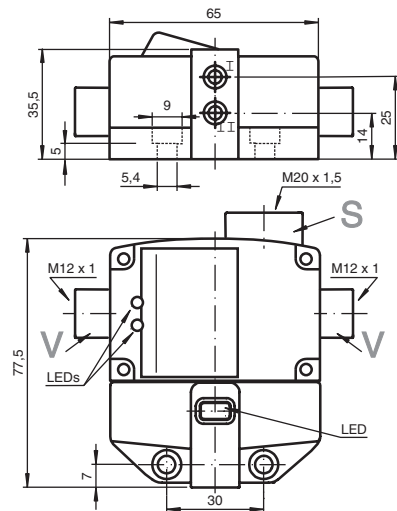
NBN3-F31K-E8-K



NBN3-F31K-E8

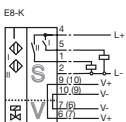


NBN3-F31K-E8-V1-V1

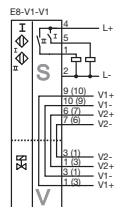


		NBN3-F31K-E8	NBN3-F31K-E8-K	NBN3-F31K-E8-V1-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	4-wire	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆	◆
Connection (valve side)	Cage clamp terminals	◆	◆	◆
	V1 connector	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

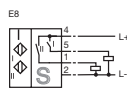
NBN3-F31K-E8-K



NBN3-F31K-E8-V1-V1



NBN3-F31KE8

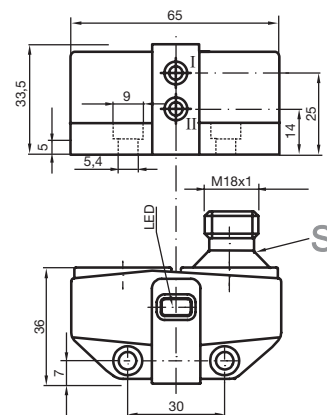


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

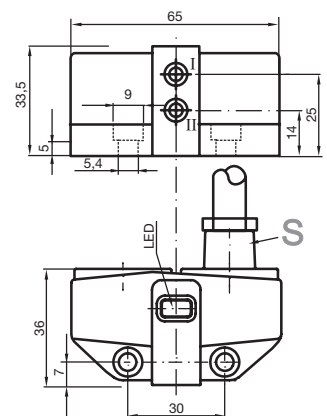
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting



NBN3-F31-U8-V18

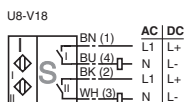


NBN3-F31-U8-K

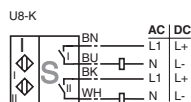


		NBN3-F31-U8-K	NBN 3-F31-U8-V18
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	4-wire	◆	◆
Switching element function	AC/DC binary NO	◆	◆
Assured operating distance	0 ... 243 mm	◆	◆
Operating voltage	20 ... 253 V AC/DC	◆	◆
Reverse polarity protection	yes	◆	◆
Short-circuit protection	yes	◆	◆
Voltage drop	≤ 8 V	◆	◆
Operating current	4 ... 400 mA	◆	◆
Off-state current	≤ 1.7 mA	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	5 m, PVC cable	◆	◆
Connection (system side)	V18-connector	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

NBN3-F31-U8-V18



NBN3-F31-U8-K



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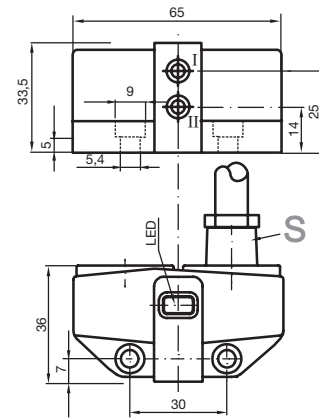
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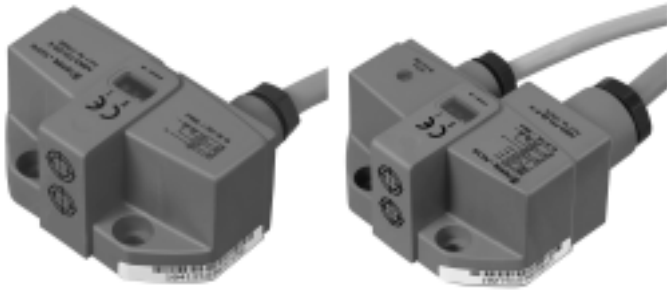
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive

NBN3-F31-Z8-K

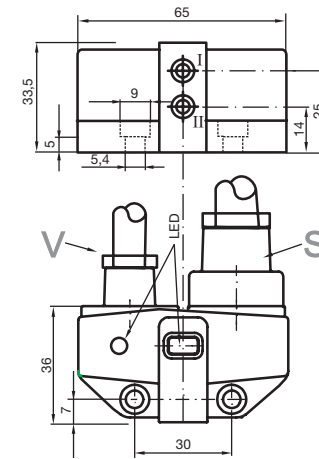


1.9

Inductive sensors for valve positioners

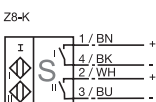


NBN3-F31-Z8-K-K

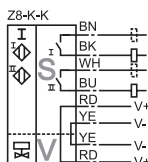


		NBN3-F31-Z8-K	NBN3-F31-Z8-K-K
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	Binary NO	◆	◆
	PNP Dual Make function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	6 ... 60 V	◆	◆
Reverse polarity protection	tolerant	◆	◆
Short-circuit protection	no	◆	◆
Voltage drop	≤ 6 V	◆	◆
Operating current	4 ... 100 mA	◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection (system side)	5 m, PVC cable	◆	◆
Connection (valve side)	0.5 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆

NBN3-F31-Z8-K



NBN3-F31-Z8-K-K

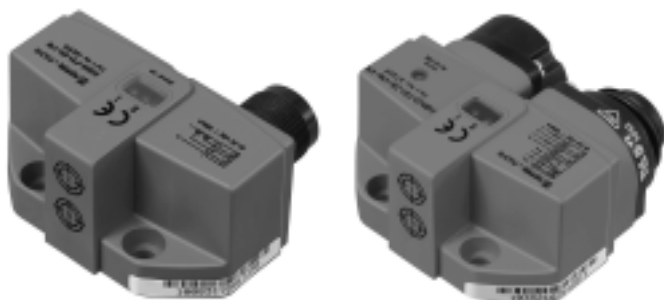


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

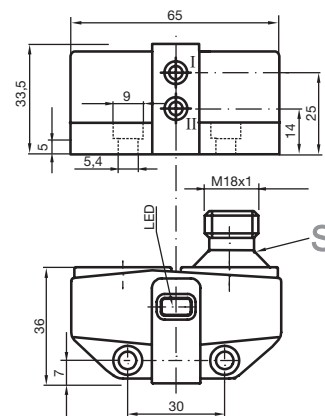
Date of edition 20.08.03-20



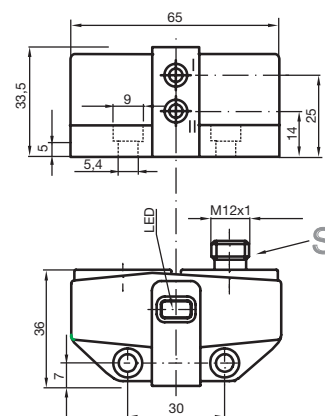
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



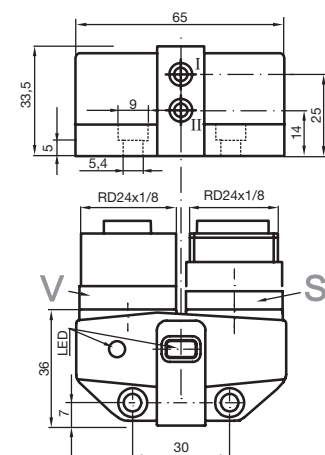
NBN3-F31-Z8-V18



NBN3-F31-Z8-V1

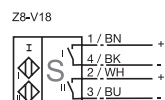


NBN3-F31-Z8-V16-V16

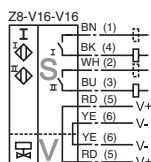


		NBN3-F31-Z8-V1	NBN3-F31-Z8-V16-V16	NBN3-F31-Z8-V18
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	Binary NO	◆	◆	◆
Assured operating distance	0 ... 243 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	6 ... 60 V	◆	◆	◆
Reverse polarity protection	tolerant	◆	◆	◆
Short-circuit protection	no	◆	◆	◆
Voltage drop	≤ 6 V	◆	◆	◆
Operating current	4 ... 100 mA	◆	◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection (system side)	V1-connector	◆		
	V16-connector		◆	
	V18-connector			◆
Connection (valve side)	V16-connector		◆	
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

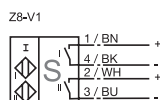
NBN3-F31-Z8-V18



NBN3-F31-Z8-V16-V16



NBN3-F31-Z8-V1



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Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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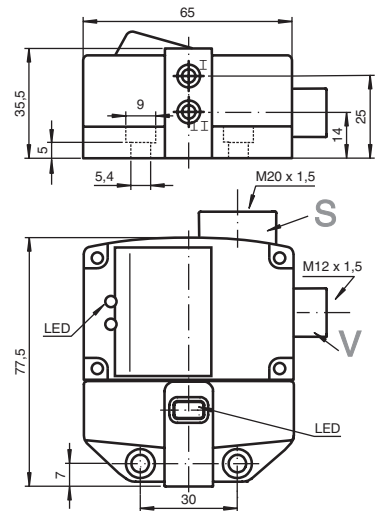
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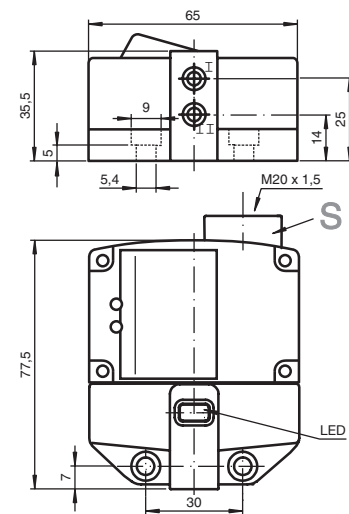
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



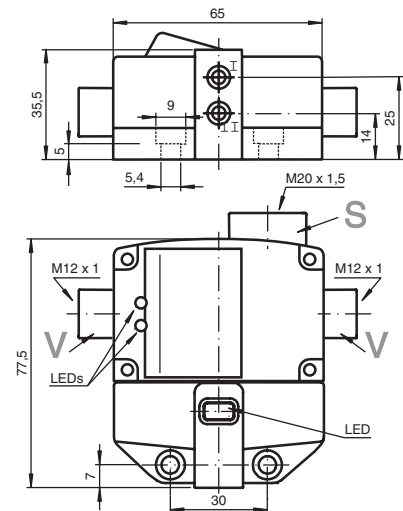
NBN3-F31K-Z8-K



NBN3-F31K-Z8

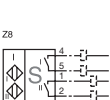


NBN3-F31K-Z8-V1-V1

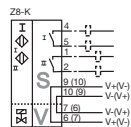


		NBN3-F31K-Z8	NBN3-F31K-Z8-K	NBN3-F31K-Z8-V1-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
	3-wire			◆
Switching element function	DC binary NO	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
	6 ... 60 V			◆
No-load supply current	≤ 25 mA	◆	◆	◆
Reverse polarity protection	all connections			◆
	tolerant	◆	◆	
Short-circuit protection	no	◆	◆	
	pulsing			◆
Voltage drop	≤ 3 V			◆
	≤ 6 V	◆	◆	
Operating current	0 ... 100 mA	◆	◆	◆
	4 ... 100 mA	◆	◆	
Off-state current	0 ... 0.5 mA typ.	◆	◆	◆
	0 ... 1 mA typ. 0.7 mA	◆	◆	
Operating voltage display	LED, green			◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow			◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆	◆
Connection (valve side)	Cage clamp terminals V1 connector	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP68	◆	◆	◆

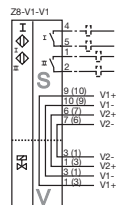
NBN3-F31K-Z8



NBN3-F31K-Z8-K



NBN3-F31K-Z8-V1-V1



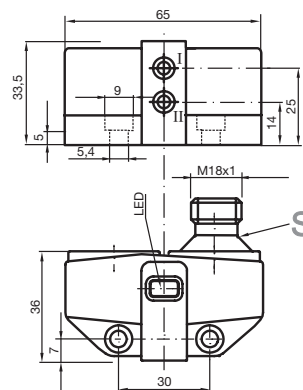
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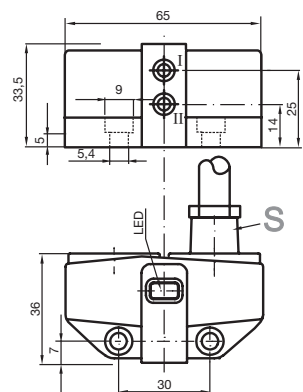
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



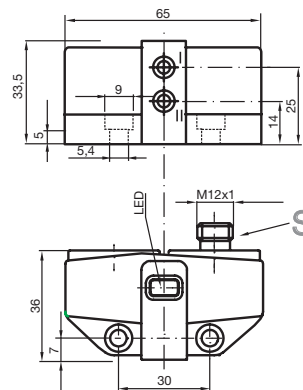
NBN3-F31-E8-V18-3G



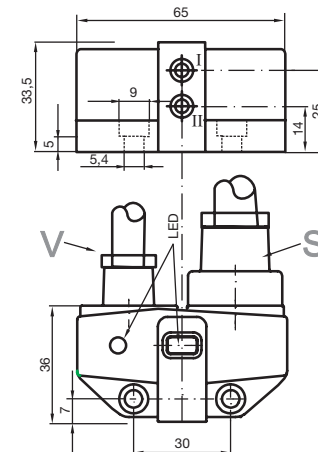
NBN3-F31-E8-K3G-3D



NBN3-F31-E8-V1-3G-3D

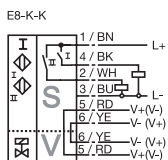


NBN3-F31-E8-KK-3G-3D

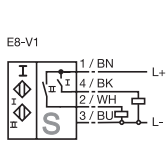


		NBN3-F31-E8-K-3G-3D	NBN3-F31-E8-K-K-3G-3D	NBN3-F31-E8-V1-3G-3D	NBN3-F31-E8-V18-3G
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤25 mA	◆	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤3 V	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection (system side)	V1-connector	◆	◆	◆	◆
	V18-connector	◆	◆	◆	◆
	5 m, PVC cable	◆	◆	◆	◆
Connection (valve side)	0.5 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	3G	◆	◆	◆	◆
	3G; 3D	◆	◆	◆	◆

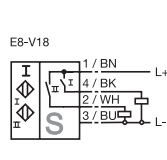
NBN3-F31-E8-KK-3G-3D



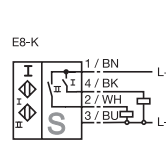
NBN3-F31-E8-V1-3G-3D



NBN3-F31-E8-V18-3G



NBN3-F31-E8-K-3G-3D



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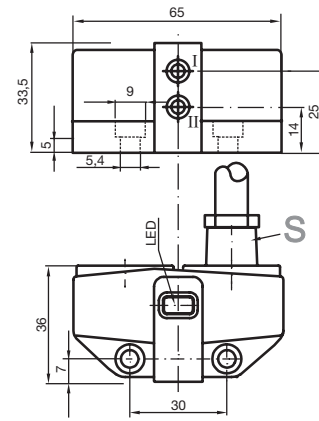
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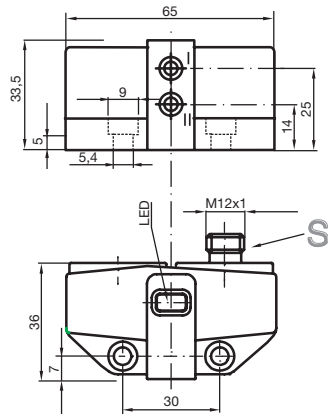
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



NBN3-F31-Z8-K-3G-3D



NBN3-F31-Z8-V1-3G-3D



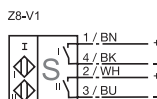
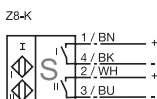
1.9

Inductive sensors for valve positioners

		NBN3-F31-Z8-K-3G-3D	NBN3-F31-Z8-V1-3G-3D
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	Binary NO PNP      Dual Make function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	6 ... 60 V	◆	◆
Reverse polarity protection	tolerant	◆	◆
Short-circuit protection	no	◆	◆
Voltage drop	≤ 6 V	◆	◆
Operating current	4 ... 100 mA	◆	◆
Off-state current	0 ... 1 mA typ. 0.7 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection (system side)	V1-connector 5 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3G; 3D	◆	◆

NBN3-F31-Z8-K-3G-3D

NBN3-F31-Z8-V1-3G-3D



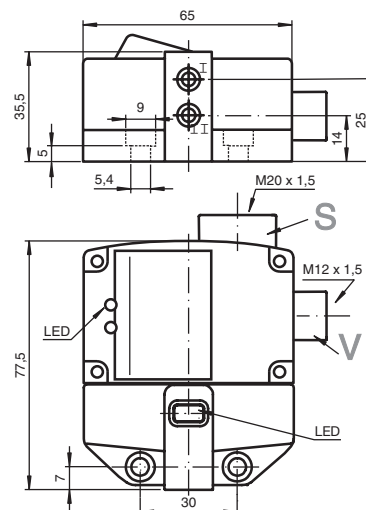
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



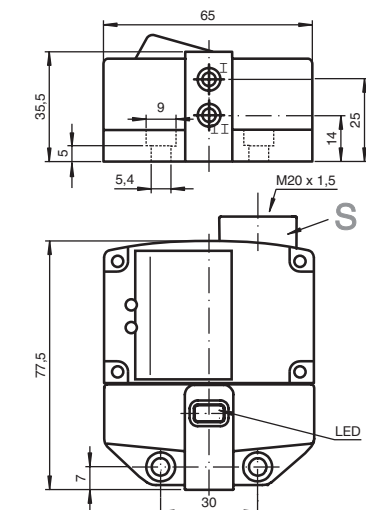
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



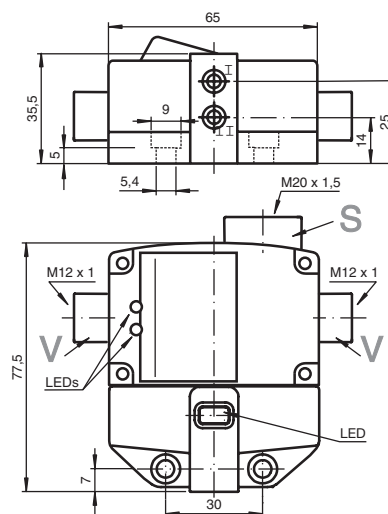
NBN3-F31K-E8-K-3D



NBN3-F31K-E8-3G-3D

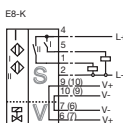


NBN3-F31K-E8-V1-V1-3D

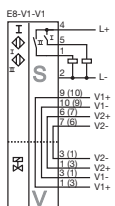


		NBN3-F31K-E8-3G-3D	NBN3-F31K-E8-K-3D	NBN3-F31K-E8-V1-V1-3D
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	4-wire	◆	◆	◆
Switching element function	PNP Dual Make function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤25 mA	◆	◆	◆
Reverse polarity protection	all connections	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤3 V	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA	◆	◆	◆
Operating voltage display	LED, green	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆	◆
Connection (valve side)	Cage clamp terminals	◆	◆	◆
Housing material	V1 connector	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65	◆	◆	◆
	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	3D	◆	◆	◆
	3G; 3D	◆	◆	◆

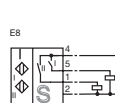
NBN3-F31K-E8-K-3D



NBN3-F31K-E8-V1-V1-3D



NBN3-F31K-E8-3G-3D



Date of edition: 20.08.03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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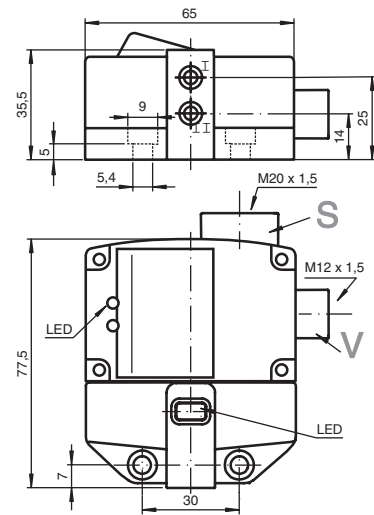
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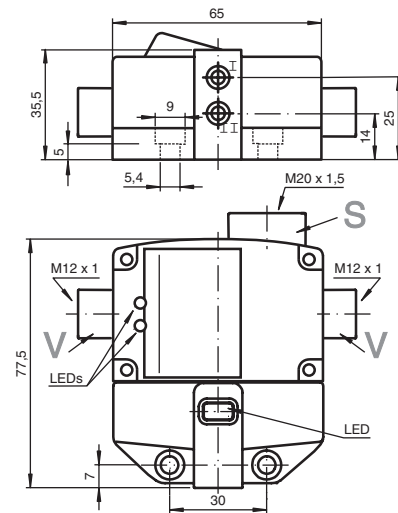


- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive

NBN3-F31K-Z8-K3D

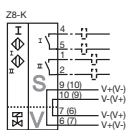


NBN3-F31K-Z8-V1-V1-3D

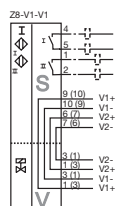


		NBN3-F31K-Z8-K-3D	NBN3-F31K-Z8-V1-V1-3D
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
	3-wire		◆
Switching element function	DC binary NO	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
	6 ... 60 V		◆
No-load supply current	≤ 25 mA	◆	◆
Reverse polarity protection	all connections	◆	◆
	tolerant	◆	
Short-circuit protection	no	◆	◆
	pulsing		◆
Voltage drop	≤ 3 V		◆
	≤ 6 V	◆	
Operating current	0 ... 100 mA	◆	◆
	4 ... 100 mA	◆	
Off-state current	0 ... 0.5 mA typ.	◆	◆
	0 ... 1 mA typ. 0.7 mA	◆	
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Valve status indication	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆
Connection (valve side)	Cage clamp terminals	◆	◆
	V1 connector		◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP68	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3D	◆	◆

NBN3-F31K-Z8-K3D



NBN3-F31K-Z8-V1-V1-3D

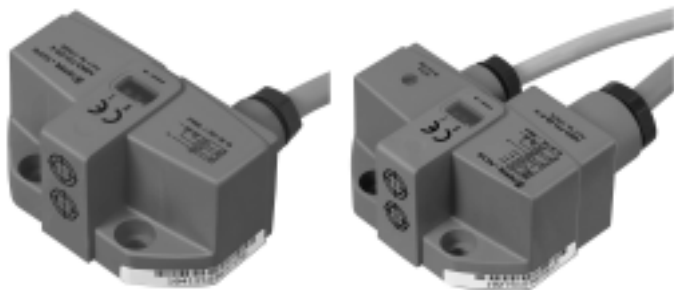


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

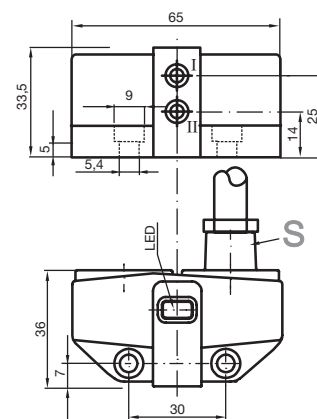
Date of edition 20.08.03-20



- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive
- EC-Type Examination Certificate TUV99 ATEX 1479X
- Usable up to SIL2 acc. to IEC 61508

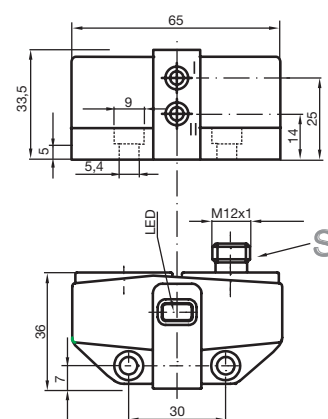


NCN3-F31-N4-K

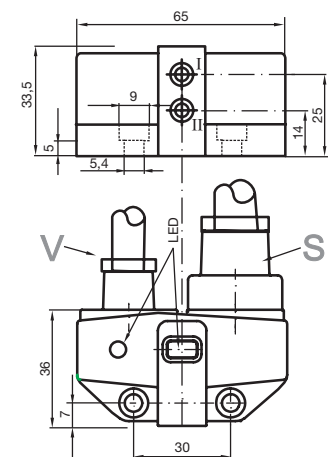


		NCN3-F31-N4-K	NCN3-F31-N4-K-K	NCN3-F31-N4-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection (system side)	V1-connector	◆	◆	◆
	5 m, PVC cable	◆	◆	◆
Connection (valve side)	0.5 m, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 3G; 3D	◆	◆	◆

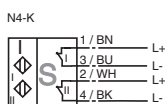
NCN3-F31-N4-V1



NCN3-F31-N4-K-K

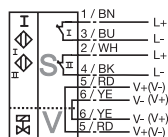


NCN3-F31-N4-K

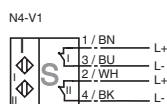


NCN3-F31-N4-K-K

N4-K-K



NCN3-F31-N4-V1



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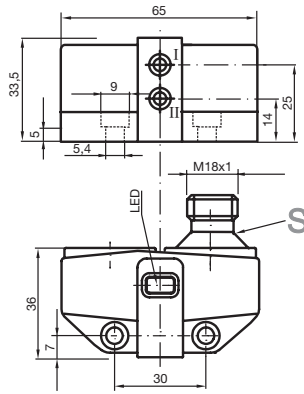
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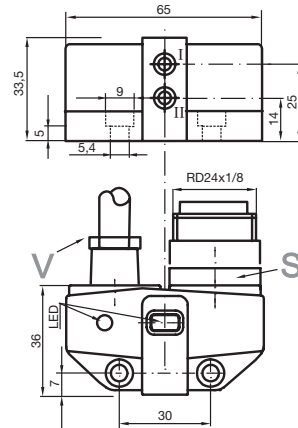
- Fixed setting
- Satisfies machinery directive
- EC-Type Examination Certificate TUV99 ATEX 1479X
- Direct mounting on standard actuators
- Compact and stable housing
- NCN3-F31-N4-V16-K



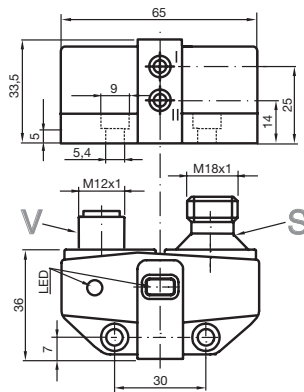
NCN3-F31-N4-V18



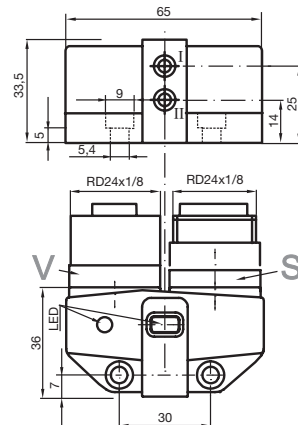
NCN3-F31-N4-V16-K



NCN3-F31-N5-V18-V1

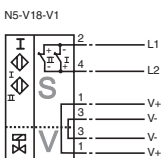


NCN3-F31-N4-V16-V16

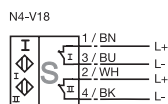


		NCN3-F31-N4-V16-K	NCN3-F31-N4-V16-V16	NCN3-F31-N4-V18	NCN3-F31-N5-V18-V1
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆	◆
	NAMUR binary NC	◆	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆
Current consumption					
Measuring plate not detected	≥ 3 mA	◆	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆	◆
Connection (system side)	V16-connector	◆	◆	◆	◆
	V18-connector	◆	◆	◆	◆
Connection (valve side)	V1 connector	◆	◆	◆	◆
	V16-connector	◆	◆	◆	◆
	0.5 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see in the instruction manuals	◆	◆	◆	◆
Category	1G; 2G	◆	◆	◆	◆
	1G; 2G; 3G	◆	◆	◆	◆

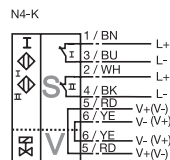
NCN3-F31-N5-V18-V1



NCN3-F31-N4-V18



NCN3-F31-N4-V16-K



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

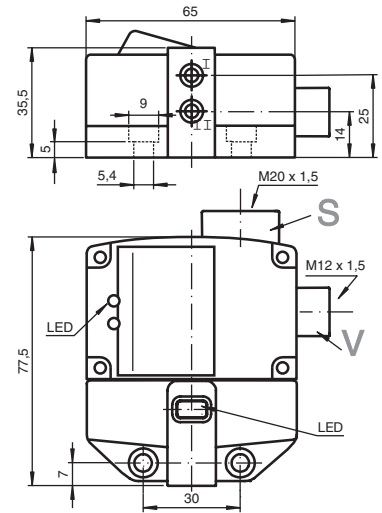




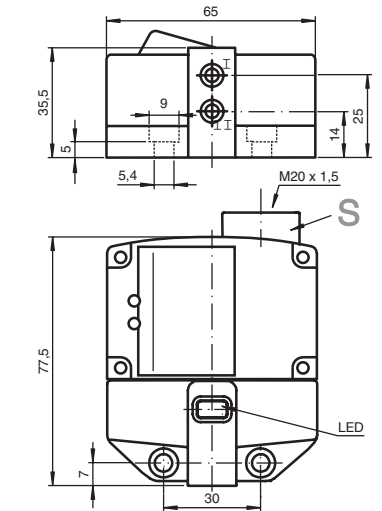
- Direct mounting on standard actuators
- Compact and stable housing with terminal compartment connection
- Fixed setting
- Satisfies machinery directive
- EC-Type Examination Certificate TUV99 ATEX 1479X
- Usable up to SIL2 acc. to IEC 61508



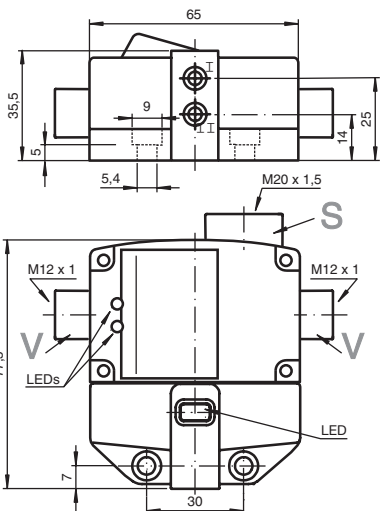
NCN3-F31K-N4-K



NCN3-F31K-N4

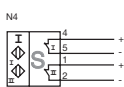


NCN3-F31K-N4-V1-V1

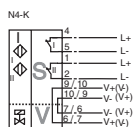


		NCN3-F31K-N4	NCN3-F31K-N4-K	NCN3-F31K-N4-V1-V1
Rated operating distance	3 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	DC Dual Break function	◆	◆	◆
Assured operating distance	0 ... 2.3 mm	◆	◆	◆
	0 ... 2.43 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Valve status indication	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆	◆
Connection (valve side)	Cage clamp terminals V1 connector	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
	IP68	◆	◆	◆
Note	LED switch-off	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 3G; 3D	◆	◆	◆

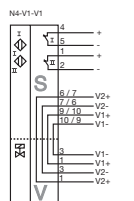
NCN3-F31K-N4



NCN3-F31K-N4-K



NCN3-F31K-N4-V1-V1



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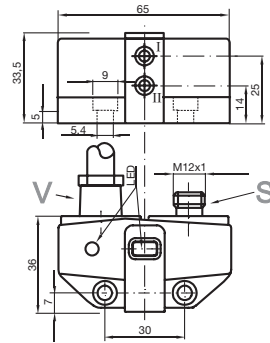
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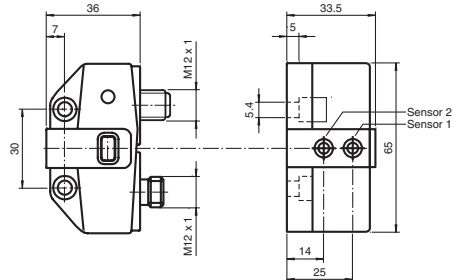


- A/B slave with extended addressing possibility for up to 62 slaves
- Direct mounting on standard actuators
- Nominal sensing range 3 mm by V2A target
- Mode of operation, programmable
- Protection degree IP67
- Communication monitoring, turn-off

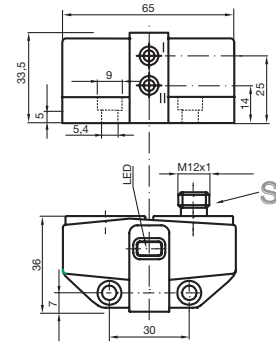
NCN3-F31-B3B-V1-K



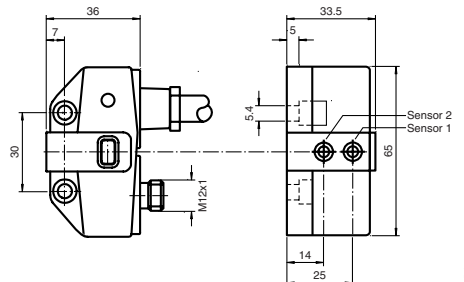
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NCN3-F31-B3B-V1



NCN3-F31-B3B-V1-K



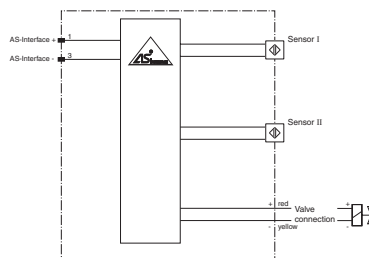
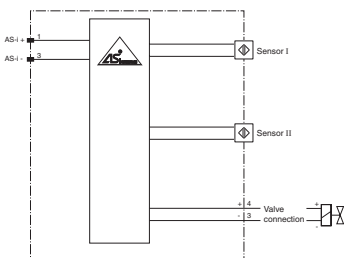
1.9

Inductive sensors for valve positioners

		NCN3-F31-B3B-V1-K	NCN3-F31-B3B-V1-K-3G	NCN3-F31-B3B-V1	NCN3-F31-B3B-V1-V1
Rated operating distance	3 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Switching element function	programmable	◆	◆	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Rated operational voltage	26.5 ... 31.6 V from AS-Interface	◆	◆	◆	◆
Rated operational current	100 mA	◆	◆	◆	◆
No-load supply current	≤ 35 mA	◆	◆	◆	◆
LED PWR	AS-i voltage; LED green	◆	◆	◆	◆
LED IN	switching state (input); LED yellow	◆	◆	◆	◆
LED OUT	binary LED yellow/red yellow: switching state red: lead breakage/short-circuit	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection (system side)	V1-connector	◆	◆	◆	◆
Connection (valve side)	V1 connector 0.5 m, PVC cable	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Housing	PBT	◆	◆	◆	◆
Note	valve voltage limited to 26,4 V max.; valve power 2,5 W max.	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	3G	◆	◆	◆	◆

NCN3-F31-B3B-V1-V1

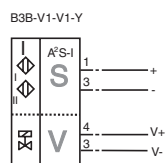
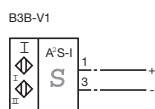
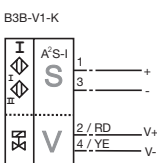
NCN3-F31-B3B-V1-K



NCN3-F31-B3B-V1-K  
NCN3-F31-B3B-V1-K3G

NCN3-F31-B3B-V1

NCN3-F31-B3B-V1-V1

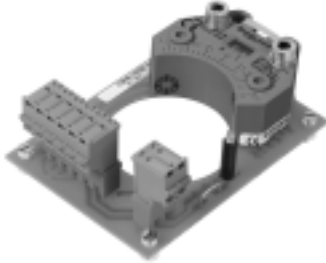


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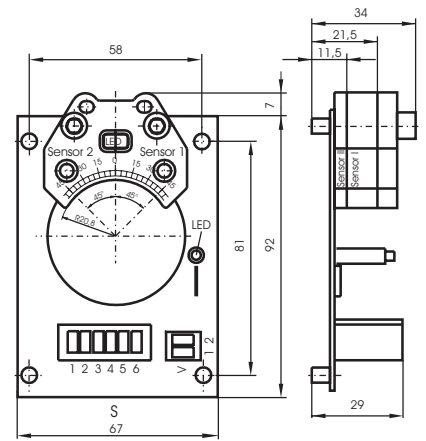
Date of edition 20.08.03-20



- For installation in housing
- **Pluggable cage clamp terminals**  
PL1-F25-E8-K
- **PL1... with valve connection**  
PL1-F25-E8-K
- **Valve LEDs disconnectable (wire jumper)**  
PL1-F25-E8-K
- Satisfies machinery directive

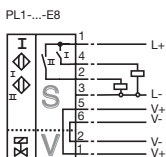


PL1-F25-E8-K  
PL1-F25-E8-S



		PL1-F25-E8-K	PL1-F25-E8-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Dual Make function	◆	◆
Assured operating distance	0 ... 243 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 25 mA	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Valve status indication	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	Cage clamp terminals 2 m, PVC cable	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆
Connection (valve side)	Cage clamp terminals	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP20	◆	◆
Note	Installation in housing	◆	◆

PL1-F25-E8-K  
PL1-F25-E8-S



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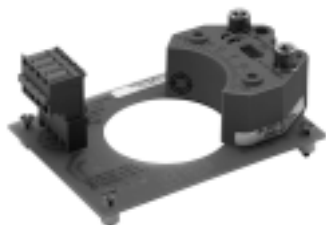
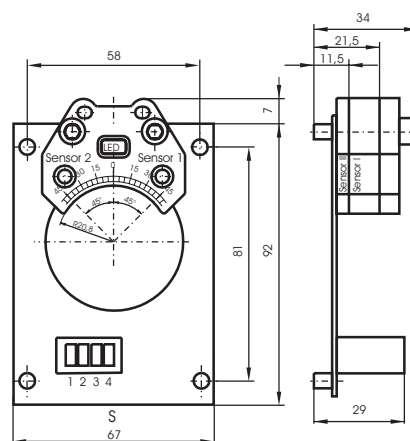
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- For installation in housing
- Pluggable cage clamp terminals  
PL2-F25-E8-K
- PL2... without valve connection  
PL2-F25-E8-K

PL2-F25-E8-K  
PL2-F25-E8-S

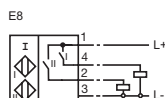


1.9

Inductive sensors for valve positioners

		PL2-F25-E8-K	PL2-F25-E8-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP Dual Make function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 25 mA	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	screw terminals	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP20	◆	◆

PL2-F25-E8-K  
PL2-F25-E8-S



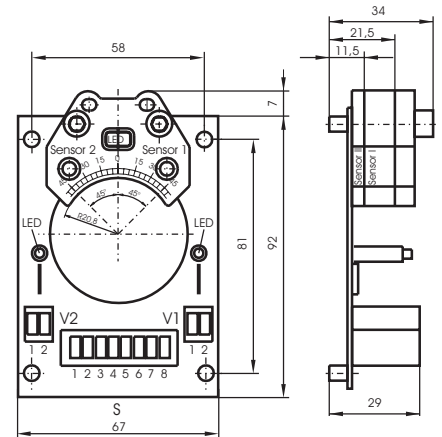
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



- For installation in housing
- Pluggable cage clamp terminals
- PL4... with 2 valve connections
- Valve LEDs disconnectable (wire jumper)
- Satisfies machinery directive

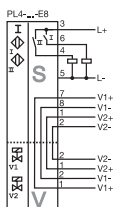


PL4-F25-E8-K



		<b>PL4-F25-E8-K</b>
Rated operating distance	3 mm	◆
Installation	embeddable	◆
Output type	3-wire	◆
Switching element function	PNP Dual Make function	◆
Assured operating distance	0 ... 2.43 mm	◆
Kind of voltage	DC	◆
Operating voltage	10 ... 30 V	◆
No-load supply current	≤25 mA	◆
Reverse polarity protection	protected against reverse polarity	◆
Short-circuit protection	pulsing	◆
Voltage drop	≤3 V	◆
Operating current	0 ... 200 mA	◆
Off-state current	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆
Operating voltage display	LED, green	◆
Indication of the switching state	LED, yellow	◆
Valve status indication	LED, yellow	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection (system side)	Cage clamp terminals	◆
Connection (valve side)	Cage clamp terminals	◆
Housing material	PBT	◆
Sensing face	PBT	◆
Protection degree	IP20	◆

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Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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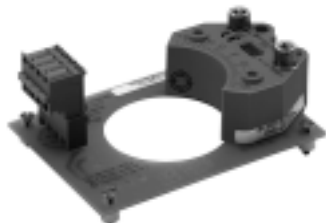
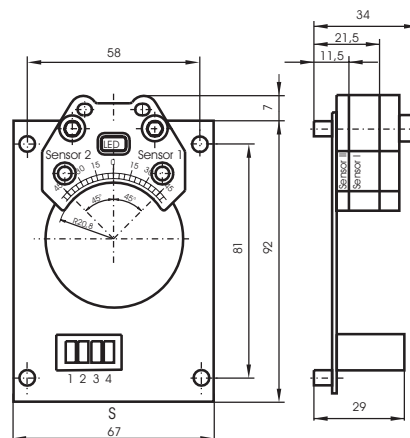
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CE  
0102

- For installation in housing
- Pluggable cage clamp terminals  
PL2-F25-N4-K
- PL2... without valve connection  
PL2-F25-N4-K

PL2-F25-N4-K  
PL2-F25-N4-S

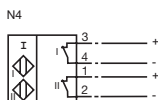


1.9

Inductive sensors for valve positioners

		PL2-F25-N4-K	PL2-F25-N4-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable		◆
Output type	2-wire	◆	◆
Switching element function	DC Dual Break function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	◆
No-load supply current	≥ 3 mA	◆	
	≤ 3 mA		◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	yes	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Valve status indication	-		◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	plug strip		◆
Connection (system side)	Cage clamp terminals	◆	
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Connection			
Note	Installation in housing		◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G		◆
	1G; 2G; 3G	◆	

PL2-F25-N4-K  
PL2-F25-N4-S



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

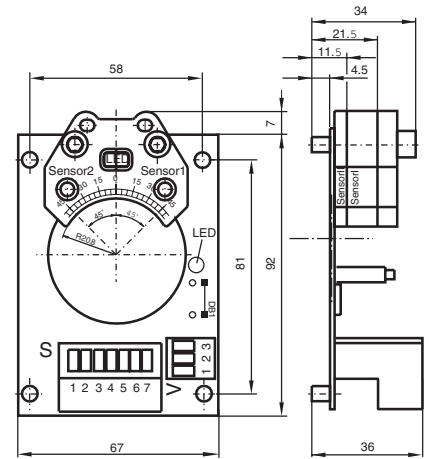
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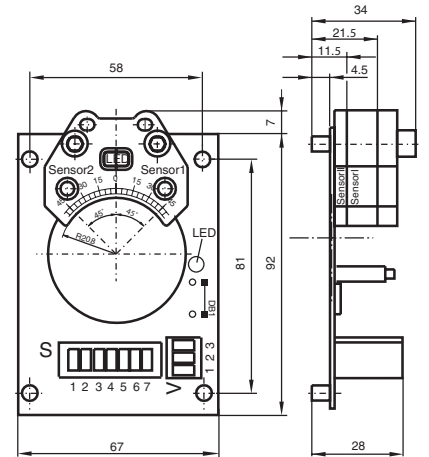
- For installation in housing
- Pluggable cage clamp terminals  
PL3-F25-N4-K
- PL3... with valve and screen connection  
PL3-F25-N4-K
- Valve LEDs disconnectable (wire jumper)  
PL3-F25-N4-K
- EC-Type Examination Certificate  
TUV99 ATEX 1479X  
PL3-F25-N4-K



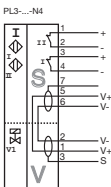
PL3-F25-N4-K



PL3-F25-N4-S



		PL3-F25-N4-K	PL3-F25-N4-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	DC Dual Break function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	◆
No-load supply current	≥3 mA	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Short-circuit protection	yes	◆	◆
Current consumption			
Measuring plate not detected	≥3 mA	◆	◆
Measuring plate detected	≤1 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Valve status indication	LED, yellow can be switched off by of DB1	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection type	plug strip	◆	◆
Connection (system side)	Cage clamp terminals	◆	◆
Connection (valve side)	Cage clamp terminals	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Note	Installation in housing	◆	◆
Use in the hazardous area	see instruction manual	◆	◆
Category	1G; 2G	◆	◆
	1G; 2G; 3G	◆	◆



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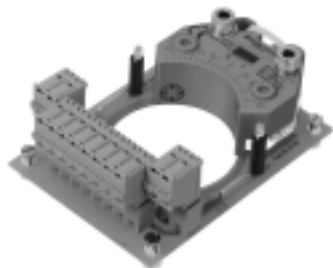
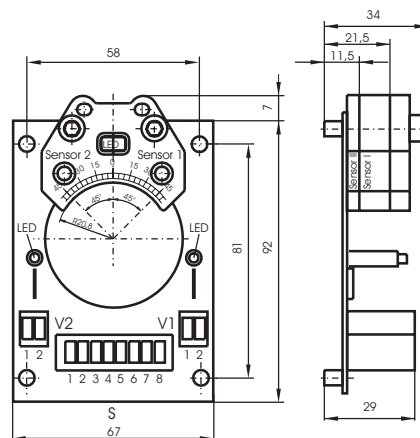
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- **PL4... with 2 valve connections**  
PL4-F25-N4-K
- **Valve LEDs disconnectable (wire jumper)**  
PL4-F25-N4-K
- **EC-Type Examination Certificate TUV99 ATEX 1479X**  
PL4-F25-N4-K

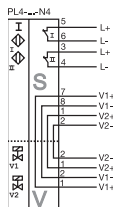
PL4-F25-N4-K  
PL4-F25-N4-S



1.9

Inductive sensors for valve positioners

		PL4-F25-N4-K	PL4-F25-N4-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching element function	DC Dual Break function	◆	◆
Assured operating distance	0 ... 2.43 mm	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Valve status indication	LED, yellow	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
Connection (system side)	Cage clamp terminals screw terminals	◆	◆
Connection (valve side)	Cage clamp terminals screw terminals	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Note	Installation in housing	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G	◆	◆
	1G; 2G; 3G	◆	



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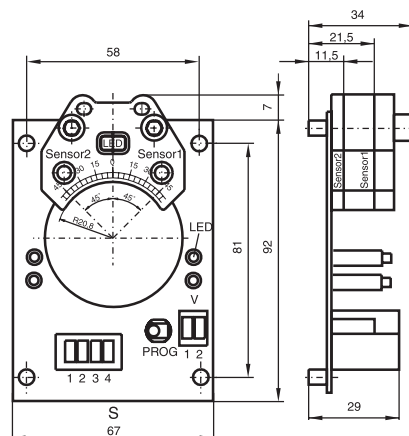
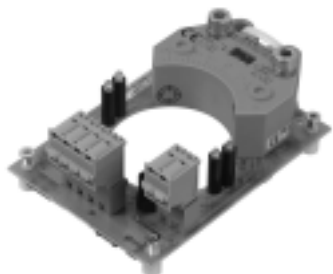
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- PL1... with valve connection
- Lead breakage and short-circuit monitoring of the valve
- 4-way LED indicator
- Satisfies machinery directive
- After an AS-interface communication error the valve voltage falls
- For installation in housing

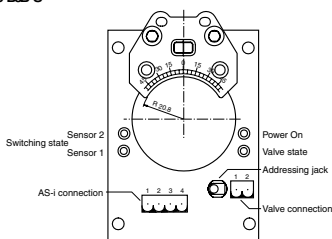
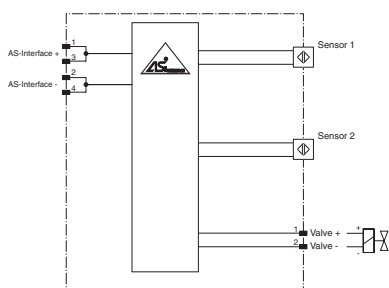
PL1-F25-B3B-K  
PL1-F25-B3B-S



		PL1-F25-B3B-K	PL1-F25-B3B-S
Rated operating distance	3 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
Switching elementfunction	AS-Interface programmable	◆	◆
Assured operating distance	0 ... 243 mm	◆	◆
Kind of voltage	DC	◆	◆
Rated operational voltage	26.5 ... 31.6 V from AS-Interface	◆	◆
Operating voltage	26.5 ... 31.9 V via AS-I bus system	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Operating current	100 mA	◆	◆
LED POWER	AS-i voltage; LED green	◆	◆
LED IN	switching state (input); LED yellow	◆	◆
LED OUT	binary LED yellow/red yellow: switching state red: lead breakage/short-circuit	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection (system side)	screw terminals	◆	◆
Connection (valve side)	screw terminals	◆	◆
	2-pin CombiCon connector	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP00	◆	◆
Housing	PBT	◆	◆
Note	The valve voltage is limited of max. 26.4 V; valve power max. 2.1 W	◆	◆

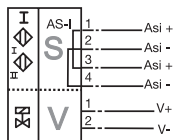
PL1-F25-B3B-K  
PL1-F25-B3B-S

PL1-F25-B3B-K  
PL1-F25-B3B-S



PL1-F25-B3B-K  
PL1-F25-B3B-S

B3B



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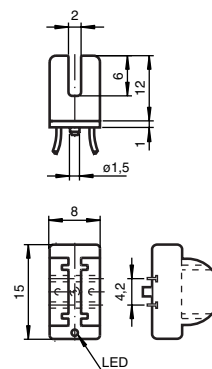
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- Basic series
- 2 mm slot width
- 2-wire sensor



SB2-Z0GELB  
SB2-Z0GRUEN

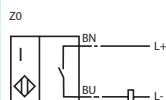


1.10

Inductive sensors, slot style

		SB2-Z0 GELB	SB2-Z0 GRUEN
Slot width	2 mm	◆	◆
Depth of immersion (lateral)	5 ... 7	◆	
	5 ... 7 mm		◆
Installation	not embeddable	◆	◆
Switching element function	DC      Make function	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	5 ... 30 V	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆
Hysteresis	0 ... 0.05	◆	
	0.11 ... 0.2		◆
Reverse polarity protection	tolerant	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 4.9 V	◆	◆
Operating current	2 ... 50 mA	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	0.5 m, flexible lead LIF YW	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆

SB2-Z0GELB  
SB2-Z0GRUEN



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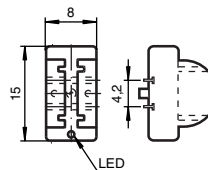
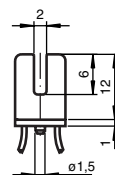
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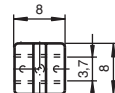
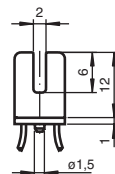
- Comfort series
- 2 mm slot width
- SJ2-N
- SC2-N0 GELB
- SC2-N0 GRUEN
- SJ2,2-N
- Usable up to SIL2 acc. to IEC 61508



SC2-N0 GELB

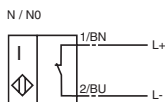


SJ2-N



		SJ2-N	SC2-N0 GELB	SC2-N0 GRUEN
Slot width	2 mm	◆	◆	◆
Depth of immersion (lateral)	2.2 mm			
	3.3 ... 4			
	5 ... 7 typ. 6 mm			
Output type	2-wire	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆
Switching frequency	0 ... 5000 Hz	◆	◆	◆
Hysteresis	0 ... 0.05 mm		◆	
	0.005 ... 0.2	◆		
	0.11 ... 0.2 mm			◆
Current consumption				
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow		◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
	-25 ... 60 °C (248 ... 333 K)			
Connection type	0.5 m, flexible lead LIFYW	◆		
	0.5 m, PVC - flexible lead		◆	◆
	0.6 m, flexible lead LIYV			
Housing material	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆		
	1G; 2G; 3G; 1D; 3D		◆	◆
	2G; 1D			

SC2-N0 GELB  
SC2-N0 GRUEN  
SJ2-N



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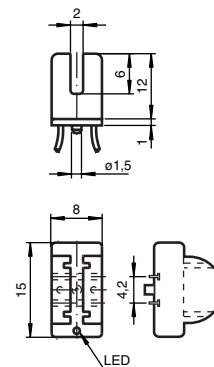
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- Basic series
- 2 mm slot width
- 2-wire sensor

SB2-Z0-3D GELB  
SB2-Z0-3D GRUEN

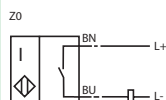


1.10

Inductive sensors, slot style

		SB2-Z0-3D GELB	SB2-Z0-3D GRUEN
Slot width	2 mm	◆	◆
Depth of immersion (lateral)	5 ... 7	◆	
	5 ... 7 mm		◆
Installation	not embeddable	◆	◆
Switching element function	DC      Make function	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	5 ... 30 V	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆
Hysteresis	0 ... 0.05	◆	
	0.11 ... 0.2		◆
Reverse polarity protection	tolerant	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 4.9 V	◆	◆
Operating current	2 ... 50 mA	◆	◆
Off-state current	0 ... 0.5 mA typ.	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 .. 343 K)	◆	◆
Connection type	0.5 m, flexible lead LIFYW	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3D	◆	◆

SB2-Z0-3D GELB  
SB2-Z0-3D GRUEN



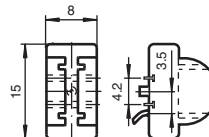
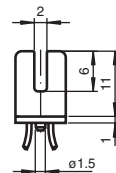
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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CE  
0102

- 2 mm slot width
- Usable up to SIL3 acc. to IEC61508

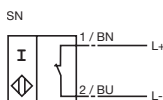
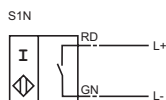
SJ2-S1N  
SJ2-SN



		SJ2-S1N	SJ2-SN
Slot width	2 mm	◆	◆
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
	NAMUR NO	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	◆
Switching frequency	0 ... 5000 Hz	◆	◆
Hysteresis	0 ... 0.2 typ. %	◆	◆
Current consumption			
Measuring plate not detected	≥ 3 mA		◆
	≤ 1 mA	◆	
Measuring plate detected	≥ 3 mA	◆	
	≤ 1 mA		◆
Constant magnetic field	50 mT	◆	◆
Alternating magnetic field	80 mT	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
	-40 ... 100 °C (233 ... 373 K)		◆
Connection type	0.5 m, flexible lead LIFYW	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Note	only for non-ferrous metal	◆	◆
	Adjustable stop		◆
	adjustable stop		◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 3G; 1D; 3D	◆	◆

SJ2-S1N

SJ2-SN



Date of edition: 20.08-03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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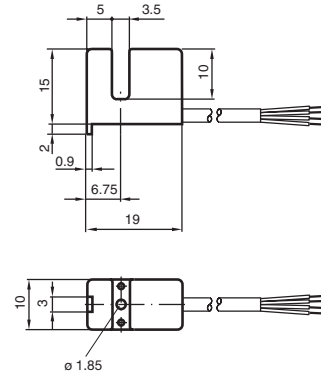
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- Basic series
- 3.5 mm slot width

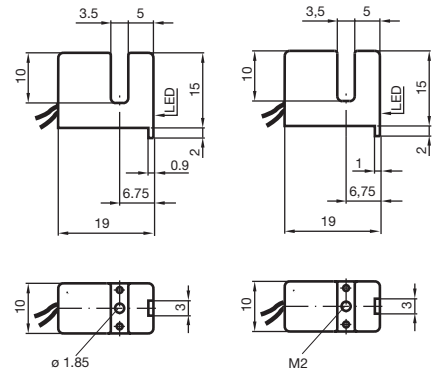


SB3,5-A2



SB3,5-E2  
SB3,5-E2BLAU

SB3,5-G-E2



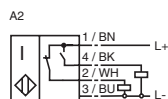
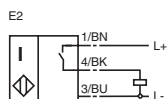
1.10

Inductive sensors, slot style

		SB3,5-E2	SB3,5-G-E2	SB3,5-E2 BLAU	SB3,5-A2
Slot width	3.5 mm	◆	◆	◆	◆
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	◆	◆	◆	◆
	5 ... 7 mm				◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP Anivalent	◆	◆	◆	◆
	PNP Make function	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
	≤ 7 mA			◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆		◆
	0 ... 3000 Hz			◆	◆
Hysteresis	0.1 ... 0.4			◆	◆
	0.21 ... 0.4 mm	◆		◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	yes	◆	◆	◆	◆
	pulsing	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆
	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
	-25 ... 85 °C (248 ... 358 K)				◆
Connection type	0.5 m, flexible lead UY	◆		◆	◆
	0.5 m, PVC cable				◆
	135 mm, PVC - flexible lead		◆		
Housing material	Crastin (PBTB)				◆
	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

SB3,5-E2  
SB3,5-E2BLAU  
SB3,5-G-E2

SB3,5-A2



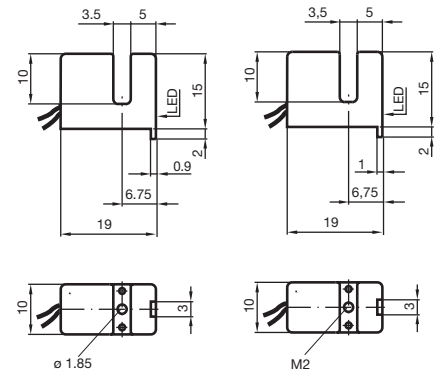
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- Basic series
- 3.5 mm slot width



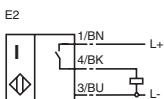
SB3,5-E2-3D

SB3,5-G-E2-3D



		SB3,5-E2-3D	SB3,5-G-E2-3D
Slot width	3.5 mm	◆	◆
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP      Make function	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆
Hysteresis	0.21 ... 0.4 mm	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	0.5 m, flexible lead LIY 135 mm, PVC - flexible lead	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3D	◆	◆

SB3,5-E2-3D  
SB3,5-G-E2-3D



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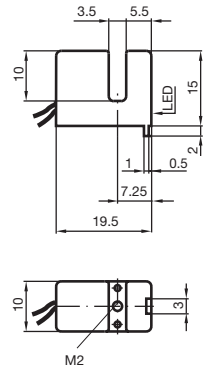
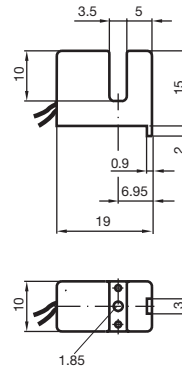


- Comfort series
- 3.5 mm slot width
- Usable up to SIL2 acc. to IEC 61508



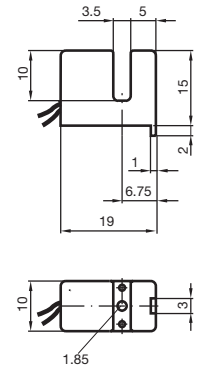
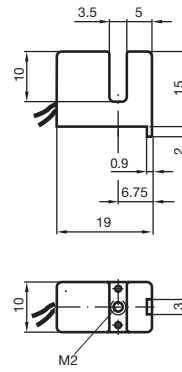
SJ3,5-N

SC3,5-G-N



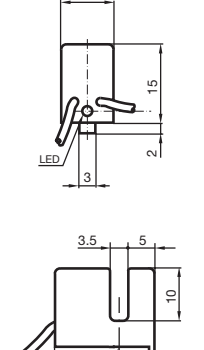
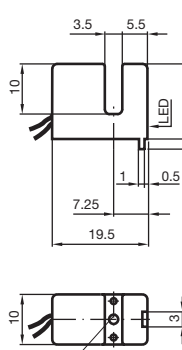
SJ3,5-G-N

SJ35-H

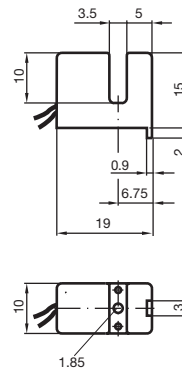


SC3,5-N0 BLAU

SJ35-N LED

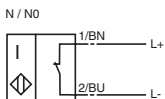


SJ3,5-N BLAU  
SJ3,5-N GELB  
SJ3,5-N GRUEN



Inductive sensors, slot style

	SJ3,5-H	SJ3,5-N	SJ3,5-G-N	SC3,5-G-N0	SC3,5-N0 BLAU	SJ3,5-N BLAU	SJ3,5-N GELB	SJ3,5-N GRUEN	SJ3,5-N LED
Slot width	◆	◆	◆	◆	◆	◆	◆	◆	◆
Depth of immersion (lateral)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output type	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	◆	◆	◆	◆	◆	◆	◆	◆	◆
Kind of voltage	◆	◆	◆	◆	◆	◆	◆	◆	◆
Nominal voltage	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	◆	◆	◆	◆	◆	◆	◆	◆	◆
Hysteresis	◆	◆	◆	◆	◆	◆	◆	◆	◆
0 ... 0.6			◆						
0 ... 0.6 mm				◆					
0.1 ... 0.4 mm								◆	
0.11 ... 0.2 mm									◆
0.21 ... 0.4 mm							◆		
0.41 ... 0.6 mm									◆
0.8 ... 1.1 mm									◆
Reverse polarity protection	◆								◆
Current consumption									
Measuring plate not detected	◆	◆	◆	◆	◆	◆	◆	◆	◆
Measuring plate detected	◆	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state				◆					◆
Ambient temperature	◆	◆	◆	◆	◆	◆	◆	◆	◆
-25 ... 100 °C (248 ... 373 K)									◆
-25 ... 70 °C (248 ... 343 K)		◆							
Connection type			◆	◆					◆
0.5 m, flexible lead LIY									◆
0.5 m, PVC - flexible lead		◆							
135 mm, PVC - flexible lead									◆
Housing material	◆	◆	◆	◆	◆	◆	◆	◆	◆
PBT									◆
PBT/PPS		◆							
Protection degree	◆	◆	◆	◆	◆	◆	◆	◆	◆
IP67									◆
Use in the hazardous area	◆	◆	◆	◆	◆	◆	◆	◆	◆
Category									
1G; 2G; 1D		◆	◆	◆	◆	◆	◆	◆	◆
1G; 2G; 3G; 1D; 3D									◆
2G	◆								



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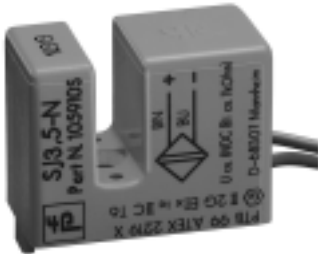
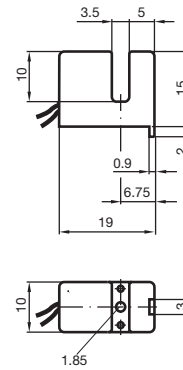
Date of edition 20.08.03-20





- 3.5 mm slot width
- Usable up to SIL3 acc. to IEC61508

SJ3,5-S1N  
SJ3,5-SN



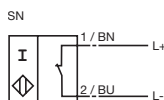
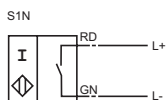
1.10

Inductive sensors, slot style

		SJ3,5-SN	SJ3,5-S1N
Slot width	3.5 mm	◆	◆
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	◆	◆
Output type	2-wire	◆	◆
Switching element function	NAMUR NC	◆	◆
	NAMUR NO		◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Switching frequency	0 ... 2500 Hz		◆
	0 ... 3000 Hz	◆	
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	
	≤ 1 mA		◆
Measuring plate detected	≥ 3 mA		◆
	≤ 1 mA	◆	
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆
	-50 ... 100 °C (223 ... 373 K)	◆	
Connection type	0.5 m, flexible lead LIY	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Note	only for non-ferrous metal		◆
	Adjustable stop		◆
	adjustable stop Security relevant only	◆	
	up to -40°C		
Use in the hazardous area	see instruction manuals	◆	◆
Category	1G; 2G; 3G; 1D; 3D	◆	◆

SJ3,5-S1N

SJ3,5-SN



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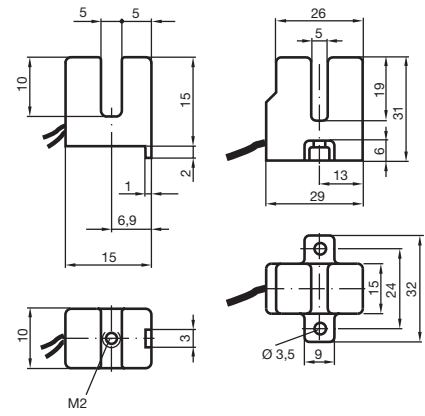


- Comfort series
- 5 mm slot width
- Usable up to SIL2 acc. to IEC 61508 SJ5-N

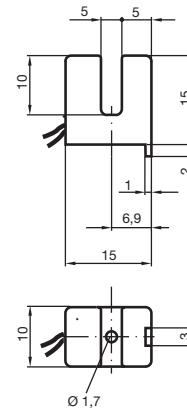


SJ5-G-N

SJ5-K-N



SJ5-N

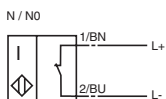


		SJ5-N	SJ5-K-N	SJ5-G-N
Slot width	5 mm	◆	◆	◆
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	◆	◆	◆
	8 ... 10 typ. 9 mm	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	NAMUR NC	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆
Switching frequency	0 ... 2000 Hz	◆	◆	◆
Hysteresis	0.05 ... 0.3 mm	◆	◆	◆
	0.05 ... 0.65 mm	◆	◆	◆
Current consumption		◆	◆	◆
Measuring plate not detected	≥ 3 mA	◆	◆	◆
Measuring plate detected	≤ 1 mA	◆	◆	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆	◆	◆
Connection type	0.5 m, flexible lead LIY	◆	◆	◆
	2 m, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆

1.10

Inductive sensors, slot style

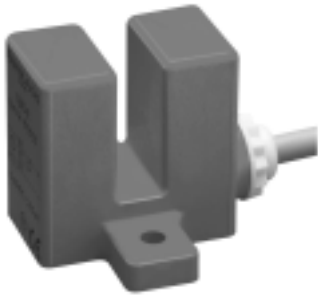
SJ5-G-N  
SJ5-K-N  
SJ5-N



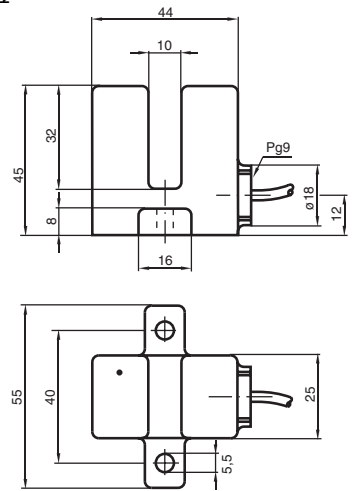
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-20

- Comfort series
- 10 mm slot width

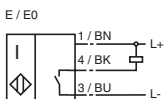


SJ10-E  
SJ10-E2

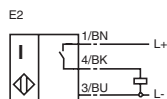


		SJ10-E	SJ10-E2
Slot width	10 mm	◆	◆
Depth of immersion (lateral)	13.5 ... 16.5 mm	◆	◆
Output type	3-wire	◆	◆
Switching element function	NPN Make function	◆	◆
	PNP Make function	◆	◆
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆
Hysteresis	typ. 5%	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆

SJ10-E



SJ10-E2



Date of edition: 20.08-03-20

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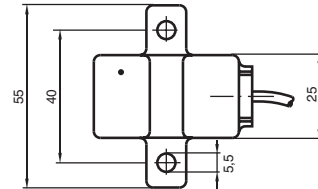
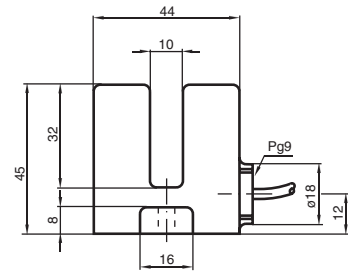
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- Comfort series
- 10 mm slot width
- Usable up to SIL2 acc. to IEC 61508

SJ10-N



1.10

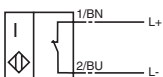
Inductive sensors, slot style



		SJ10-N
Slot width	10 mm	◆
Depth of immersion (lateral)	13.5 ... 16.5 typ. 15 mm	◆
Output type	2-wire	◆
Switching element function	NAMJR NC	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Operating voltage	5 ... 25 V	◆
Switching frequency	0 ... 1000 Hz	◆
Hysteresis	0.1 ... 0.5 mm	◆
Current consumption		
Measuring plate not detected	≥ 3 mA	◆
Measuring plate detected	≤ 1 mA	◆
Ambient temperature	-25 ... 100 °C (248 ... 373 K)	◆
Connection type	2 m, PVC cable	◆
Housing material	PBT	◆
Protection degree	IP67	◆
Use in the hazardous area	see instruction manuals	◆
Category	1G; 2G; 1D	◆

SJ10-N

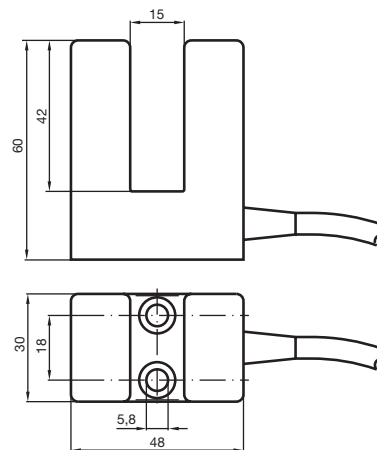
N / NO



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Comfort series
- 15 mm slot width

SJ15-A  
SJ15-A2  
SJ15-E  
SJ15-E2



		SJ15-E	SJ15-E2	SJ15-A	SJ15-A2
Slot width	15 mm	◆	◆	◆	◆
Depth of immersion (lateral)	17 ... 20 mm	◆	◆	◆	◆
Output type	3-wire	◆	◆		
	4-wire				◆
Switching element function	NPN Antivalent			◆	
	NPN Make function	◆			
	PNP Antivalent				◆
	PNP Make function		◆		
Kind of voltage	DC	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆	◆	◆
Hysteresis	typ. 5%		◆		
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

1.10

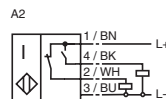
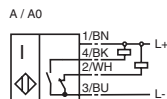
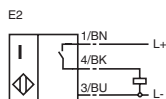
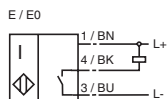
Inductive sensors, slot style

SJ15-E

SJ15-E2

SJ15-A

SJ15-A2



Date of edition 20.08-03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

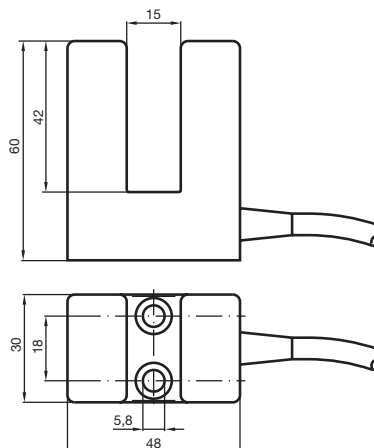
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- Comfort series
- 15 mm slot width

SJ15-WO  
SJ15-WS



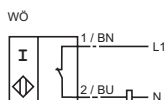
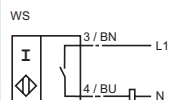
1.10

Inductive sensors, slot style

		SJ15-WS	SJ15-WO
Slot width	15 mm	◆	◆
Depth of immersion (lateral)	18.5 ... 20.5 mm	◆	◆
Output type	2-wire	◆	◆
Switching element function	AC Break function	◆	◆
	AC Make function	◆	◆
Kind of voltage	AC	◆	◆
Operating voltage	20 ... 253 V	◆	◆
Switching frequency	0 ... 25 Hz	◆	◆
Hysteresis	typ. 5%	◆	◆
Voltage drop	Typ. 4 V at 40 ... 500 mA load current	◆	◆
	Typ. 5 V at 15 ... 40 mA load current	◆	◆
	Typ. 7 V at 5 ... 15 mA load current	◆	◆
Momentary current (20 ms, 0.1 Hz)	≤ 4000 mA	◆	◆
Operating current	5 ... 500 mA	◆	◆
Off-state current	≤ 2 mA	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆

SJ15-WS

SJ15-WO



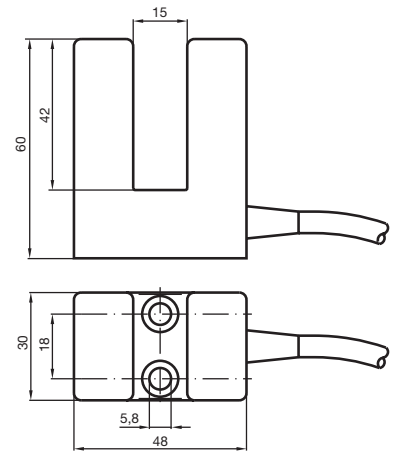
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Comfort series
- 15 mm slot width

CE  
0102



SJ15-N



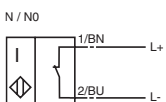
Slot width	15 mm	◆
Depth of immersion (lateral)	16 ... 19 typ. 17.5 mm	◆
Output type	2-wire	◆
Switching elementfunction	NAMUR NC	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Operating voltage	5 ... 25 V	◆
Switching frequency	0 ... 1000 Hz	◆
Hysteresis	0.3 ... 1.5 mm	◆
Current consumption		
Measuring plate not detected	≥ 3 mA	◆
Measuring plate detected	≤ 1 mA	◆
Ambient temperature	-25 .. 70 °C (248 ... 343 K)	◆
Connection type	2 m, PVC cable	◆
Housing material	PBT	◆
Protection degree	IP67	◆
Use in the hazardous area	see instruction manuals	◆
Category	1G; 2G; 1D	◆

SJ15-N

1.10

Inductive sensors, slot style

SJ15-N



Date of edition 20.08-03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

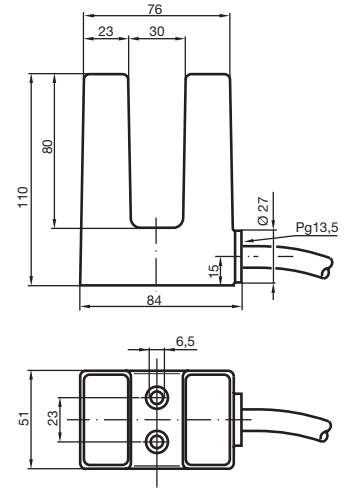
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- Comfort series
- 30 mm slot width

SJ30-A  
SJ30-A2  
SJ30-WO  
SJ30-WS



1.10

Inductive sensors, slot style

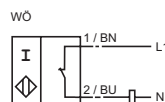
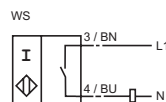
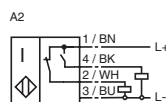
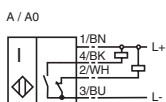
		SJ30-A	SJ30-A2	SJ30-WS	SJ30-WO
Slot width	30 mm	◆	◆	◆	◆
Depth of immersion (lateral)	27 ... 31 typ.	◆	◆	◆	◆
Output type	2-wire			◆	◆
	4-wire	◆	◆		
Switching element function	AC Break function				◆
	AC Make function			◆	
	NPN Antivalent	◆			
	PNP Antivalent		◆		
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆		
	20 ... 253 V <sup>1)</sup>			◆	◆
No-load supply current	≤ 20 mA	◆	◆		
Switching frequency	0 ... 150 Hz	◆	◆		
	0 ... 25 Hz			◆	◆
Reverse polarity protection		◆	◆		
Short-circuit protection	pulsing	◆	◆		
Voltage drop	≤ 3 V	◆	◆		
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA			◆	◆
Operating current	0 ... 200 mA	◆	◆		
	10 ... 500 mA			◆	◆
Off-state current	0 ... 2.5 mA typ.			◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	ABS	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Note	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V			◆	◆

SJ30-A

SJ30-A2

SJ30-WS

SJ30-WO



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

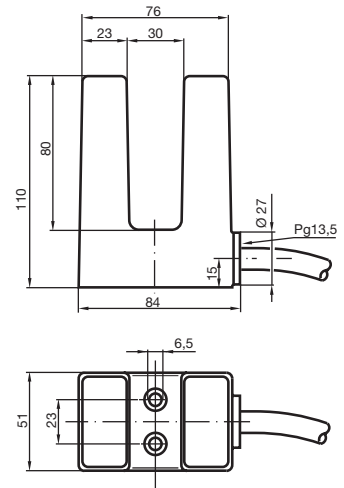


- Comfort series
- 30 mm slot width

CE  
0102



S80-N

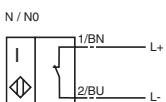


Slot width	30 mm	◆	SJ30-N
Depth of immersion (lateral)	27 ... 30 typ. 28.5 mm	◆	
Output type	2-wire	◆	
Switching elementfunction	NAMUR NC	◆	
Kind of voltage	DC	◆	
Nominal voltage	8 V	◆	
Operating voltage	5 ... 25 V	◆	
Switching frequency	0 ... 150 Hz	◆	
Hysteresis	0.1 ... 0.3 mm	◆	
Current consumption			
Measuring plate not detected	≥ 3 mA	◆	
Measuring plate detected	≤ 1 mA	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Connection type	2 m, PVC cable	◆	
Housing material	ABS	◆	
Protection degree	IP67	◆	
Use in the hazardous area	see instruction manuals	◆	
Category	1G; 2G; 1D	◆	

1.10

Inductive sensors, slot style

S80-N



Date of edition: 20.08.03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

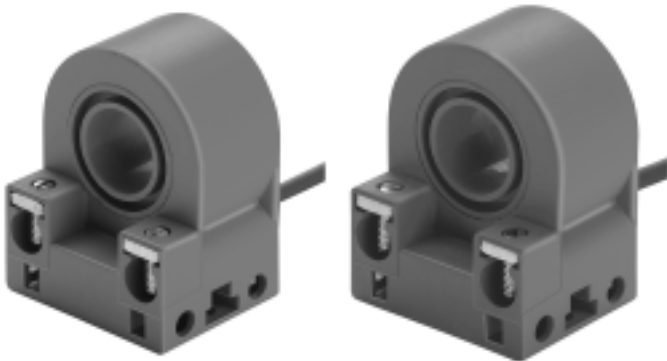
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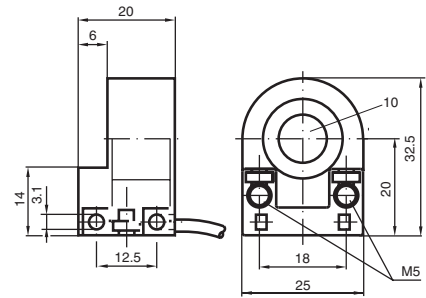
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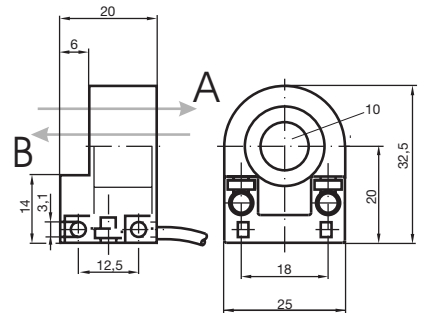
- **Comfort series**
- **10 mm inside diameter**
- **Bistable**  
RC10-14-N3
- **Direction detection**  
RC10-14-N3



RC10-14-N0



RC10-14-N3

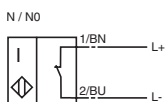


1.11

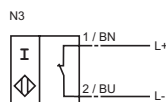
Inductive sensors, ring style

		RC10-14-N0	RC10-14-N3
Inside diameter	10 mm	◆	◆
Measuring cylinder			
Diameter	2.5 mm	◆	◆
Length	3 mm		◆
	4 mm	◆	
Measuring cone			
Material	9S20K		◆
Output type	2-wire	◆	◆
Switching element function	NAMUR bistable		◆
	NAMUR NC	◆	
Kind of voltage	DC	◆	◆
Nominal voltage	8 V	◆	◆
Operating voltage	5 ... 25 V	◆	
Switching frequency	0 ... 2000 Hz	◆	
Hysteresis	typ. 1 %		◆
Reverse polarity protection	protected against reverse polarity		◆
Current consumption			
Traverse B	3 mA		◆
Traverse A	1 mA		◆
Measuring plate not detected	≥ 3 mA	◆	
Measuring plate detected	≤ 1 mA	◆	
Ambient temperature	-20 ... 100 °C (253 ... 373 K)		◆
	-20 ... 65 °C (253 ... 338 K)	◆	
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	2G	◆	◆

RC10-14-N0



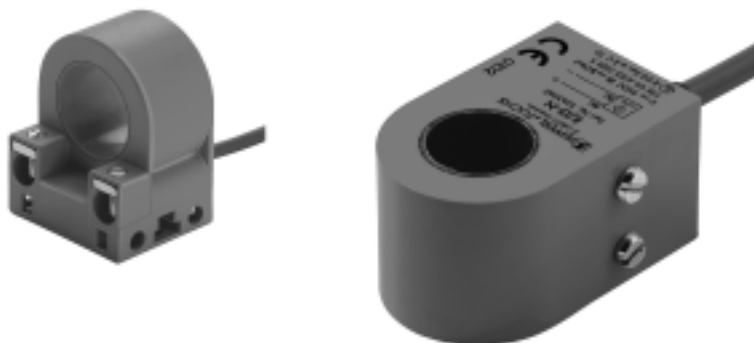
RC10-14-N3



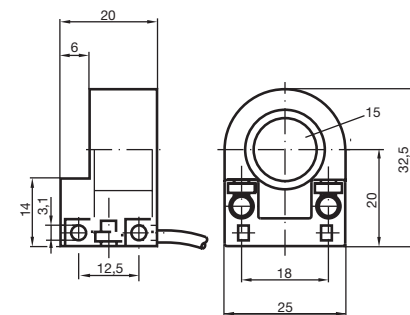
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



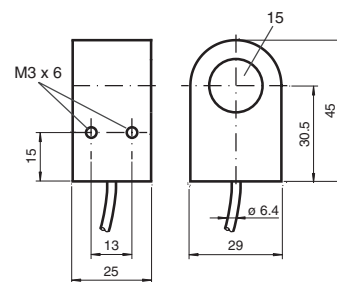
- **Comfort series**
- **15 mm inside diameter**
- **Bistable**  
RC15-14-N3
- **Direction detection**  
RC15-14-N3
- **High passage speed 10 m/s**  
RC15-14-N3



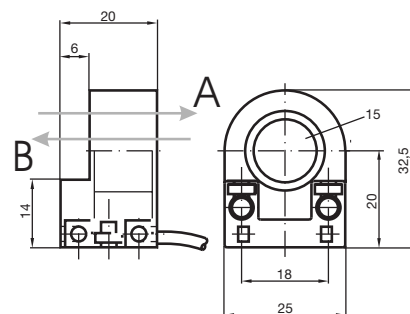
RJ15-14-N  
RC15-14-N0



RJ15-N



RC15-14-N3

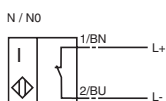


		RJ15-N	RJ15-14-N	RC15-14-N0	RC15-14-N3
Inside diameter	15 mm	◆	◆	◆	◆
Measuring cylinder	Fe-metal				
	9S20K		◆	◆	◆
Diameter	3 mm	◆	◆	◆	◆
Length	4 mm	◆	◆	◆	◆
	6 mm		◆		
Passage speed	≤ 10 m/s				◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR bistable				◆
	NAMUR NC	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆	◆
Operating voltage	5 ... 25 V	◆	◆	◆	◆
Switching frequency	0 ... 1500 Hz	◆	◆	◆	◆
Hysteresis	typ. 1 %				◆
Reverse polarity protection	protected against reverse polarity				◆
Current consumption					
Traverse B	3 mA				◆
Traverse A	1 mA				◆
Measuring plate not detected	≥ 3 mA	◆	◆	◆	
Measuring plate detected	≤ 1 mA	◆	◆	◆	
Ambient temperature	-20 ... 65 °C (253 ... 338 K)			◆	
	-20 ... 70 °C (253 ... 343 K)				◆
	-25 ... 70 °C (248 ... 343 K)	◆	◆		
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	2G	◆	◆	◆	◆

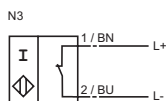
1.11

Inductive sensors, ring style

RJ15-14-N  
RJ15-N  
RC15-14-N0



RC15-14-N3



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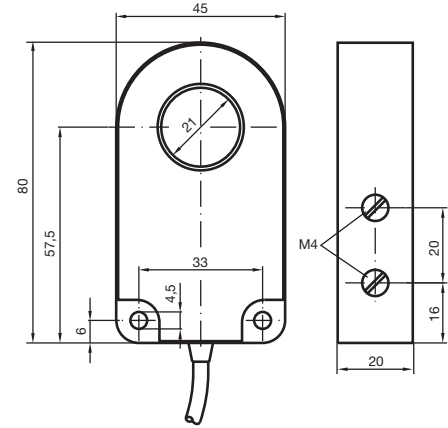
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- Comfort series
- 21 mm inside diameter

RJ21-E  
RJ21-E2  
RJ21-E3



1.11

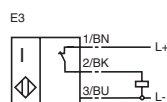
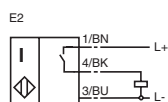
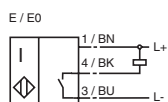
Inductive sensors, ring style

		RJ21-E	RJ21-E2	RJ21-E3
Inside diameter	21 mm	◆	◆	◆
Measuring cylinder				
Diameter	6 mm	◆	◆	◆
Length	12 mm	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	NPN    Make function	◆		
	PNP    Break function			◆
	PNP    Make function		◆	
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 1000 Hz	◆	◆	◆
Hysteresis	typ. 5%	◆	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

RJ21-E

RJ21-E2

RJ21-E3



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

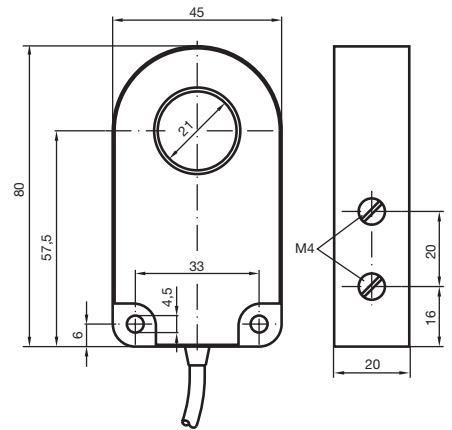
Date of edition 20.08.03-20

- Comfort series
- 21 mm inside diameter

CE  
0102



RJ21-N

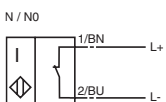


		RJ21-N
Inside diameter	21 mm	◆
Measuring cylinder	9S20K	◆
Diameter	6 mm	◆
Length	12 mm	◆
Output type	2-wire	◆
Switching elementfunction	NAMUR NC	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Operating voltage	5 ... 25 V	◆
Switching frequency	0 ... 1000 Hz	◆
Current consumption		
Measuring plate not detected	≥ 3 mA	◆
Measuring plate detected	≤ 1 mA	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	2 m, PVC cable	◆
Housing material	PBT	◆
Protection degree	IP67	◆
Use in the hazardous area	see instruction manuals	◆
Category	2G	◆

1.11

Inductive sensors, ring style

RJ21-N



Date of edition 20.08-03-20

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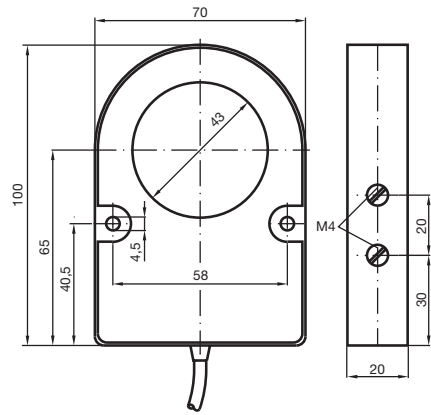
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- Comfort series
- 43 mm inside diameter

RJ43-E



1.11

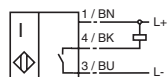
Inductive sensors, ring style

		RJ43-E	RJ43-E2
Inside diameter	43 mm	◆	◆
Measuring cylinder			
Diameter	9 mm	◆	◆
Length	18 mm	◆	◆
Output type	3-wire	◆	◆
Switching element function	NPN     Make function	◆	
	PNP     Make function		◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 20 mA	◆	◆
Switching frequency	0 ... 500 Hz	◆	◆
Hysteresis	typ. 5%	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Protection degree	IP67	◆	◆

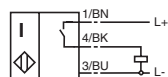
RJ43-E

RJ43-E2

E / E0



E2

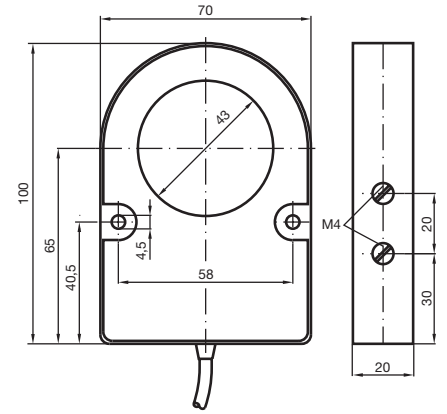


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Comfort series
- 43 mm inside diameter

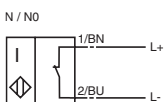
RJ43-N

CE  
0102



		RJ43-N
Inside diameter	43 mm	◆
Measuring cylinder	9S20K	◆
Diameter	9 mm	◆
Length	18 mm	◆
Output type	2-wire	◆
Switching elementfunction	NAMUR NC	◆
Kind of voltage	DC	◆
Nominal voltage	8 V	◆
Operating voltage	5 ... 25 V	◆
Switching frequency	0 ... 500 Hz	◆
Current consumption		◆
Measuring plate not detected	≥ 3 mA	◆
Measuring plate detected	≤ 1 mA	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	2 m PVC cable	◆
Housing material	PBT	◆
Protection degree	IP67	◆
Use in the hazardous area	see instruction manuals	◆
Category	2G	◆

RJ43-N



Date of edition 20.08-03-20

Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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1.11

Inductive sensors, ring style





# Capacitive sensors

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## Functional description

The active component a capacitive sensor consists of a disk-shaped sensor electrode and a cupshaped shield (Fig. 1). These two electrodes form a capacitor with a base capacitance of  $C_G$ . The capacitance changes by the amount  $C$  as a target approaches the sensor (distance  $\sim s$ ).  $\Delta$

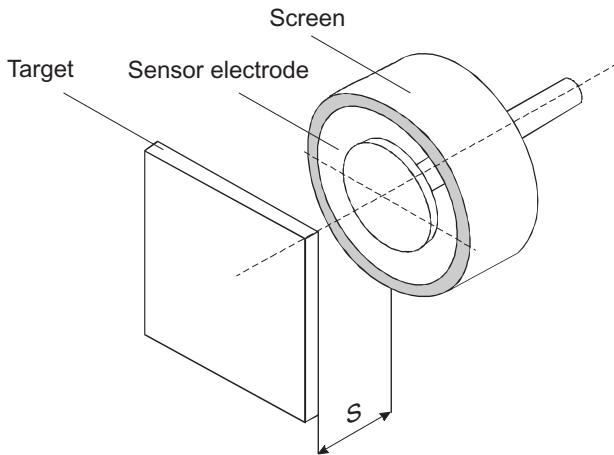


Fig. 1: Principles of the capacitive proximity switch

The capacitor is part of an RC generator. Its output voltage  $U_o$  is dependent on the effective capacity  $C_a = C_G + \Delta C$  between the sensor electrode and the shield potential.

The RC generator starts to oscillate when the distance between the target and the sensor falls below a certain value. The output voltage of the generator is demodulated and filtered after which background suppression is applied producing the signal across the output.



In the F46 series this functional principle has been further extended by integrating the sensor electrode within the printed circuit board of the internal electronics. This greatly improved the shielding and the EMC resistance. This series can therefore be installed directly on metal or connected to each other side by side.

When properly selected, the "see through" capability and tie wrap mounting style allow the sensor to be used for flow monitoring in hoses and synthetic pipes.

The permitted wall thicknesses and materials and the suitable media can be found in the following tables.

CBN2-F46 CCN2-F46A-...*	Contents					
	liquid			solid		
Container material	Water Acids Caustic solutions	Oil Diesel	Ackohol Benzene Solvents	PVC granulate grain size < 3 mm	Grain Flour Sugar etc.	Sand
for direct contact	unsuitable	unsuitable	unsuitable	no detection	no detection	no detection
Glass	< 6 mm	no detection	no detection	no detection	no detection	no detection
Plexiglass	< 2 mm	no detection	no detection	no detection	no detection	no detection
PVC	< 2 mm	no detection	no detection	no detection	no detection	no detection
PVC hose	< 2 mm	no detection	no detection	no detection	no detection	no detection
Teflon	< 1 mm	no detection	no detection	no detection	no detection	no detection

CBN5-F46 CCN5-F46A-...*	Contents					
	liquid			solid		
Container material	Water Acids Caustic solutions	Oil Diesel	Ackohol Benzene Solvents	PVC granulate grain size < 3 mm	Grain Flour Sugar etc.	Sand
for direct contact	unsuitable	unsuitable	unsuitable	no detection	detection	detection
Glass	< 1,5 mm	< 1,5 mm	< 1,5 mm	no detection	< 1,5 mm	< 1,5 mm
Plexiglass	< 6 mm	no detection	no detection	no detection	< 6 mm	< 6 mm
PVC	< 6 mm	no detection	no detection	no detection	< 3 mm	< 3 mm
PVC hose	< 4 mm	no detection	no detection	no detection	no detection	no detection
Teflon	< 10 mm	no detection	no detection	no detection	no detection	no detection

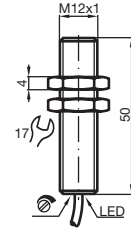
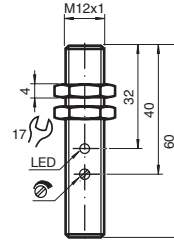
CBN10-F46 CCN10-F46A-...*	Contents					
	liquid			solid		
Container material	Water Acids Caustic solutions	Oil Diesel	Ackohol Benzene Solvents	PVC granulate grain size < 3 mm	Grain Flour Sugar etc.	Sand
for direct contact	unsuitable	unsuitable	unsuitable	detection	detection	detection
Glass	too sensitive	too sensitive	too sensitive	too sensitive	too sensitive	too sensitive
Plexiglass	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
PVC	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
PVC hose	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
Teflon	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm

\* The F46A series is characterized by its chemical resistance and by its compliance with the IP68 protection class.

- The switching distance can be set over a wide range with the potentiometer
- Comfort series
- 4 mm embeddable

CJ4-12GM-E2-V1

CJ4-12GM-E  
CJ4-12GM-E2



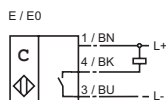
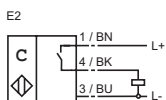
2.1

Capacitive sensors, standard

		CJ4-12GM-E	CJ4-12GM-E2	CJ4-12GM-E2-V1
Rated operating distance	4 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	NPN Make function PNP Make function	◆	◆	◆
Assured operating distance	0 ... 2.88 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 35 V	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector	◆	◆	◆
	2 m, PUR cable	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65	◆	◆	◆

CJ4-12GM-E2  
CJ4-12GM-E2-V1

CJ4-12GM-E



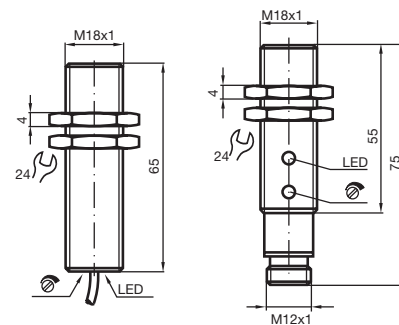
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- Comfort series
- 8 mm embeddable
- The switching distance can be set over a wide range with the potentiometer



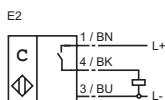
CJ8-18GM-E  
CJ8-18GM-E2

CJ8-18GM-E2-V1

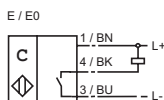


		CJ8-18GM-E	CJ8-18GM-E2	CJ8-18GM-E2-V1
Rated operating distance	8 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	NPN Make function PNP Make function	◆	◆	◆
Assured operating distance	0 ... 5.76 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V 10 ... 35 V	◆	◆	◆
No-load supply current	≤ 10 mA ≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 100 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
Operating current	0 ... 300 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-30 ... 70 °C (243 ... 343 K)	◆	◆	◆
Connection type	V1-connector	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆
	brass	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP67	◆	◆	◆

CJ8-18GM-E2  
CJ8-18GM-E2-V1



CJ8-18GM-E



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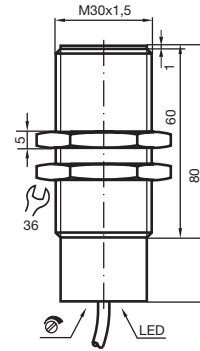
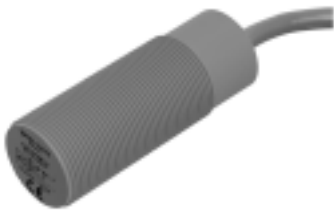
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- The switching distance can be set over a wide range with the potentiometer
- Comfort series
- 10 mm embeddable

CJ10-30GK-A  
CJ10-30GK-E  
CJ10-30GK-E2

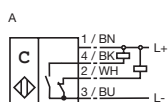


2.1

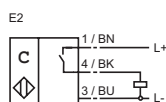
Capacitive sensors, standard

		CJ10-30GK-A	CJ10-30GK-E	CJ10-30GK-E2
Rated operating distance	10 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire		◆	◆
	4-wire	◆		
Switching element function	NPN Antivalent	◆		
	NPN Make function		◆	
	PNP Make function			◆
Assured operating distance	0 ... 7.2 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Off-state current	0 ... 0.1 mA typ. 0.1 µA at 25 °C	◆	◆	◆
	0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65	◆	◆	◆

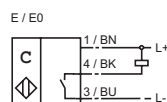
CJ10-30GK-A



CJ10-30GK-E2



CJ10-30GK-E



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

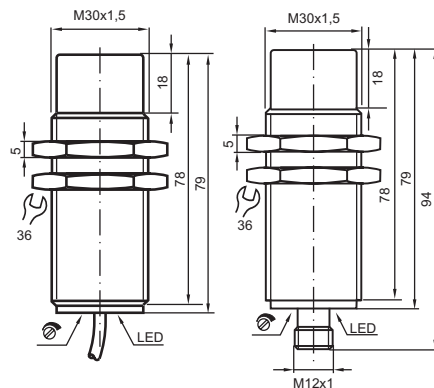


- Comfort series
- 10 mm embeddable
- The switching distance can be set over a wide range with the potentiometer



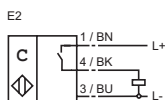
CJ10-30GM-E  
CJ10-30GM-E2  
CJ10-30GM-A  
CJ10-30GM-A2

CJ10-30GM-E2-V1  
CJ10-30GM-A2-V1

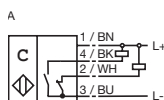


		CJ10-30GM-E	CJ10-30GM-E2	CJ10-30GM-E2-V1	CJ10-30GM-A	CJ10-30GM-A2	CJ10-30GM-A2-V1
Rated operating distance	10 mm	◆	◆	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆
Switching element function	4-wire				◆	◆	◆
	NPN Antivalent				◆	◆	◆
	NPN Make function	◆					
	PNP Antivalent					◆	◆
	PNP Make function		◆	◆			◆
Assured operating distance	0 ... 7.2 mm	◆	◆	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆	◆	◆	◆
No-load supply current	≤20 mA	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆
Voltage drop	≤2.8 V	◆	◆	◆	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Connection type	V1-connector			◆			◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆
Housing material	Stainless steel	◆	◆	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆

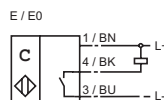
CJ10-30GM-E2  
CJ10-30GM-E2-V1



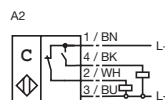
CJ10-30GM-A



CJ10-30GM-E



CJ10-30GM-A2  
CJ10-30GM-A2-V1



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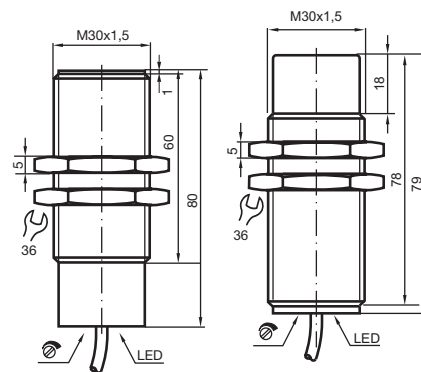
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- The switching distance can be set over a wide range with the potentiometer
- Comfort series
- 10 mm embeddable

CJ10-30GK-WO  
CJ10-30GK-WS

CJ10-30GM-WO  
CJ10-30GM-WS

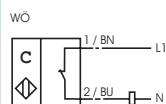


2.1

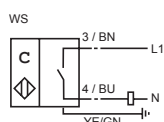
Capacitive sensors, standard

		CJ10-30GK-WS	CJ10-30GK-WO	CJ10-30GM-WS	CJ10-30GM-WO
Rated operating distance	10 mm	◆	◆	◆	◆
Installation	embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	AC Break function		◆		◆
	AC Make function	◆		◆	
Assured operating distance	0 ... 7.2 mm	◆	◆	◆	◆
Kind of voltage	AC	◆	◆	◆	◆
Operating voltage	20 ... 253 V	◆	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆	◆
Reverse polarity protection	tolerant	◆	◆	◆	◆
Short-circuit protection	no	◆	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 1200 mA	◆	◆	◆	◆
Operating current	5 ... 200 mA	◆	◆	◆	◆
Off-state current	0.7 ... 1.5 mA typ.	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	Stainless steel			◆	◆
	PBT	◆	◆		
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

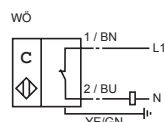
CJ10-30GK-WO



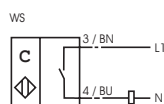
CJ10-30GM-WS



CJ10-30GM-WO



CJ10-30GK-WS

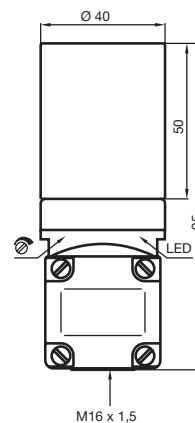


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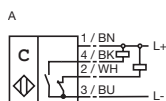


CJ15-40-A  
CJ15-40-A2  
CJ15-40-W

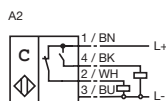


		CJ15-40-A	CJ15-40-A2	CJ15-40-W
Rated operating distance	15 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	4-wire	◆	◆	◆
	AC Make/Break function	◆	◆	◆
	NPN Antivalent	◆	◆	◆
	PNP Antivalent	◆	◆	◆
Assured operating distance	0 ... 10.8 mm	◆	◆	◆
Kind of voltage	AC	◆	◆	◆
	DC	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆
	20 ... 253 V <sup>1)</sup>	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	no	◆	◆	◆
	pulsing	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆
	≤ 7 V	◆	◆	◆
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
	10 ... 200 mA	◆	◆	◆
Off-state current	0 ... 2.5 mA typ.	◆	◆	◆
Indication of the switching state	LED, red	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT	◆	◆	◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Note	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage U <sub>b</sub> 80...253 V	◆	◆	◆

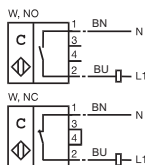
CJ15-40-A



CJ15-40-A2



CJ15-40-W



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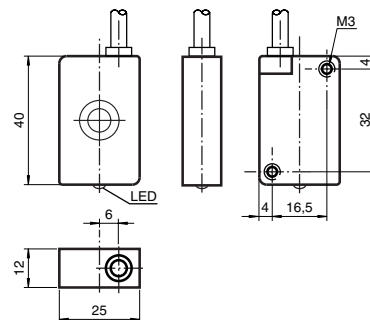
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- Flat housing
- 8 mm not embeddable
- 12 mm not embeddable
- 15 mm not embeddable

CBN12-F64-E2  
 CBN8-F64-E1  
 CCN15-F64-E2



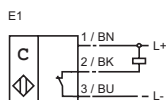
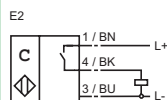
2.1

Capacitive sensors, standard

		CBN8-F64-E1	CBN12-F64-E2	CCN15-F64-E2
Rated operating distance	12 mm		◆	
	15 mm			◆
	8 mm	◆		
Installation	not embeddable	◆	◆	◆
Output type	3-wire	◆	◆	◆
Switching element function	NPN Break function	◆		
	PNP Make function		◆	◆
Assured operating distance	0 ... 12 mm			◆
	0 ... 6.48 mm	◆		
	0 ... 9.5 mm		◆	
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 30 V		◆	◆
	10.8 ... 30 V	◆		
No-load supply current	≤ 15 mA		◆	◆
	≤ 16 mA	◆		
Switching frequency	0 ... 20 Hz		◆	◆
	0 ... 5 Hz	◆		
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆
Off-state current	0 ... 0.01 mA typ.	◆		
	0 ... 50 µA typ. 5 µA		◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PUR cable			◆
	2 m, PVC cable	◆		
	3.1 m PUR cable		◆	
Housing material	Crastin (PBTB)	◆		
	PBT		◆	◆
Sensing face	Crastin (PBTB)	◆		
Protection degree	PBT		◆	◆
	IP67	◆	◆	◆

CBN12-F64-E2  
 CCN15-F64-E2

CBN8-F64-E1



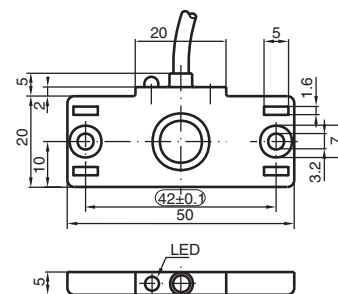
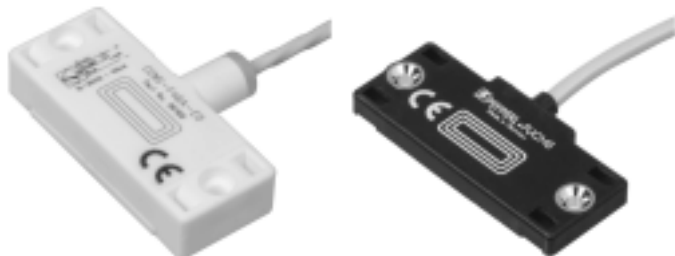
Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Date of edition 20.08.03-20



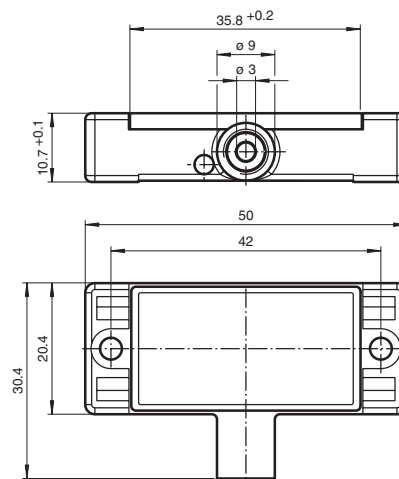
- mounting slots for cable ties
- Mounting holes for screwing
- Flat housing
- chemically constant housing made of PVDF  
CCN5-F46A-E0  
CCN5-F46A-E2

CBN10-F46-E0  
CBN10-F46-E2  
CBN2-F46-E0  
CBN2-F46-E2  
CBN5-F46-E0  
CBN5-F46-E2  
CCN5-F46-E0  
CCN5-F46-E2



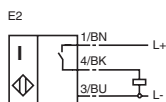
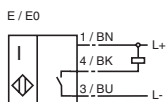
		CBN2-F46-E0	CBN2-F46-E2	CBN5-F46-E0	CBN5-F46-E2	CCN5-F46A-E0	CCN5-F46A-E2	CBN10-F46-E0	CBN10-F46-E2
Rated operating distance	10 mm								
	2 mm	◆	◆						
	5 mm			◆	◆	◆	◆	◆	◆
Installation	not embeddable	◆	◆	◆	◆	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆	◆	◆	◆	◆
Switching element function	NPN	◆	◆	◆	◆	◆	◆	◆	◆
	PNP			◆	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.4 mm	◆	◆						
	0 ... 3.5 mm			◆	◆	◆	◆		
	0 ... 7 mm							◆	◆
Kind of voltage	DC	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 5 Hz							◆	◆
Reverse polarity protection		◆	◆	◆	◆	◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆	◆	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆	◆	◆	◆	◆	◆
Operating current	0 ... 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆	◆	◆	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆	◆	◆	◆	◆
	LED, red					◆	◆		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆
Connection type	2 m FEP cable							◆	◆
	2 m, PVC cable	◆	◆	◆	◆	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆	◆	◆	◆	◆
	PVDF						◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆	◆	◆	◆	◆
	PVDF						◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
	IP68						◆	◆	◆
Note	cable tensile strength 20 N							◆	◆

CCN5-F46A-E0  
CCN5-F46A-E2



CBN10-F46-E0  
CBN2-F46-E0  
CBN5-F46-E0  
CCN5-F46A-E0

CBN10-F46-E2  
CBN2-F46-E2  
CBN5-F46-E2  
CCN5-F46A-E2



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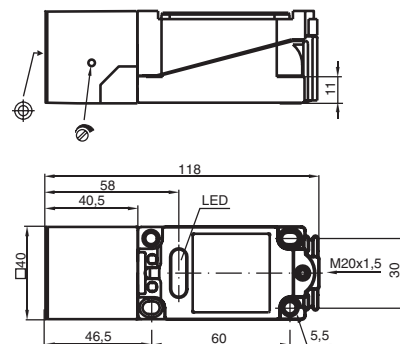
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- **Comfort series**
- **15 mm embeddable**
- **The switching distance can be set over a wide range with the potentiometer**

CJ15-U1-A2  
CJ15-U1-W

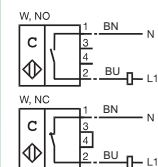


2.1

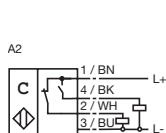
Capacitive sensors, standard

		CJ15+U1+A2	CJ15+U1+W
Rated operating distance	15 mm	◆	◆
Installation	embeddable	◆	◆
Output type	2-wire	◆	◆
	4-wire	◆	
Switching element function	AC Make/Break function	◆	◆
	PNP Antivalent	◆	
Assured operating distance	0 ... 10.8 mm	◆	◆
Kind of voltage	AC	◆	◆
	DC	◆	
Operating voltage	10 ... 30 V	◆	
	20 ... 253 V <sup>1)</sup>		◆
No-load supply current	≤ 20 mA	◆	
Switching frequency	0 ... 10 Hz	◆	◆
Reverse polarity protection		◆	
Short-circuit protection	no		◆
	pulsing	◆	
Voltage drop	≤ 3 V	◆	
	≤ 7 V		◆
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA		◆
Operating current	0 ... 200 mA	◆	
	10 ... 500 mA		◆
Off-state current	0 ... 2.5 mA typ.		◆
Operating voltage display	LED, green	◆	
Indication of the switching state	LED, yellow	◆	
	LED, red		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP65	◆	◆
Note	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage U <sub>b</sub> 80...253 V		◆

CJ15-U1-W



CJ15-U1-A2

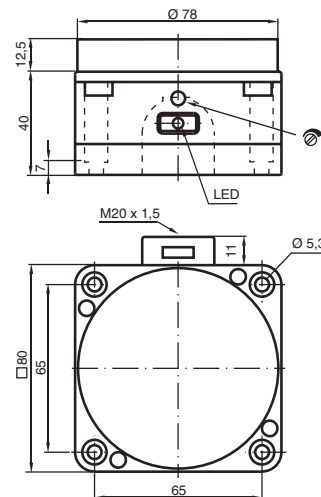


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- **Comfort series**
- **40 mm not embeddable**
- **The switching distance can be set over a wide range with the potentiometer**

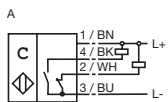


C40-FP-A0-P1  
C40-FP-A2-P1  
C40-FP-W-P1

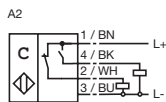


		C40-FP-A0-P1	C40-FP-A2-P1	C40-FP-W-P1
Rated operating distance	40 mm	◆	◆	◆
Installation	not embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
	4-wire	◆	◆	
Switching element function	AC	◆	◆	◆
	NPN	◆		
	PNP		◆	
Assured operating distance	0 ... 28.8 mm	◆	◆	◆
Kind of voltage	AC	◆	◆	◆
	DC	◆	◆	
Operating voltage	10 ... 60 V	◆	◆	
	20 ... 253 V			◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	
Short-circuit protection	no			◆
	pulsing	◆	◆	
Voltage drop	≤ 2.8 V	◆	◆	
	≤ 7 V			◆
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA			◆
Operating current	0 ... 200 mA	◆	◆	
	10 ... 500 mA			◆
Off-state current	0 ... 2.5 mA typ.			◆
Indication of the switching state	LED, yellow	◆	◆	
	LED, red			◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	terminal compartment	◆	◆	◆
Housing material	PBT/POM	◆	◆	◆
Sensing face	POM	◆	◆	◆
Protection degree	IP65	◆	◆	◆

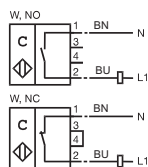
C40-FP-A0-P1



C40-FP-A2-P1



C40-FP-W-P1

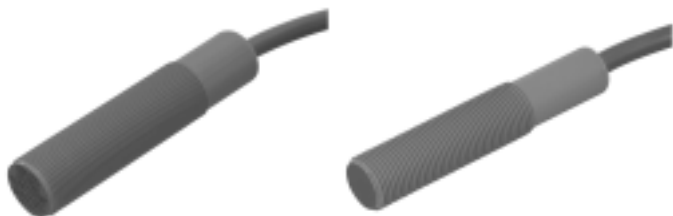


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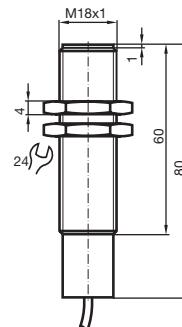
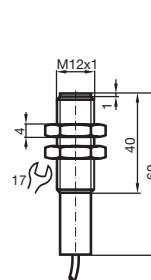


- Comfort series
- 1 mm not embeddable
- 2 mm not embeddable
- 4 mm not embeddable
- 6 mm not embeddable



CJ1-12GK-N  
CJ4-12GK-N

CJ2-18GK-N  
CJ6-18GK-N

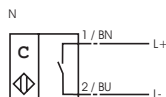


2.2

Capacitive sensors for hazardous areas (NAMUR)

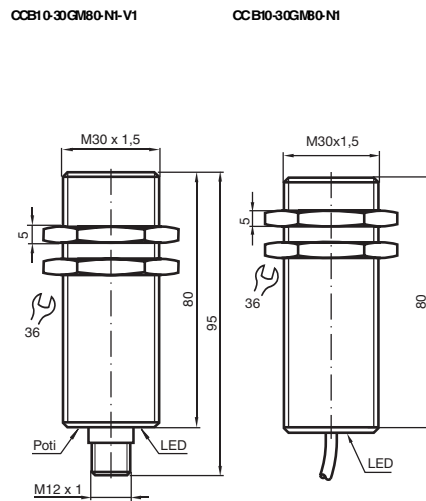
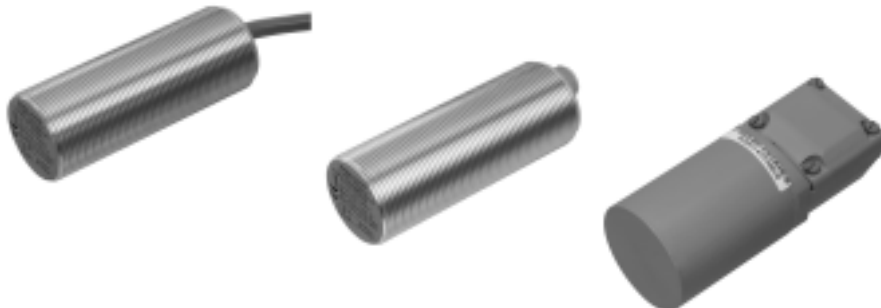
		CJ1-12GK-N	CJ4-12GK-N	CJ2-18GK-N	CJ6-18GK-N
Rated operating distance		1 mm	4 mm	2 mm	6 mm
Installation	not embeddable	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆
Switching element function	NAMUR NO	◆	◆	◆	◆
Assured operating distance	0 ... 0.72 mm	◆			
	0 ... 1.44 mm			◆	
	0 ... 2.88 mm		◆		
	0 ... 4.32 mm				◆
Nominal voltage	8 V	◆	◆	◆	◆
Operating voltage	7 ... 12 V	◆	◆	◆	◆
Switching frequency	0 ... 1 Hz	◆	◆	◆	◆
Current consumption	Measuring plate not detected	≤ 1 mA	◆	◆	◆
	Measuring plate detected	≥ 2.4 mA	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆	◆
Housing material	PBT	◆	◆	◆	◆
Sensing face	PBT	◆	◆	◆	◆
Protection degree	IP68	◆	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆	◆

CJ1-12GK-N  
CJ2-18GK-N  
CJ4-12GK-N  
CJ6-18GK-N

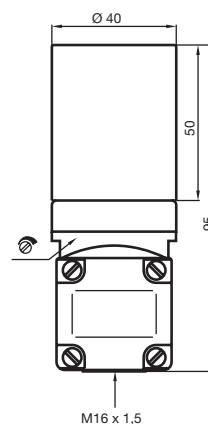


Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

- Comfort series
- 1The switching distance can be set over a wide range with the potentiometer

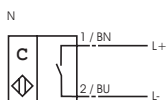


CJ15-40-N

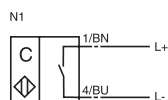


		CCB10-30GM80-N1	CCB10-30GM80-N1-V1	CJ15-40-N
Rated operating distance	10 mm	◆	◆	
	15 mm			◆
Installation	embeddable	◆	◆	◆
Output type	2-wire	◆	◆	◆
Switching element function	NAMUR NO	◆	◆	◆
Assured operating distance	0 ... 10.8 mm			◆
	0 ... 8.1 mm			◆
Nominal voltage	8 V	◆	◆	◆
Operating voltage	5.9 ... 22.7 V	◆	◆	
	7 ... 12 V			◆
Switching frequency	0 ... 10 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	
Current consumption				
Measuring plate not detected	≤ 1 mA	◆	◆	◆
Measuring plate detected	≥ 2.4 mA	◆	◆	◆
	≥ 3 mA	◆		
Indication of the switching state	LED, yellow	◆		
	LED, red			◆
	Multihole-LED, yellow		◆	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)	◆	◆	
	-25 ... 70 °C (248 ... 343 K)			◆
Connection type	terminal compartment			◆
	V1-connector		◆	
	2 m, PVC cable	◆		
Housing material	Stainless steel	◆	◆	
	PBT			◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65			◆
	IP67	◆	◆	
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆

CJ15-40-N



CCB10-30GM80-N1  
CCB10-30GM80-N1-V1



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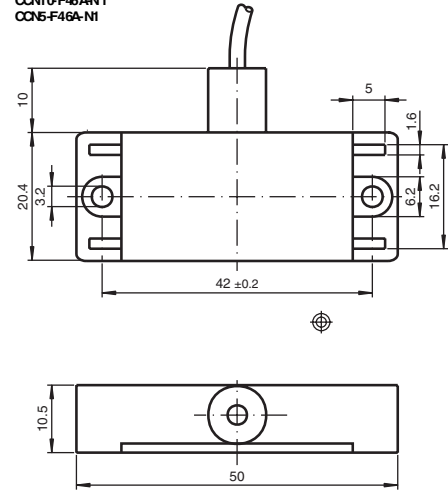
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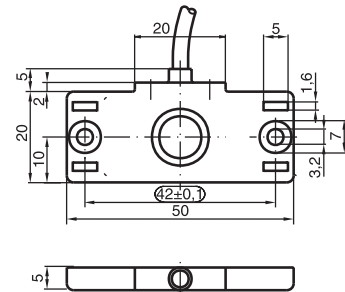
- Flat housing
- mounting slots for cable ties
- chemically constant housing made of PVDF  
CCN5-F46A-N1  
CCN10-F46A-N1



CCN10-F46A-N1  
CCN5-F46A-N1



CBN10-F46-N1  
CBN2-F46-N1  
CBN5-F46-N1

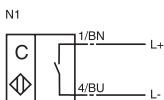


2.2

Capacitive sensors for hazardous areas (NAMUR)

		CBN2-F46-N1	CBN5-F46-N1	CBN10-F46-N1	CCN5-F46A-N1	CCN10-F46A-N1
Rated operating distance	10 mm	◆		◆		◆
	2 mm		◆			
	5 mm				◆	
Installation	not embeddable	◆	◆	◆	◆	◆
Output type	2-wire	◆	◆	◆	◆	◆
Switching element function	NAMUR NO	◆	◆	◆	◆	◆
Assured operating distance	0 ... 1.4 mm	◆				
	0 ... 3.5 mm		◆		◆	
	0 ... 7 mm			◆		◆
Nominal voltage	8.2 V (R <sub>i</sub> approx. 1 kΩ)	◆	◆	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆	◆	◆
Current consumption						
Measuring plate not detected	≤ 1 mA	◆	◆	◆	◆	◆
Measuring plate detected	≥ 22 mA	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆
Connection type	2 m, PUR cable	◆	◆	◆		
	2 m, PVDF cable				◆	◆
Housing material	PBT	◆	◆	◆		
	PVDF				◆	◆
Sensing face	PBT	◆	◆	◆		
	PVDF				◆	◆
Protection degree	IP67	◆	◆	◆		
	IP68				◆	◆
Note	cable tensile strength 20 N				◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆	◆	◆
Category	1G; 2G; 1D	◆	◆	◆	◆	◆

CCN10-F46-N1  
CCN2-F46-N1  
CCN5-F46-N1  
CCN10-F46A-N1  
CCN5-F46A-N1

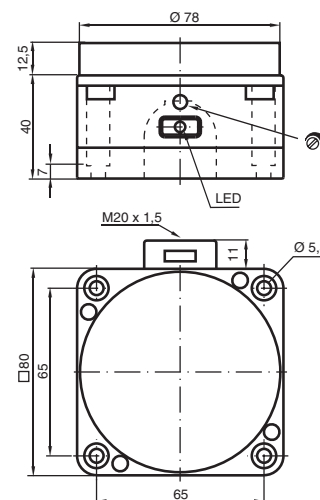


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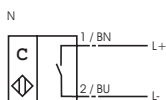
- Comfort series
- 40 mm not embeddable
- The switching distance can be set over a wide range with the potentiometer

CJ40-FPN-P1



		CJ40-FPN-P1
Rated operating distance	40 mm	◆
Installation	not embeddable	◆
Output type	2-wire	◆
Switching element function	NAMUR NO	◆
Assured operating distance	0 ... 28.8 mm	◆
Nominal voltage	8 V	◆
Switching frequency	0 ... 10 Hz	◆
Current consumption		
Measuring plate not detected	≤ 1 mA	◆
Measuring plate detected	≥ 2.4 mA	◆
Indication of the switching state	LED, red	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Connection type	terminal compartment	◆
Housing material	PBT/POM	◆
Sensing face	POM	◆
Protection degree	IP65	◆
Use in the hazardous area	see instruction manuals	◆
Category	1G; 2G; 1D	◆

CJ40-FPN-P1



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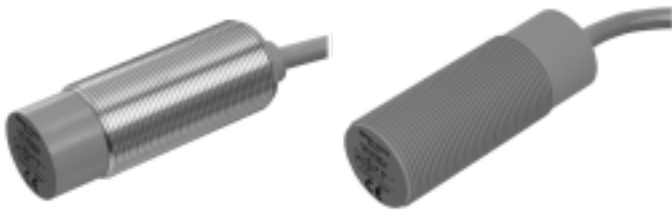
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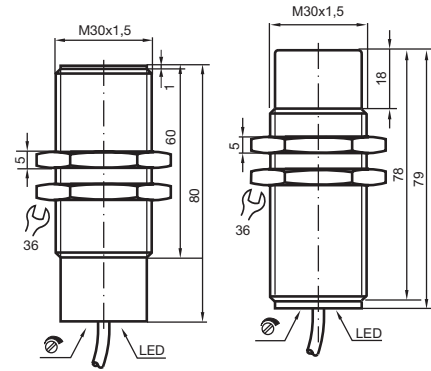
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- The switching distance can be set over a wide range with the potentiometer
- Comfort series
- 10 mm embeddable



CJ10-30GK-A2-3D

CJ10-30GM-A2-3D  
CJ10-30GM-E2-3G-3D



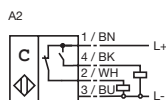
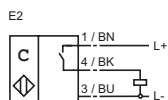
2.2

Capacitive sensors for hazardous areas (3G, 3D)

		CJ10-30GM-E2-3G-3D	CJ10-30GM-A2-3D	CJ10-30GK-A2-3D
Rated operating distance	10 mm	◆	◆	◆
Installation	embeddable	◆	◆	◆
Output type	3-wire	◆		
	4-wire		◆	◆
Switching element function	PNP Antivalent		◆	◆
	PNP Make function	◆		
Assured operating distance	0 ... 7.2 mm	◆	◆	◆
Kind of voltage	DC	◆	◆	◆
Operating voltage	10 ... 60 V	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆	◆
Reverse polarity protection		◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆
Voltage drop	≤ 2.8 V	◆	◆	◆
Operating current	0 ... 200 mA	◆	◆	◆
Off-state current	0 ... 0.5 mA typ. 0.01 mA 0 ... 0.5 mA typ. 0.1 µA at 25 °C	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	2 m, PVC cable	◆	◆	◆
Housing material	Stainless steel	◆	◆	
	PBT			◆
Sensing face	PBT	◆	◆	◆
Protection degree	IP65			◆
	IP67	◆	◆	
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	3D		◆	◆
	3G; 3D	◆		

CJ10-30GM-E2-3G-3D

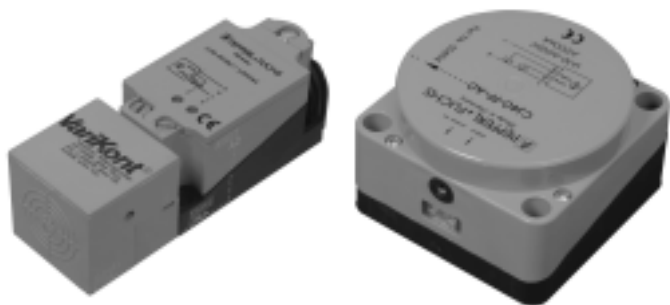
CJ10-30GK-A2-3D  
CJ10-30GM-A2-3D



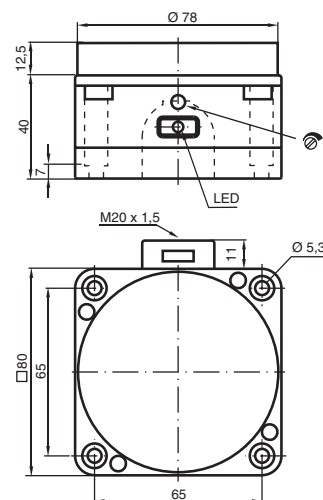
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- The switching distance can be set over a wide range with the potentiometer
- 15 mm embeddable  
CJ15+U1+A2-3G-3D
- 40 mm not embeddable  
CJ40-FP-A2-P1-3D

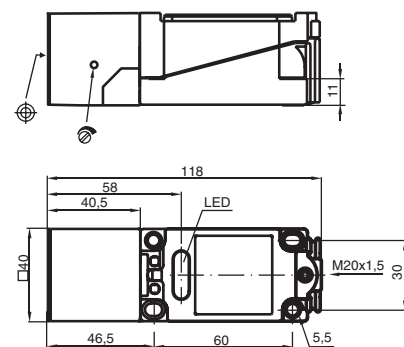


CJ40-FP-A2-P1-3D

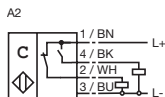


		CJ15+U1+A2-3G-3D	CJ40-FP-A2-P1-3D
Rated operating distance	15 mm	◆	◆
Installation	40 mm	◆	◆
	embeddable	◆	◆
Output type	not embeddable	◆	◆
	4-wire	◆	◆
Switching element function	PNP Antivalent	◆	◆
Assured operating distance	0 ... 10.8 mm	◆	◆
	0 ... 28.8 mm	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
	10 ... 60 V	◆	◆
No-load supply current	≤ 20 mA	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 2.8 V	◆	◆
	≤ 3 V	◆	◆
Operating current	0 ... 200 mA	◆	◆
Operating voltage display	LED, green	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	terminal compartment	◆	◆
Housing material	PBT	◆	◆
	PBT/POM	◆	◆
Sensing face	PBT	◆	◆
	POM	◆	◆
Protection degree	IP65	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3D	◆	◆
	3G; 3D	◆	◆

CJ15+U1+A2-3G-3D



CJ15+U1+A2-3G-3D  
CJ40-FP-A2-P1-3D



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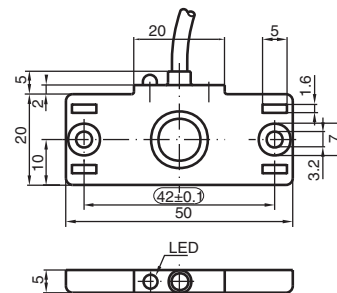
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- Flat housing
- mounting slots for cable ties
- 2 mm not embeddable  
CBN2-F46-E2-3G-3D
- 5 mm not embeddable  
CBN5-F46-E2-3G-3D

CBN5-F46-E2-3G-3D  
CBN2-F46-E2-3G-3D

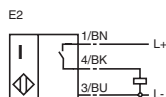


2.2

Capacitive sensors for hazardous areas (3G, 3D)

		CBN2-F46-E2-3G-3D	CBN5-F46-E2-3G-3D
Rated operating distance	2 mm	◆	
	5 mm		◆
Installation	not embeddable	◆	◆
Output type	3-wire	◆	◆
Switching element function	PNP      Make function	◆	◆
Assured operating distance	0 ... 1.4 mm	◆	
	0 ... 3.5 mm		◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 15 mA	◆	◆
Switching frequency	0 ... 10 Hz	◆	◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 2 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Of-state current	0 ... 0.5 mA typ. 0.01 mA	◆	◆
Indication of the switching state	LED, yellow	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	2 m, PVC cable	◆	◆
Housing material	PBT	◆	◆
Sensing face	PBT	◆	◆
Protection degree	IP67	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆
Category	3G; 3D	◆	◆

CBN5-F46-E2-3G-3D  
CBN2-F46-E2-3G-3D



Detailed data and product description, see data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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# Magnetic field sensors

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## Magnetic field sensors for standard applications

### Applications

Magnetic field sensors are used to detect the presence of magnets (electromagnets and permanent magnets) or ferromagnetic objects. Permanent magnets are predominantly used in automation technology as they can be used without a power supply.

Magnetic field sensors have a greater operating range and smaller footprint than inductive sensors. In addition, they can be fully encapsulated inside metal housings. This opens up new areas of application, especially in automation technology and automotive engineering.

### Operating principle

Each magnet generates a magnetic field. Figures 1 and 2 show how strongly the magnetic field depends on the axial distance  $z$  to the permanent magnet (Fig. 1) and the radial distance  $r$  to the permanent magnet (Fig. 2). In this way, the presence and distance of a permanent magnet from the sensor can be measured using a suitable magnetic field sensor capable of determining the strength of the magnetic field.

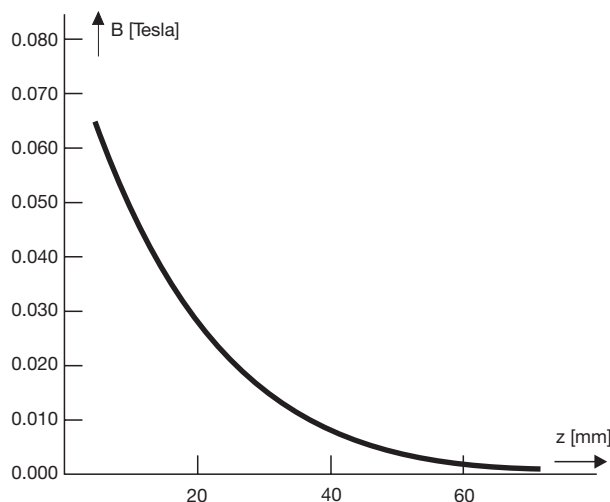


Figure 1: Magnetic flow density  $B$  of the permanent magnet depending on radial coordinate  $z$  ( $r = 0$ )

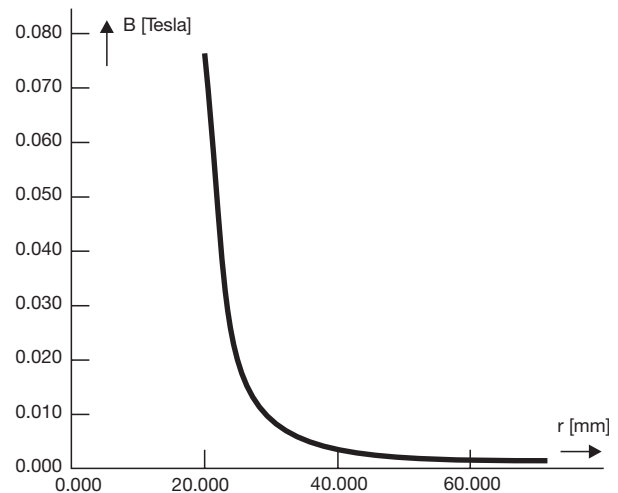


Figure 2: Magnetic flow density  $B$  of the permanent magnet depending on axial coordinate  $z$  ( $r = 0$ )

### Circuitry

The impedance of the coil is measured and evaluated. This is influenced by the coil's inductivity, which in turn is dependent on the reversible permeability of the core material.

The higher the superimposed (external) magnetic field, the lower the reversible permeability. The lower the reversible permeability, the less the coil impedance – a measure of the intensity of the external magnetic field.

If the sensor coil is supplied with an alternating current  $I$  with a constant amplitude, the resulting voltage  $U$  is proportional to the value of the coil impedance and therefore a measure of the field intensity.

### Response curves

The response curve depends on the orientation of the magnet.

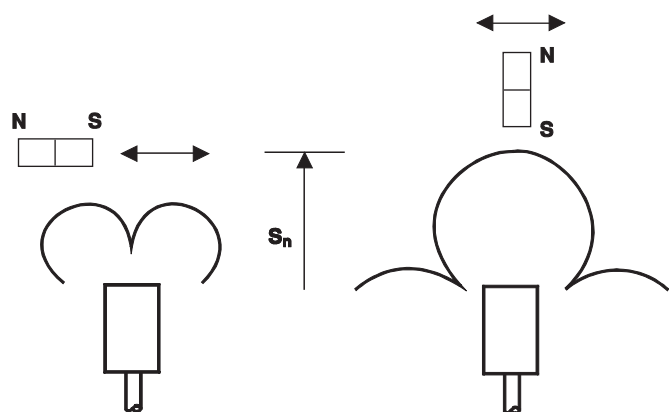


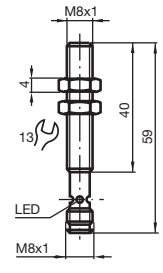
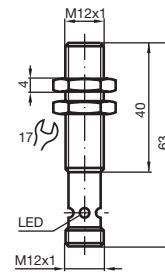
Figure 3: Response curve of the magnetic field sensor

- 60 mm embeddable



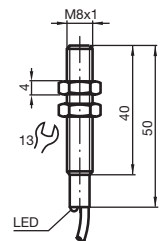
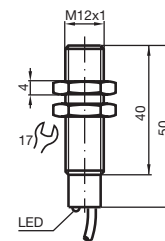
MB60-12GM50-E2-V1

MB60-8GM50-E2-V3



MB60-12GM50-E2

MB60-8GM50-E2

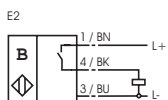


		MB 60-12GM50-E2	MB60-12GM50-E2-V1	MB 60-8GM50-E2	MB60-8GM50-E2-V3
Rated operating distance	60 mm	◆	◆	◆	◆
Installation	embeddable, in non-magn. metal	◆	◆	◆	◆
Output type	3-wire	◆	◆	◆	◆
Switching element function	PNP Make function	◆	◆	◆	◆
Assured operating distance	10 ... 48.6 mm	◆	◆	◆	◆
Kind of voltage	DC	◆	◆	◆	◆
Operating voltage	10 ... 30 V	◆	◆	◆	◆
No-load supply current	≤ 10 mA	◆	◆	◆	◆
Switching frequency	0 ... 5000 Hz	◆	◆	◆	◆
Reverse polarity protection		◆	◆	◆	◆
Short-circuit protection	pulsing	◆	◆	◆	◆
Voltage drop	≤ 1.5 V	◆	◆	◆	◆
Operating current	0 ... 300 mA	◆	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆	◆
	Multihole-LED, yellow		◆		◆
Ambient temperature	-25 ... 75 °C (248 ... 348 K)	◆	◆	◆	◆
Connection type	V1-connector		◆		◆
	V3-connector				◆
	2 m, PUR cable			◆	
Housing material	brass, nickel-plated	◆	◆	◆	◆
Sensing face	PA	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆

3.1

Magnetic field sensors, standard

MB60-12GM50-E2  
 MB60-12GM50-E2-V1  
 MB60-8GM50-E2  
 MB60-8GM50-E2-V3



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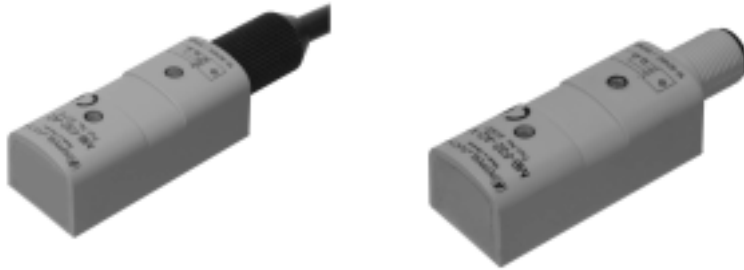
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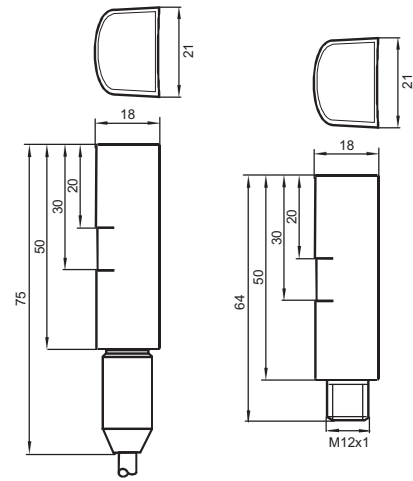


- For hydraulic cylinder
- Zero-contact detection of piston position
- No holes are required in the cylinder
- Freely positionable
- Simple, protected attachment



MB-F32-A2

MBF32-A2-V1

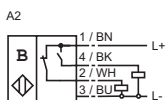


3.1

Magnetic field sensors, standard

		MB-F32-A2	MBF32-A2-V1
Rated operating distance			
Installation	on the cylinder	◆	◆
Switching range	typ. 50 mm	◆	◆
Output type	4-wire	◆	◆
Switching element function	PNP Antivalent	◆	◆
Kind of voltage	DC	◆	◆
Operating voltage	10 ... 30 V	◆	◆
No-load supply current	≤ 30 mA	◆	◆
Hysteresis	typ. 5 mm		◆
Reverse polarity protection		◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 1.5 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Indication of the switching state	LED, red (output 1); LED, yellow (output 2)	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆
Connection type	V1-connector		◆
	2 m, PVC cable	◆	
Housing material	Polyamide (PA)	◆	◆
Sensing face	Polyamide (PA)	◆	◆
Protection degree	IP67	◆	◆

MB-F32-A2  
MB-F32-A2-V1



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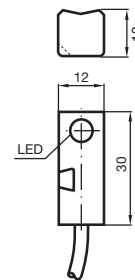
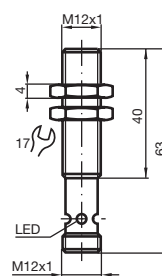


- **Comfort series**
- **60 mm embeddable with permanent magnet**  
**DM 60-31-15**  
 MC60-12GM50-1N  
 MC60-12GM50-1N-V1
- **35 mm embeddable**  
 MJ35-F12-1N



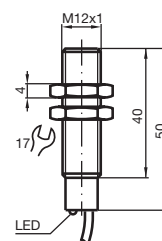
MC60-12GM50-1N-V1

MJ35-F12-1N



MC60-12GM50-1N

		MC60-12GM50-1N	MC60-12GM50-1N-V1	MJ35-F12-1N
Rated operating distance	35 mm			◆
Installation	60 mm embeddable	◆	◆	◆
	embeddable, in non-magn. metal	◆	◆	◆
Output type	2-wire	◆	◆	◆
Output type	NAMUR			◆
Switching element function	NAMUR NO	◆	◆	◆
Assured operating distance	0 ... 35 mm			◆
	10 ... 48.6 mm	◆	◆	
Kind of voltage	DC	◆	◆	◆
Nominal voltage	8 V	◆	◆	◆
Switching frequency	0 ... 1000 Hz			◆
	0 ... 5000 Hz	◆	◆	
Current consumption				
Magnet detected	≥ 2.5 mA	◆	◆	
	≥ 3 mA			◆
Magnet not detected	≤ 1 mA	◆	◆	◆
Indication of the switching state	LED, yellow	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Connection type	V1-connector		◆	
Housing material	2 m, PVC cable	◆		◆
	aluminium, black anodised			◆
Sensing face	Stainless steel	◆	◆	
	Stainless steel	◆	◆	
	PBT			◆
Protection degree	IP67	◆	◆	◆
Use in the hazardous area	see instruction manuals	◆	◆	◆
Category	2G	◆	◆	◆

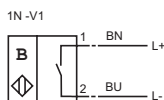
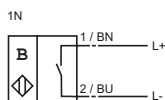


3.2

Magnetic field sensors for hazardous areas

MC60-12GM50-1N  
MJ35-F12-1N

MC60-12GM50-1N-V1



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3.2

**Magnetic field sensors for hazardous areas**



# Photoelectric sensors

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## Note:

See our special catalogs for information on the following

- photoelectric safety sensors
- photoelectric sensors for doors, gates and elevators
- barcode scanners and data matrix readers

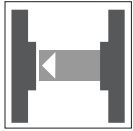
We offer a wide range of vision sensors and systems to help you solve complex tasks with image recognition.

<sup>\*)</sup> also convergent mode and background evaluation

## Overview

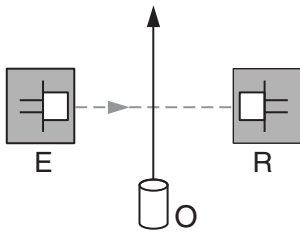
Type, size, shape, and surface characteristics of the objects to be detected, the distance between the sensor and the object, and the ambient conditions determine the design of the system and the sensor type.

### 1. Thru-beam sensors



The transmitter and receiver of the thru-beam sensor are housed in different cases that are separated from each other. The transmitter (E) is aimed directly into the receiver (R). If an object (O)

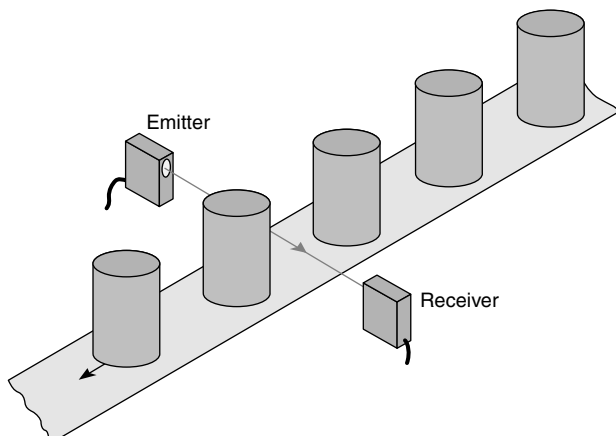
interrupts the light beam, the output is switched accordingly.



Features:

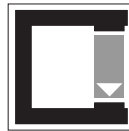
- Detects opaque and reflective objects.
- Large range and high reliability because the light beam only passes through the signal path once.
- Not significantly affected by interference, and therefore suitable for applications in difficult conditions. Possible applications include outside of buildings or in environments subject to contamination.
- Additional installation expense, since both units need to be mounted and wired.

Typically, thru-beam sensors are used to monitor production and packaging lines (see fig.) to measure full state in transparent containers or as a safety measure for doors and hazardous areas. The last-named being an application of thru-beam systems.



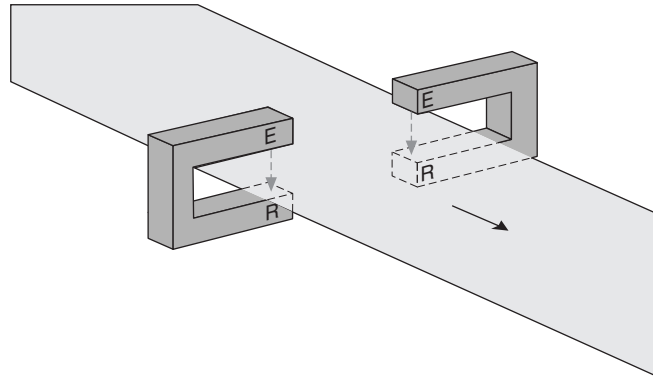
## Special versions of thru-beam sensors

### Slot style sensors

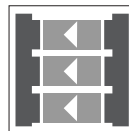


If the distance between the transmitter and receiver is small - a few millimeters or centimeters- the two can be arranged across from each other in a u-shaped housing. Since wiring is only required

for one device, slot style sensors (see figure) give the advantage of a simpler electrical installation. In addition, there is no need to adjust the optical axis.

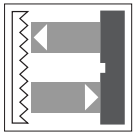


### Light grids

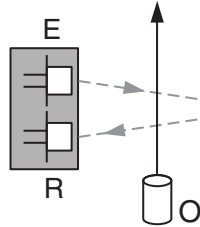


In safety applications, the task at hand often involves monitoring a large surface. The easiest way to achieve this is by arranging a number of thru-beam sensors parallel to each other. In a light grid of this type, all transmitters are combined in a single housing. This also applies to the receivers whose switch outputs are logically connected. This reduces installation time and expense when compared to a corresponding number of thru-beam sensors. The distances between the individual beams of the grid can be selected specifically for the application.

## 2. Retro-reflective sensors

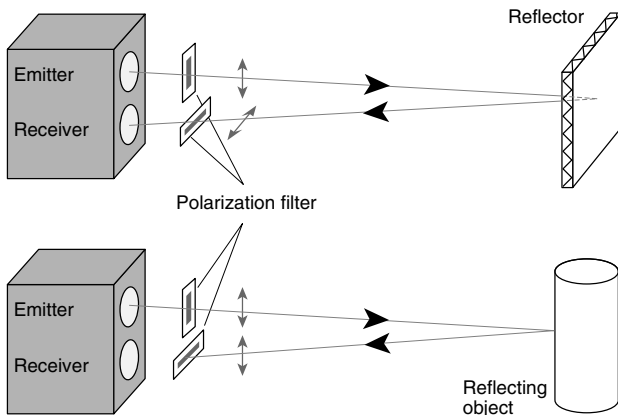


The retro-reflective sensor contains transmitter and receiver in a single housing. The light of the transmitter is reflected to the receiver by a reflector. If the light beam is interrupted the switching function is triggered.



### Retro-reflective sensors with polarization filter

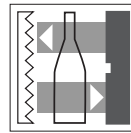
A typical problem that arises for retro-reflective systems is that glossy/reflective objects cannot be reliably detected. A polarizing filter is utilized to eliminate false signals that may occur if a shiny target passes in front of the retro-reflective sensor. A corner cube reflector is employed to accurately return the light energy, on a parallel axis, into the receiver (see fig.).



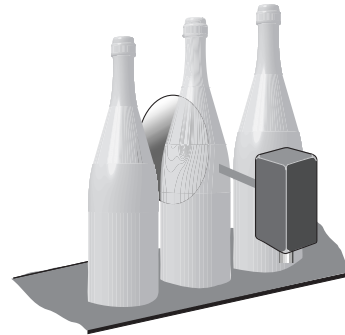
#### Features:

- Detects opaque and glossy objects.
- Versions for clear object detection (G versions)
- Reduced time and cost since because the electric connection is only required on the sensor side.

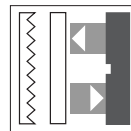
### Retro-reflective sensors for clear object detection



The clear object detection sensor detects clear objects. Through the use of a low hysteresis circuit, the sensor detects small changes in light typical when sensing clear objects.

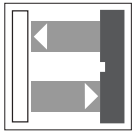


### Retro-reflective sensors with foreground suppression

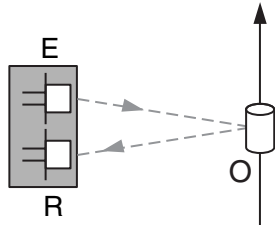


These retro-reflective sensors do not erroneously identify glossy targets as the reflector when they are within a certain distance.

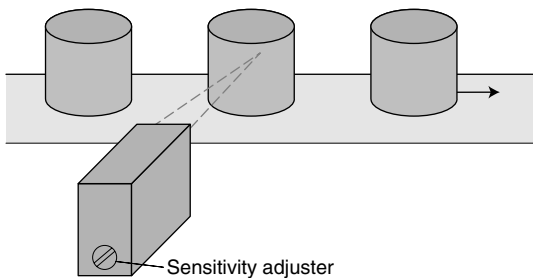
### 3. Diffuse mode sensors



The principle of the diffuse mode sensor is based on the same principle as a retro-reflective sensor. It does not have a reflector, however. Instead, some light returns directly to the receiver and the target is detected.



Due to the diffuse reflection (reemission) through the object, the detection range of the diffuse sensor is reduced in comparison to the retro-reflective sensor. This is referred to as the sensing range. The sensing range is the maximum distance from the sensor at which an object can still be reliably detected.



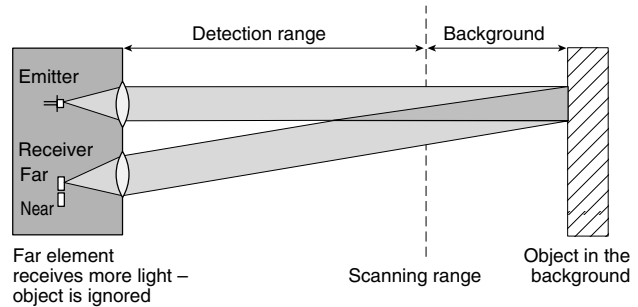
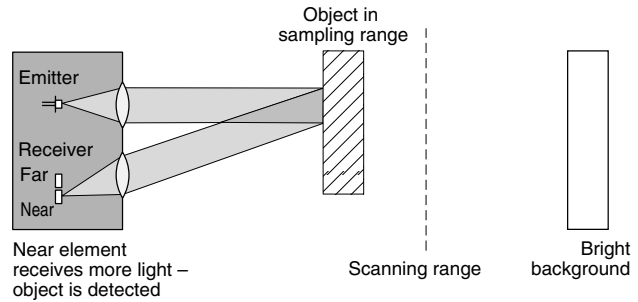
#### Diffuse mode sensors with background suppression



Diffuse mode sensors with background suppression were developed to achieve a defined scanning range for any objects irrespective of their brightness, color and other characteristics as well

as the brightness of the background. The following figure illustrates the functional principle of a diffuse mode sensor with background suppression. The light emitted by the transmitter reaches the object bundled by the optics. If the object is within the scanning range then a portion of the reflected light, bundled by the receiver lens, is imaged on the proximity element of the receiver (N); the sensor issues the signal "switched on".

With increasing object distance this light spot moves towards the distance element (F). Near the scanning range limit half of the light spot is on the proximity and half on the distance element, and the sensor returns "off". If the object moves further away, the light only falls onto the distance element and the sensor continues to signal "off".

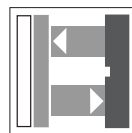


#### Features:

- A nearly constant sensing range on diffusely reflecting materials with sharply differing reemission levels.
- Dark objects in front of a bright background are reliably detected.
- Not sensitive to interfering reflections of objects outside the adjusted sensing range.
- High functional reserve.
- Low Inexpensive and relatively quick installation since the sensor consists of only one unit and no reflector is required.

The principle of **foreground suppression** is similar to background suppression. Diffuse mode sensors of this type ignore all objects that are located closer to the sensor than a previously adjusted minimum sensing range.

#### Diffuse mode sensors with convergent mode (HGU)



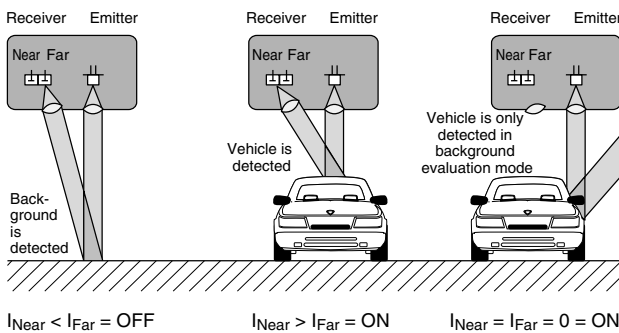
A convergent beam sensor is a more efficient type of diffuse mode sensing. The emitter lens is focused to an exact point in front of the sensor and the receiver lens is focused to the same point. The range for a convergent beam sensor is fixed and defined as this focus point. The sensor is able to detect an object at the focus point, plus or minus some distance. Because all the emitted energy is focused to a single point, a high amount of excess gain is available. This excess gain enables the sensor to easily detect narrow or low reflectivity targets.

**Diffuse mode sensors with background evaluation**

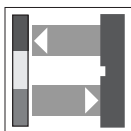


In addition to background suppression, a somewhat opposite principle used for specific applications is background evaluation. While the first process ignores the background and only looks at objects within the sensing range, the other evaluates only the light reflected from the background. The background, not the object, is the reference (see fig.). If an object interrupts the light path to the background, the sensor switches regardless of whether or not the reflected light has reached the receiver, thus signaling or not signaling an object detected in front of the background - for example with reflecting objects.

Sensors with background evaluation have no blind area and are more suitable for recording difficult objects, especially those that are highly reflective. In addition, they can be tested and designed to be self-monitoring.



**Special versions of diffuse mode sensors**



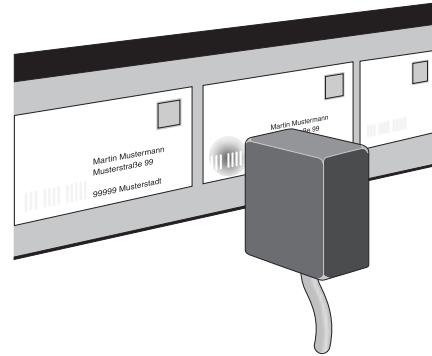
The standard feature of the diffuse mode sensors (responding sensitively to the surface characteristics of the target) is put to use by contrast and color sensors.

**Contrast sensor**

This sensor evaluates the difference in brightness between the scanned object and a marking on it. The color of the emitted light or the color of the print markings must be selected such that as strong a contrast as possible is achieved. Our contrast sensors are equipped with a 3 color LED light source. The optimum light emission color is selected automatically during the sensor teach-in. Many sensors are based on the autocollimation principle, i.e. transmitter and receiver are on a common optical axis (one-eyed system). This permits greater flexibility in the installation position of the sensor.

**Luminescence sensor**

A variation of the contrast sensor, the luminescence sensor works with modulated ultra-violet light. Suitable materials (luminophores) are placed on the scanner material and then energized by irradiation. These materials include optical brighteners in white paper, but they are also components in certain kinds of chalk, paint, oils, greases, and text marks.



The light reflected by the luminophores to the receiver has a longer wavelength than the light emitted from the transmitter; it is within the visible part of the spectrum. Because of the modulation and the precisely defined frequency offset between the transmitted and received light, luminescence scanners are immune to ambient light and are highly reliable.

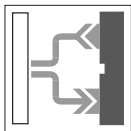
**Color sensors**

While a standard contrast sensor evaluates only differences in brightness within a specific range of the spectrum determined by the light color of the sensor, the color sensor breaks up the light re-emitted from the target into several portions of the spectrum and returns an intensity value for each of these sub-spectra. The distribution of this value reflects the spectral properties - and thus the color - of the target.

Visolux color sensors work according to the three range procedure. Below are descriptions of the active and passive three-range procedure.

- Active three-range method:  
 The sensor material is beamed sequentially with three transmitter colors (red, green, and blue). The quantity of light reflected is individually measured for each color. The three colors that are obtained are used to determine the color of the sensor object.
- Passive three-range method  
 The sensor material is beamed by a white LED with white transmitted light. After this the red, green, and blue portions of the reflected light are filtered out and the light quantity is determined for each one. Three receivers are used for this process. In this manner, the color of the target is determined.

#### 4. Fiber optic cables



The characteristics of fiber optic cables are, depending on design, similar to those of a thru-beam or a diffuse mode sensor.

Thru-beam systems have one fiber optic cable each for transmitter and receiver. For diffuse systems, the light is guided in a single fiber optic cable through separate transmitter and receiver fibers.

The transmitter and receiver are arranged together in a single housing. The optically active area is guided via flexible fiber optic cable (glass or plastic) from the device to the sampling station. Due to their small active surfaces, fiber optic systems are also suitable for detecting small details in close-up applications. For this purpose, special fiber optic cables with coaxial or mixed fiber arrangement and small fiber diameters (plastic optical fiber: 100 m, glass fibers: typically, 50 m) are available.

Due to the large opening angle of the light aperture of the fiber optic (about 70°), on the other hand, fiber optics are generally used for shorter distances than standard photoelectric sensors. These distances can be increased if necessary using suitable lens attachments.

##### Glass or plastic?

When choosing the right fiber optic cable, the user must decide between plastic or glass. The characteristics of these two materials are briefly outlined below.



##### Plastic fiber optic cables

consist of a single fiber enclosed in a PVC sheathing. The low weight and high bending flexibility of the light fiber optic material permits their use in frequently moving parts. A particular advantage is the customization of the cables. The standard length is 2 m. Using the cutter included, the fiber optic cable can easily be shortened to the required length for your application. The cables are available in two diameters and have different heads available. You will find the correct cable for your application here.

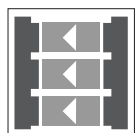
##### Glass optical fibers

consist of many individual fibers, each with a diameter of about 50 m. Depending on the application, stainless steel, PVC, metallic silicon, or silicon sheathing can be selected. Due to the low optical damping of glass fibers in comparison with plastic fibers, larger ranges are possible. The robust nature of the stainless steel sheathing allows application in high temperatures up to 300 °C. When choosing a head, in combination with the corresponding mantle material, you will find a solution for any application.

To simplify the selection for you, the fiber optic types corresponding to the individual sensor types are listed after the sensor data in the "Fiber optic devices" section.



## 5. Light grids for clear glass detection



The devices of the PR and LG series are high resolution light curtains used to detect very small non-position guided objects.

By using special low-noise receiver stages and a smart evaluation algorithm even transparent objects can be safely and reliably detected.

### Crossed beam evaluation:

Every transmitter has a line of sight to every receiver. This results in a very high sensor resolution.

### Automatic calibration:

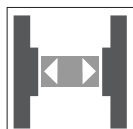
After the power supply is turned on (model number -W), or after calibration input has been externally activated (model number -F), the sensor automatically calibrates itself. In this process, each individual transmitter-receiver route is individually calibrated.

Example PR16:

16 transmitters, 16 receivers with crossed beam evaluation. 256 light beams are internally calibrated and evaluated separately. In addition, the switching limit of the individual transmitter-receiver routes is subject to continuous control during operation within a certain bandwidth. This means that at certain time intervals the sensor compares the value that has been saved with the level of reception that is actually being measured at that moment.

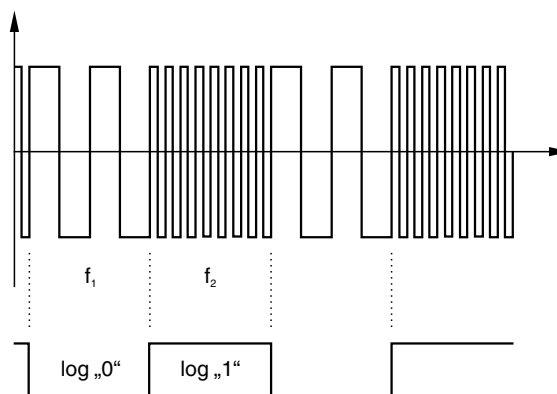
If these two values should differ over the course of time (because of slight smudges or minor misadjustment), the emitter threshold of each individual light path is redetermined. This makes it possible to ensure that highly transparent objects will always be detected, even in harsh industrial conditions.

## 6. Optical data couplers



Optical data couplers are used for the cable-free transmission of information from point A to point B. One of the two optical data couplers can be moved in an axial direction. For the transmission via the optical path, the FSK method (Frequency Shift Keying) is used. In other words, the bit information is coded in the carrier frequency.

The transmitted signal is shifted between two frequencies  $f_1$  and  $f_2$  that correspond to either logic bits 0 or 1. Narrow band filtering, used on the receiver side to convert the data back to logic, prevents extraneous signals from corrupting the transmitted data. The data transmission is unaffected by signal level variation.



Our program contains optical data couplers for parallel as well as serial data transfer.

- Parallel data transfer:

An optical data coupler can transfer 8 bits bidirectionally. To do this, the signals in the device are converted into a serial bit sequence. The data is then applied to the parallel outputs in the receiver. FSK modulation, which is noise-resistant, is used to transfer the binary signals.

- Serial data transfer:

Our serial optical data coupler also uses the FSK method. The data that is available at the interface is transferred without the use of a protocol and is then exported again at the serial interface.











Many devices with a serial interface are also available in a version with a visible red light. These devices are always used when the structure must consist of parallel transfer routes and the possibility of cross-talk with the adjacent infrared route must be excluded.

## 7. - our symbol for safety and reliability

The new generation of photoelectric sensors with the the features you need today - economical, easy to install, and reliable in harsh environments.

All photoelectric sensors in this catalog with this seal in this catalog have the following additional features:






- highly visible LEDs
- Green LED for Power on
- Modern outputs such as push-pull or AS-interface 2.11
- Ambient light resistant
- Cross-talk immune

		Sensing range						
		1 m	5 m	10 m	20 m	50 m	100 m	
	ML4.1 series	█	█	5 m				
	ML5 series	█	█	7 m				
	ML7 series ML71 series	█	█	4.5 m				
	ML8 series	█	█	4.5 m				
	ML29 series	█	█	8.5 m				
	MLV12 series	█	█	25 m				
	MLV40 series	█	█	5 m				
	RL28 series	█	█	400 m				
	RL31 series	█	█	45 m				
	RL39 series	█	█	30 m				

Light type			Supply			Switching output						Connection				Additional functions					from page			
Infrared	Visible red light	Laser	DC	AC / DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency [Hz]	Light on	Dark on	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity		TEACH-IN	Timer functions	Fiber optic connection (see optical waveguide devices)
	•		•			•			500	•	•	•	•					•						318
•			•			•			200	•	•	•				•				•				319
	•		•			•			1000		•		•		•	•		•			•			320 321
•			•			•			1000	•	•		•			•		•						322
•			•			•			100	•	•		•			•								323
•	•		•			• <sup>4)</sup>			1000	•	•	•	•	•		•		•	•	•	•			324
•			•			•			100		•	•	•			•								325
	•	•	•	•	•	• <sup>4)</sup>	•	•	1000/ 25 <sup>1)</sup>	•	•	•		•		•	•	•	•	•		•		326
	•		•	•		• <sup>4)</sup>	•		250/ 20 <sup>1)</sup>	•	•		•			•		•						329
•			•			•			300	•	•	•					•			•				331











1) Relay output 4) push-pull output stage



		Sensing range						
		1 m	5 m	10 m	20 m	50 m	100 m	
	Series KT10	1.5 m						
	Series GLV12	5 m						
	Series GLV18	25 m						
	Series 18 GM 60	10 m						
	Series VL18	85 m						

Light type			Supply			Switching output						Connection				Additional functions					from page				
Infrared	Visible red light	Laser	DC	AC / DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency	Light on	Dark on	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity	TEACH-IN	Timer functions	Fiber optic connection (see optical waveguide devices)		
●			●			●			70	●	●	● <sup>2)</sup>		● <sup>2)</sup>		●	● <sup>2)</sup>		● <sup>2)</sup>	● <sup>2)</sup>					332
	●		●			●			500	●	●	●		●		●									334
	●		●			●			500	●	●	●		●		●									335
●			●			●			500	●	●	●		●		●									336
	●	●	●			● <sup>4)</sup>			5000	●	●	●		●				●	●	●			●		337










2) in the evaluation unit SU10... or SU11...  
 4) push-pull output stage

		Sensing range					
		1 m	2 m	5 m	10 m	20 m	50 m
	ML4.1 series	1 m					
	ML5 series	2.5 m					
	ML7 series ML71 series	2.8 m					
	ML8 series	2.8 m					
	ML9 series	5.7 m					
	ML17 series	9 m					
	MLV12 series	21 m					
	MLV40 series	4 m					
	MLV41 series	5 m					
	RL28 series	42 m					

Design			Light type			Supply			Switching output					Connection				Additional functions				from page				
Standard	Clear object detection	Foreground suppression	Infrared	Visible red light	Laser	DC	AC / DC	AS-Itc face	Transistor	Relay	AS-Interface	Switching frequency [Hz]	Light On	Dark On	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity	TEACH-IN	Timer functions	
●				●		●			● <sup>4)</sup>			500	●	●	●	●										339
●			●	●		●			●			500	●	●	●				●				●			340
●	●			●		●			●			1000		●		●		●	●			●		●		341 344
●				●		●			●				●	●		●		●								346
●	●			●		●			●			1000	●	●		●		●					●	●		348
●				●		●			●			500	●	●	●	●		●	●				●			350
●	●			●	●	●			● <sup>4)</sup>			2500	●	●	●	●	●	●	●		●	●	●	●		351
●			●	●		●			●			500	●	●			●		●			●				353
	●			●		●			● <sup>4)</sup>			1000	●	●	●	●	●	●	●		●	●		●		354
●	●	●		●	●	●	●	●	● <sup>4)</sup>	●	●	1000/ 25 <sup>1)</sup>	●	●	●		●		●	●	●	●	●	●	●	355

Date of issue 4-4-08

1) Relay output      4) push-pull end stage


















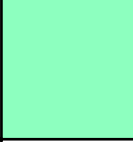
		Sensing range						
		1 m	2 m	5 m	10 m	20 m	50 m	
	RL29 series	█	█	█	█	10 m		
	RL31 series	█	█	█	█	12 m		
	RL32 series	█	█	█	4 m			
	RL39 series	█	█	█	█	█	25 m	
	M1K series	█	█	█	6 m			
	GLV12 series	█	█	█	5 m			
	GLV18 series	█	█	█	█	8 m		
	18GM60 series	█	█	█	4 m			
	VL18 series	█	█	█	█	█	18 m	



Design			Light type			Supply			Switching output					Connection				Additional functions				from page					
Standard	Clear object detection	Foreground suppression	Infrared	Visible red light	Laser	DC	AC/DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency	Light On	Dark On	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity	TEACH-IN	Timer functions		
●		●		●		●			● 4)			500	●	●			●										361
●				●		●	●		● 4)			500/ 20 <sup>1)</sup>	●	●			●	●									362
●				●		●			●			250		●			●					●					364
●				●			●			●		25 <sup>1)</sup>			●					●			●		●		365
●				●		●		●	●	●		1500	●	●	●		●			●		●			●		366
●				●		●			●			700	●	●	●		●		●				●				367
●				●		●			●			500	●	●	●		●		●								368
●				●		●			●			500	●	●	●		●		●				●				370
●				●	●	●			● 4)			500	●	●	●		●						●	●			371

1) Relay output  
4) push-pull end stage

Miniature and rectangular styles









		Limit range				
		500 mm	1 m	1.5 m	2 m	
	ML4.1 series		400 mm			
	ML4.2 series		100 mm (BGS)			
	ML5 series		400 mm			
	ML6 series		150 mm (BGS)			
	ML7 series ML71 series		200 mm 350 mm (BGS)			
	ML8 series		200 mm 350 mm (BGS)			
	ML9 series		50 mm (BGS)			
	ML17 series		450 mm			
	MLV12 series		250 mm (BGS) 100 mm (BGE)			

e nerg. = diffuse mode light sensor, energetic  
 BGS = diffuse mode light sensor with background suppression  
 BGE = diffuse mode light sensor with background evaluation

Principle			Light type			Supply		Switching output					Connection				Additional functions				from page						
Standard diffuse	Convergent mode (HGU)	Background suppression	Infrared	Visible red light	Laser	DC	AC / DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency [Hz]	Light On	Dark On	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity/ adjustable sensing range	TEACH-IN	Timer functions	Fiber optic connection (see fiber optic devices)	
●			●	●		●			● <sup>4)</sup>			500	●	●	●								●				372
			●	●		●			● <sup>4)</sup>			1000	●	●	●				●								390
●						●			●			500	●	●	●								●				373
			●	●		●			● <sup>4)</sup>			1000	●	●	●			●	●				●				391
●			●	●		●			●			1000	●	●				●	●				●	●			374 392
●			●	●		●			●			200	●	●				●						●			376 393
			●	●		●			●			1000	●					●	●					●			394
●				●		●			●			500	●	●				●	●					●			377
			●	●		●			● <sup>4)</sup>			1000	●	●	●			●	●				●				395

1) Relay output      4) push-pull output stage

Miniature and rectangular styles (contd.)

		Sensing range			
		500 mm	1 m	1.5 m	2 m
	MLV41 series	350 mm (BGS)			
	RL23 series			3 m (BGS)	
	RL28 series			2 m (BGS)	
	RL29 series			2 m 1200 mm (BGS)	
	RL31 series			1200 mm 300 mm (HGU)	
	RL39 series			2 m	
	M1K series	500 mm 100 mm (BGS)			
	SBL series		900 mm (BGS)		

BGS = diffuse mode with background suppression  
 BGE = diffuse mode with background evaluation  
 HGU = convergent mode

Cylindrical sensors start on the following page







4  
Photoelectric sensors

Date of issue 4.4.08

Principle			Light type			Supply			Switching output				Connection				Additional functions				from page						
Standard diffuse	Convergent mode (HGU)	Background suppression	Infrared	Visible red light	Laser	DC	AC / DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency	Light On	Dark On	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity/ adjustable sensing range	TEACH-IN	Timer functions	Fiber optic connection (see fiber optic devices)	
		●	●	●		●			● <sup>4)</sup>			1000	●	●		●	●		●				●				397
		●	●	●		●	●	●	●	●	●	70/ 10 <sup>1)</sup>	●	●	●					●	●		●		●		398
		●	●	●	●	●	●	●	● <sup>4)</sup>	●	●	250	●	●	●				●	●			●		●		400
●		●		●		●			● <sup>4)</sup>			125	●	●									●				378 404
●	●			●		●	●		● <sup>4)</sup>	●		500/ 20 <sup>1)</sup>	●	●					●				●				379 405
●			●				●			●		25			●					●			●		●		380
●		●	●			●			●			1500	●	●	●					●			●				381 406
		●	●			●			● <sup>3)</sup>			100	●	●				●	●				●		●		407

- 1) Relay output
- 3) additional pneumatic magnetic valve
- 4) push-pull output stage

Cylindrical sensors

		Sensing range				
		500 mm	1 m	1.5 m	2 m	
	KT10 series	80 mm 8 mm (BGS)				
	GLV12 series	200 mm				
	GLV18 series		450 mm			
	18GM60 series		500 mm			
	VT18 series		400 mm 120 mm (BGS)			
	GLV30 series				2500 mm 150 mm (BGS)	

BGS = diffuse mode with background suppression  
 BGE = diffuse mode with background evaluation  
 HGU = convergent mode

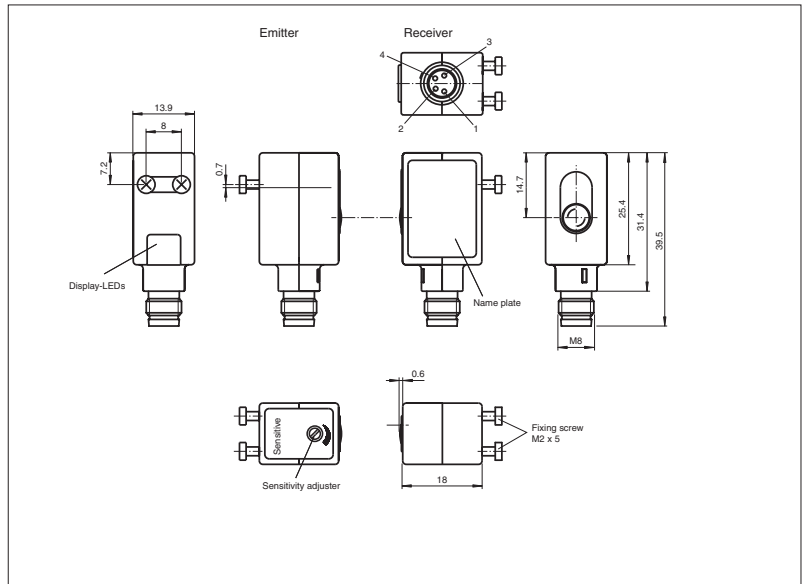
4 Photoelectric sensors

Principle			Light type			Supply		Switching output					Connection				Additional functions					from page					
Standard diffuse	Convergent mode (HGU)	Background suppression	Infrared	Visible red light	Laser	DC	AC / DC	AS-Interface	Transistor	Relay	AS-Interface	Switching frequency	Light On	Dark On	Light On / Dark On	M8 connector	M12 connector	Pigtail with M12 connector	Fixed cable	Terminal compartment	Test input	Pre-fault indication	Adjustable sensitivity/ adjustable sensing range	TEACH-IN	Timer functions	Fiber optic connection (see fiber optic devices)	
●		●	●			●			●			70	●	●	● <sup>2)</sup>		● <sup>2)</sup>		●	● <sup>2)</sup>		● <sup>2)</sup>	● <sup>2)</sup>				382 408
●				●		●			●			700	●	●	●		●		●				●				384
●				●		●			●			500	●	●	●		●		●				●				385
●				●		●			●			500	●	●	●		●		●				●				387
●		●		●		●			● <sup>4)</sup>			500	●	●	●		●						●			●	388 410
●		●	●			●			●			35	●	●			●						●			●	389 411

2) in amplifier SU 10... or SU 11...  
4) push-pull output stage



- Miniature design
- Test input
- Powerful push-pull output
- sensitivity adjuster



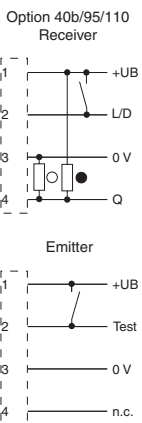
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

4.1

Photoelectric sensors, thru-beam sensors

Effective detection range	0 ... 2500 mm	◆	M 4.1/MV4.1/40b/95/110
Obstacle size	9 mm	◆	
Light type	red, modulated light	◆	
Light source	LED	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	< 25 mA (device)	◆	
Test input	Input emitter deactivation at $U_E=10 \dots 30$ V	◆	
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	
Switching type	Light/dark on selectable electrically switchable	◆	
Switching current	max. 200 mA	◆	
Switching voltage	max. 30 V DC	◆	
Switching frequency	500 Hz	◆	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Connection	M8 connector, 4-pin	◆	
Material			
Housing	ABS	◆	
Optical face	glass	◆	
Protection degree	IP 65	◆	
Mass	15 g (device)	◆	

**Electrical connection**

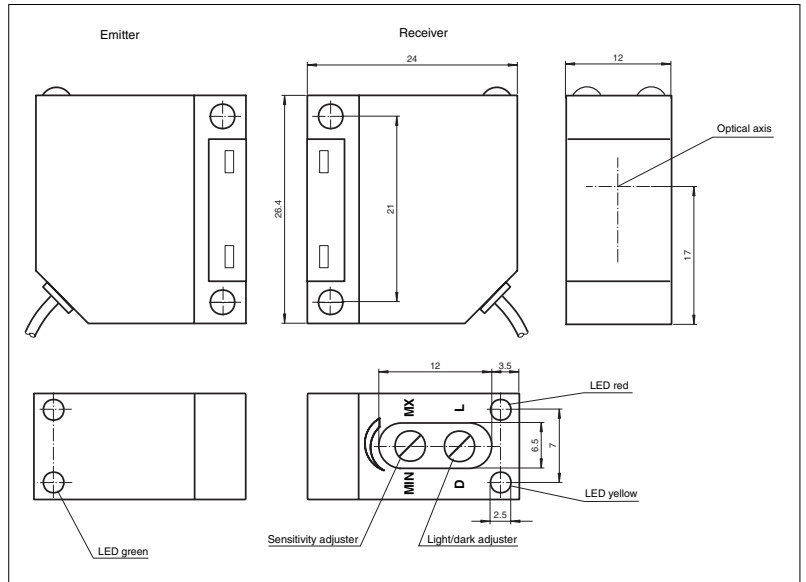


Date of edition 2008-03-20





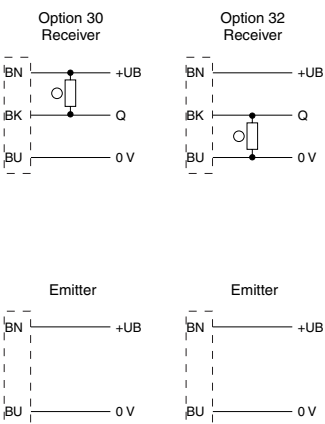
- Miniature design
- Infrared light design
- Light/dark ON, switchable
- Pre-fault indication

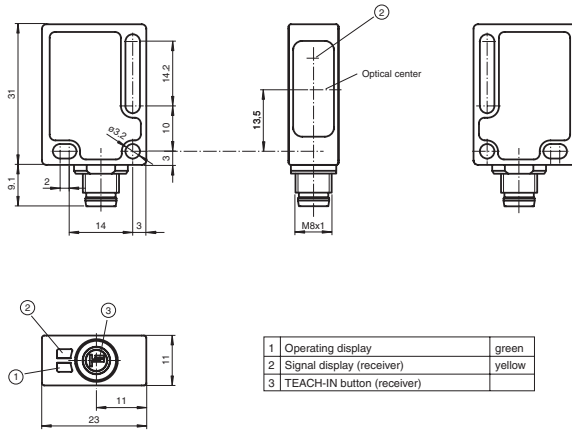


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Date of edition 2008-03-20

Effective detection range	0 ... 5000 mm	M 5/MV 5/30/1 15	M 5/MV 5/32/1 15
Light type	infrared, modulated light	◆	◆
Light source	LED, Infrared 950 nm	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 30 mA	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	light/dark ON, switchable	◆	◆
Switching current	max. 200 mA	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching frequency	200 Hz	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆
Connection	2 m cable, 3 x 0,14 mm <sup>2</sup> , PUR	◆	◆
Material			
Housing	Polycarbonate	◆	◆
Optical face	PMMA	◆	◆
Protection degree	IP67 according to EN 60529	◆	◆
Mass	10 g (device)	◆	◆

**Electrical connection**





- Miniature design
- Automatic adjustment of sensitivity via Teach-In
- Reliable, even under the toughest cleaning conditions - certified as per ECOLAB
- Clearly visible function indicators

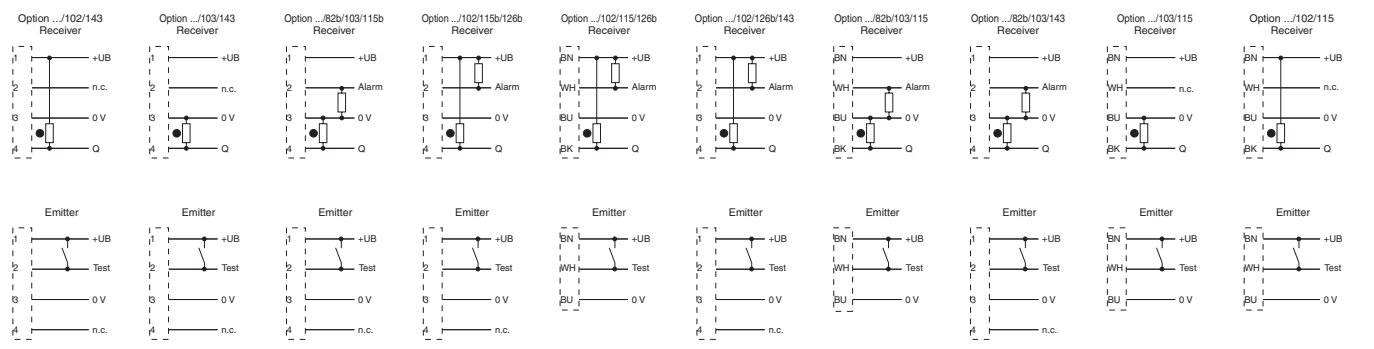


4.1

Photoelectric sensors, thru-beam sensors

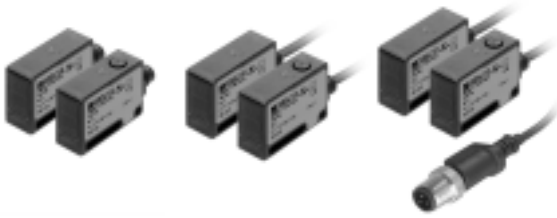
		M7 M V7 /59/76 a/1 02/115	M7/M V7/59/76 a/1 02/11 5/1 26 b	M7/M V7/59/76 a/1 02/11 5b/1 26 b	M7/M V7/59/76 a/1 02/12 6b/1 43	M7 M V7/59/76 a/1 02/143	M7 M V7/59/76 a/1 03/115	M7 M V7/59/76 a/1 03/143	M7/M V7/59/76 a/82 b/1 03/1 1 5	M7/M V7/59/76 a/82 b/1 0 3/1 1 5b	M7/M V7/59/76 a/82 b/1 03/1 4 3
Effective detection range	0 ... 3.5 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Obstacle size	min. 7 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC , class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	Emitter: ≤ 17 mA , Receiver: ≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II , rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation at +U <sub>B</sub>	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output of the pre-fault indication	1 npn, inactive after failure to achieve the stability control minima for approx. 5 s Immediately inactive if 4 beam interruptions occur within the flashing period. 1 pnp, inactive when level falls below function reserve after approx. 5 s. Immediately inactive if the beam is interrupted 4 times during the flashtime.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m plastic connector M8 , 4-pin 0.2 m fixed cable with M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material											
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	P MMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP 67, IP 69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 100 g (emitter and receiver) approx. 20 g (emitter and receiver) approx. 60 g (emitter and receiver)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection

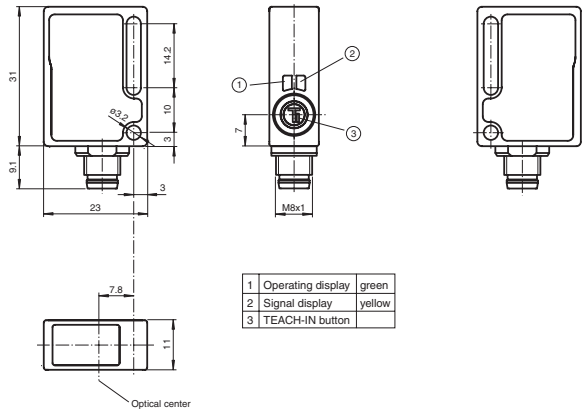


The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com. Date of edition 2008-03-20

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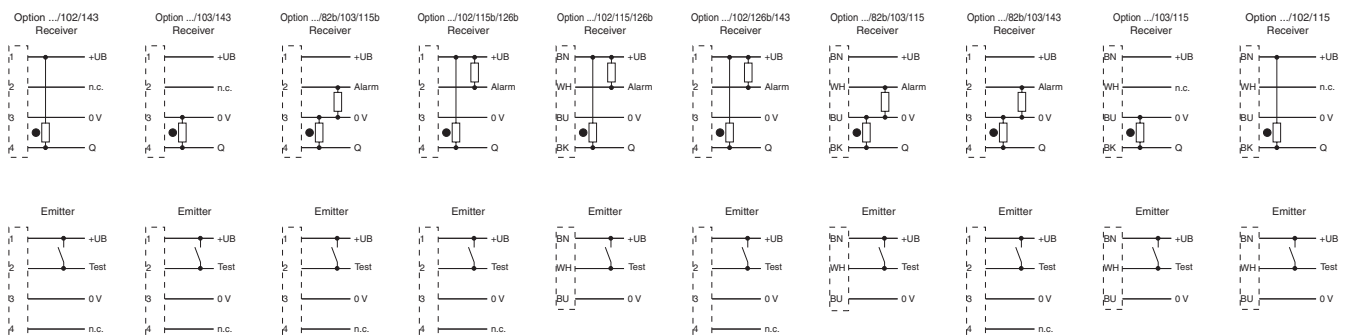


- **Miniature design**
- **Automatic adjustment of sensitivity via Teach-In**
- **Reliable, even under the toughest cleaning conditions - certified as per ECOLAB**
- **Clearly visible function indicators**



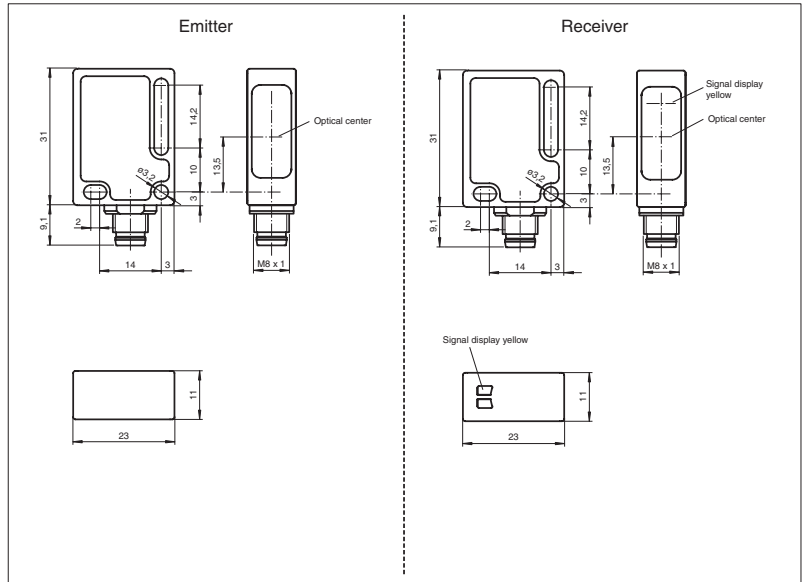
		M71/MV71/59/76 a/1 02/115	M71/MV71/59/76 a/1 02/115/1 26 b	M71/MV71/59/76 a/1 02/115 b/1 26 b	M71/MV71/59/76 a/1 02/12 6b/1 43	M71/MV71/59/76 a/1 02/143	M71/MV71/59/76 a/1 03/115	M71/MV71/59/76 a/1 03/143	M71/MV71/59/76 a/1 03/115	M71/MV71/59/76 a/1 03/115 b	M71/MV71/59/76 a/1 03/115 b
Effective detection range	0 ... 3.5 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Obstacle size	min. 7 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	Emitter: ≤ 17 mA, Receiver: ≤ 15 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation at +UB	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Output of the pre-fault indication	1 npn, inactive after failure to achieve the stability control minima for approx. 5 s Immediately inactive if 4 beam interruptions occur within the flashing period. 1 pnp, inactive when level falls below function reserve after approx. 5 s. Immediately inactive if the beam is interrupted 4 times during the flashtime.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m plastic connector M8, 4-pin 0.2 m fixed cable with M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material											
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67, IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 100 g (emitter and receiver) approx. 20 g (emitter and receiver) approx. 60 g (emitter and receiver)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**





- Miniature design
- No TEACH-IN required
- Not sensitive to ambient light
- Waterproof, protection class IP67



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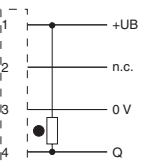
4.1

Photoelectric sensors, thru-beam sensors

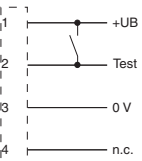
Effective detection range	0 ... 3.5 m	◆	M8/MV8/76a/102/143
Obstacle size	min. 7 mm	◆	
Light type	red, modulated light	◆	
Light source	LED, red	◆	
Operating voltage	10 ... 30 V DC, class 2	◆	
No-load supply current	Emitter: ≤ 17 mA Receiver: ≤ 15 mA	◆	
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	
Test input	emitter deactivation at +U <sub>B</sub>	◆	
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	
Switching type	dark ON	◆	
Switching current	max. 100 mA	◆	
Switching voltage	max. 30 V DC	◆	
Switching frequency	1000 Hz	◆	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Connection	plastic connector M8, 4-pin	◆	
Material		◆	
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	
Optical face	PMA	◆	
Protection degree	IP 67	◆	
Mass	approx. 20 g (emitter and receiver)	◆	

**Electrical connection**

Option .../102/143  
Receiver

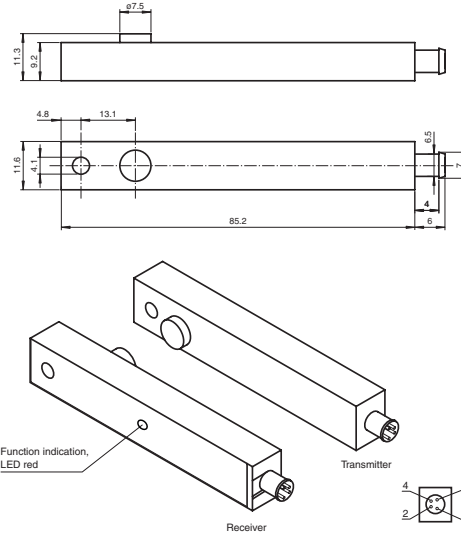


Emitter





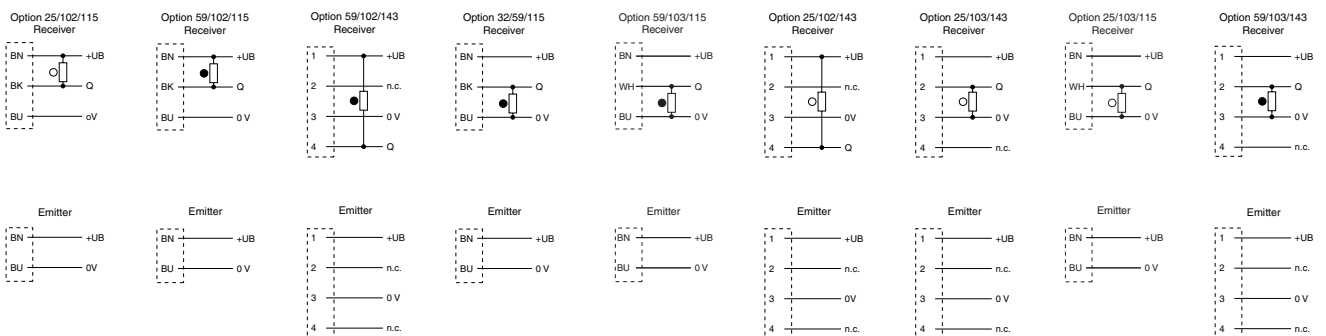
- Miniature design



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		ML29 A-P/25/103/115	ML29-P/25/102/115	ML29-P/25/102/143	ML29-P/25/103/115	ML29-P/25/103/143	ML29-P/59/102/115	ML29-P/59/102/143	ML29-P/59/103/115	ML29-P/59/103/143	ML29 A-P/25/102/115	ML29 T-P/32/59/115 100mm
Effective detection range	0 ... 2.5 m 0 ... 6 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	IRE D , 880 nm IRE D , 950 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	lateral	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 32 V DC 11 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	Emitter: ≤ 20 mA, Receiver: ≤ 10 mA Emitter: ≤ 25 mA, Receiver: ≤ 10 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation at +UB ≤ 5 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 0.1 A max. 0.2 A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC max. 32 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	10 Hz 100 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K) -25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	Fixed cable 100 mm fixed cable 6 m Plastic connector diameter 6.5 mm; 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material												
Housing	PMMA, black	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	per device 120 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**



Date of edition 2008-03-20

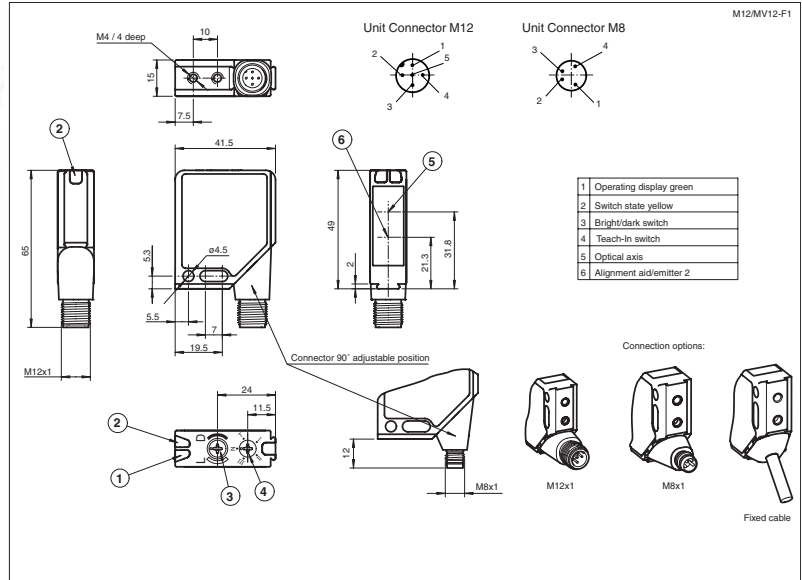
Subject to reasonable modifications due to technical advances.

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- Ultra bright LEDs for power on, stability control and switching state
- Flashing power on LED in case of short-circuit
- TEACH-IN switch for setting the contrast detection levels
- Automatic adjustment in case of soiling in contrast detection mode

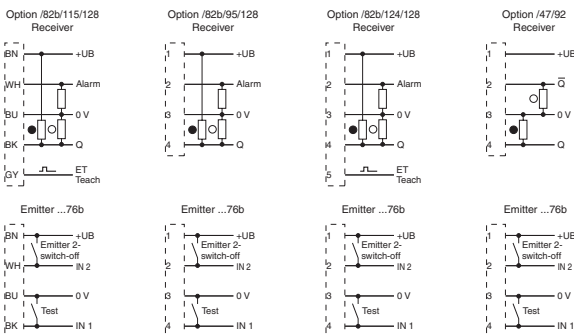


4.1

Photoelectric sensors, thru-beam sensors

		M 12/MV12-F1-IR/76b/82b/124/128	M 12/MV12-F1/76b/82b/115/128	M 12/MV12-F1/76b/82b/124/128	M 12/MV12-F1/76b/82b/95/128
Effective detection range	0 ... 16 m	◆	◆	◆	◆
Obstacle size	min. 12 mm	◆	◆	◆	◆
Light type	infrared, modulated light red, modulated light	◆	◆	◆	◆
Light source	2 LEDs, 660 nm 2 LEDs, 880 nm	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	Emitter: ≤ 35 mA, Receiver: ≤ 45 mA	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆
Test input	emitter deactivation at 0 V	◆	◆	◆	◆
Function input	Ext. Teach-In input (ET)	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity 2 pnp outputs, anivalent, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆
Switching current	max. 0.2 A	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆
Output of the pre-fault indication	1 pnp, inactive when level falls below function reserve after approx. 5 s. Immediately inactive if the beam is interrupted 4 times during the flashtime.	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆
Connection	fixed cable 2500 mm Metal connector M 12 x 1, 4-pin, 90° convertible Metal connector M 12, 5-pin, 90° convertible Metal connector M 8, 4-pin, may be rotated 90°	◆	◆	◆	◆
Material					
Housing	Frame: die-cast zinc, nickel-plated, Lateral: plastic PC, glass-fiber reinforced	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Mass	120 g (emitter and receiver)	◆	◆	◆	◆

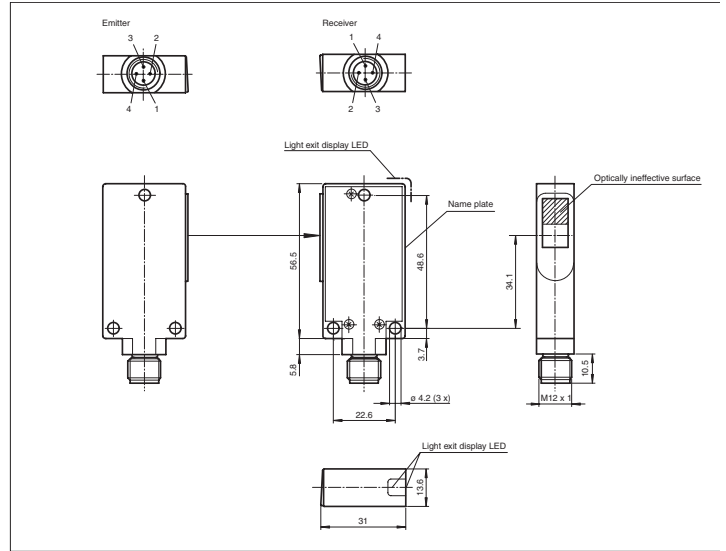
Electrical connection



The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com. Date of edition 2008-03-20



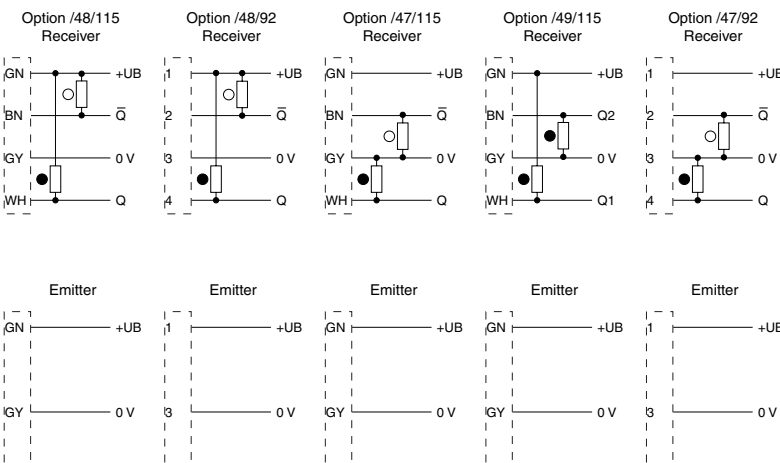
- Sturdy aluminium housing
- Scratch-resistant and solvent resistant optical covering made of glass
- Pre-fault indication



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Date of edition 2008-03-20

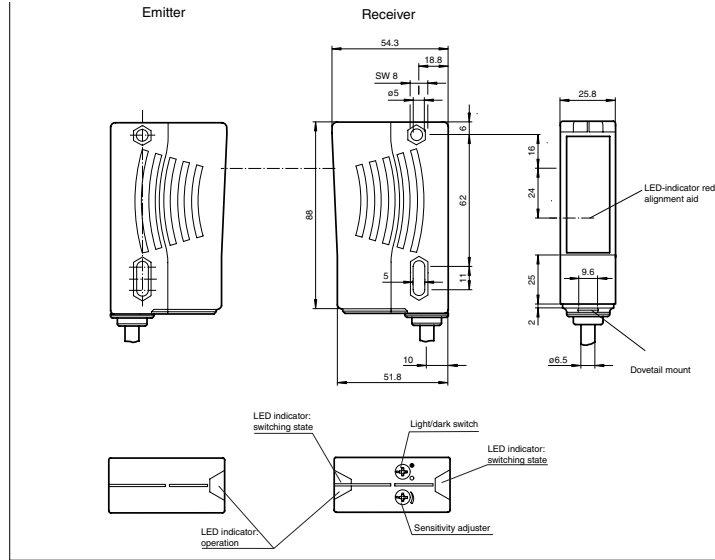
		M 40/MV40-1365/47/115	M 40/MV40-1365/47/92	M 40/MV40-1365/48/115	M 40/MV40-1365/48/92	M 40/MV40-1365/49/115
Effective detection range	0 ... 5 m	◆	◆	◆	◆	◆
Obstacle size	18 mm	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆
Light source	IRE D	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆
No-load supply current	< 35 mA (emitter) ; < 25 mA (receiver)	◆	◆	◆	◆	◆
Signal output	1 npn and 1 npn short-circuit proof, protected against reverse polarity 2 npn antivalent, short-circuit proof, protected against reverse polarity 2 npn, antivalent, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆
Switching type	dark ON light/dark switching	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆
Switching voltage	30 V DC	◆	◆	◆	◆	◆
Switching frequency	100 Hz	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆
Connection	fixed cable 2 m M12 connector, 4-pin	◆	◆	◆	◆	◆
Material						
Housing	aluminium	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆
Mass	100 g (device)	◆	◆	◆	◆	◆

**Electrical connection**





- Ultra bright LEDs for power on, stability control and switching state
- Very clearly visible LED as alignment aid in receiver optics
- Emitter deactivation
- Various transmitter frequencies

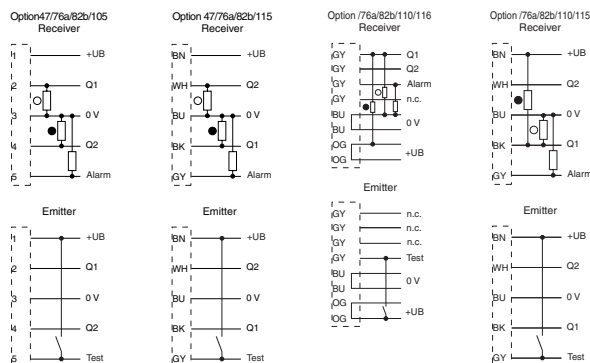


4.1

Photoelectric sensors, thru-beam sensors

		LD28/LV28-F1/47/76a/82b/105	LD28/LV28-F1/47/76a/82b/115	LD28/LV28-F1/76a/82b/110/116	LD28/LV28-F1/76a/82b/110/115
Effective detection range	0 ... 30 m	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	Emitter: ≤ 50 mA, Receiver: ≤ 35 mA	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆
Test input	emitter deactivation at +U <sub>B</sub> (I <sub>max</sub> < 3 mA at 30 V DC)	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆
Switching type	2 npn, antivalent, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching voltage	max. 200 mA	◆	◆	◆	◆
Switching frequency	max. 30 V DC	◆	◆	◆	◆
Timerfunction	1000 Hz	◆	◆	◆	◆
Output of the pre-fault indication	GAN, GAB, IAB, GAN-IAB, GAN-GAB, programmable, adjustment interval 0.02 s ... 1 s	◆	◆	◆	◆
Ambient temperature	1 pnp transistor, short-circuit proof, protected from reverse polarity, open collector, U <sub>max</sub> = 30 V DC	◆	◆	◆	◆
Connection	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆
Material	2.5 m fixed cable, 5-core, Euro norm	◆	◆	◆	◆
Housing	terminal compartment with 8 spring-loaded terminals for wire cross section 0.5 ... 1.5 mm <sup>2</sup> , insulation stripping 7.5 ... 8.5 mm, Cable screwed connection M16x1.5	◆	◆	◆	◆
Optical face	plastic connector M12 x 1, 5-pin	◆	◆	◆	◆
Protection degree	Material	◆	◆	◆	◆
Mass	Housing Plastic ABS	◆	◆	◆	◆
	Optical face Plastic pane	◆	◆	◆	◆
	Protection degree IP 67	◆	◆	◆	◆
	Mass 140 g (emitter and receiver)	◆	◆	◆	◆
	200 g (emitter and receiver)	◆	◆	◆	◆

Electrical connection



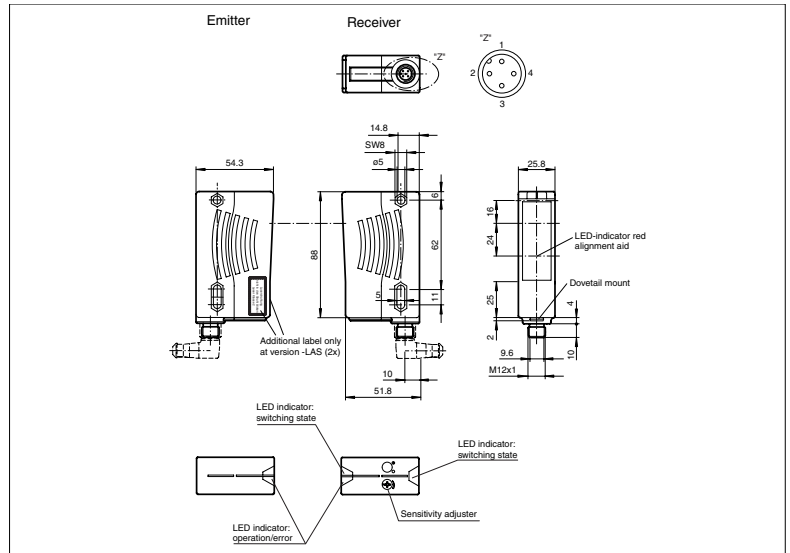
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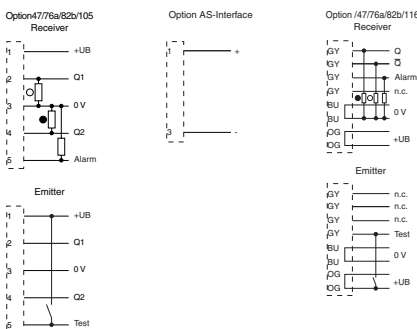
- Ultra bright LEDs for power on, stability control and switching state
- Visible red light, pulsed LASER light
- Very clearly visible LED as alignment aid in receiver optics
- Not sensitive to ambient light, even with switched energy saving lamps



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		LD28L V2 8-LAS-F1/4776a/82b/105	LD2 8/L V2 8-LAS-F1-B3 B/7 3c	LD28L V28-LAS-F1-Z/4776a/116
Effective detection range	0 ... 300 m	◆	◆	◆
Light type	red, modulated light, < 1 mW	◆	◆	◆
Light source	laser diode	◆	◆	◆
Laser class	2	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	26.5 ... 31.6 V via AS-Interface network, min. 18.5 V Emitter: ≤ 55 mA, Receiver: ≤ 35 mA Emitter: ≤ 55 mA, Receiver: ≤ 45 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Test input	emitter deactivation	◆	◆	◆
Signal output	AS-Interface	◆	◆	◆
Switching type	2 pnp, antivalent, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆
Timer function	GAN, GAB, IAB, GAN-IAB, GAN-GAB, programmable, adjustment interval 0.02 s ... 1 s	◆	◆	◆
Output of the pre-fault indication	Impulsed off-delay IAB, 50 ms, switchable via AS-Interface data bit D1: 0: stability control is falling for approx. 10 s, 1: sufficient stability control	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆	◆
Connection	terminal compartment with 8 spring-loaded terminals for wire cross section 0.5 ... 1.5 mm <sup>2</sup> plastic connector M12 x 1, 4-pin plastic connector M12 x 1, 5-pin	◆	◆	◆
Material		◆	◆	◆
Housing	Plastic ABS	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Mass	140 g (emitter and receiver) 200 g (emitter and receiver)	◆	◆	◆

**Electrical connection**

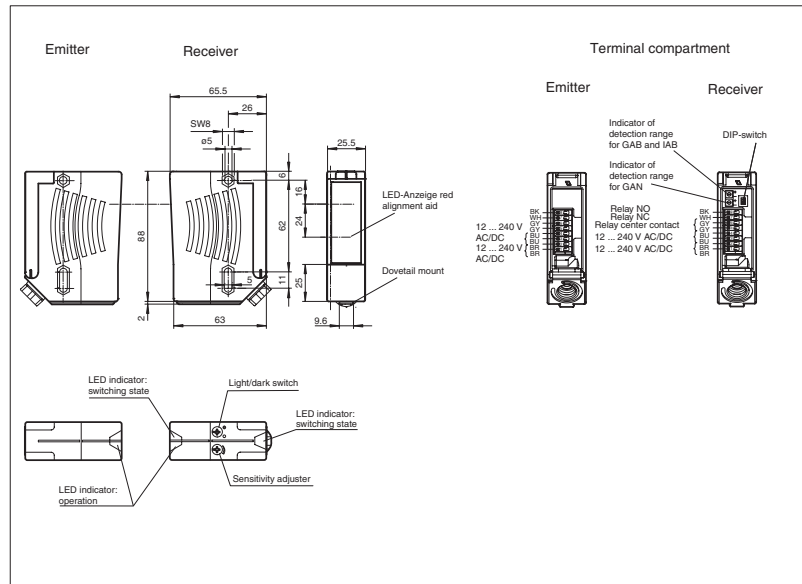


Subject to reasonable modifications due to technical advances.

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- Ultra bright LEDs for power on, stability control and switching state
- Very clearly visible LED as alignment aid in receiver optics
- Various transmitter frequencies
- Programmable time function GAN, GAB, IAB as well as GAN-IAB and GAN-GAB as double function



Laser Class II

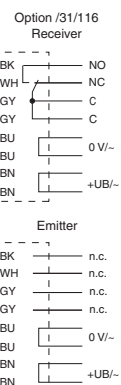
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4.1

Photoelectric sensors, thru-beam sensors

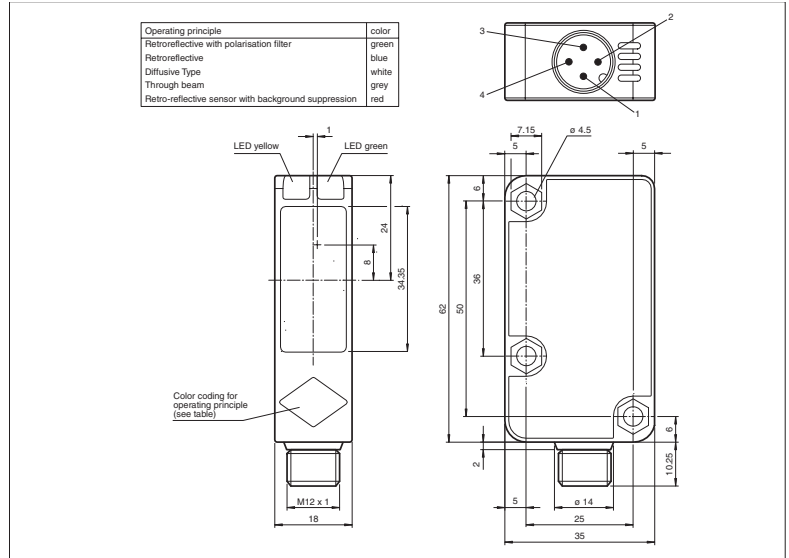
		LA28/LK28-LA-S-F1-Z/31/116	LA28/LK28-Z-F1/31/116	LA28/LK28-Z-F2/31/116
Effective detection range	0 ... 300 m 0 ... 65 m	◆		
Light type	red, modulated light red, modulated light, < 1 mW	◆	◆	◆
Light source	laser diode LED, 660 nm	◆		◆
Laser class	2	◆		
Operating voltage	12 ... 240 V AC/DC	◆		◆
Power consumption	≤ 3.5 VA	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1 Output circuit basis insulation of input circuit according to EN50178, rated insulation voltage 230 V AC Caution! The protection class 2 is only valid when the terminal compartment is closed.	◆	◆	◆
Signal output	Relay, 1 alternator	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆
Switching current	max. 2 A	◆	◆	◆
Switching voltage	max. 250 V AC/DC	◆	◆	◆
Switching frequency	25 Hz	◆	◆	◆
Timer function	GAN, GAB, IAB, GAN-GAB, programmable adjustment range 0.1 ... 10 s	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K) -40 ... 60 °C (233 ... 333 K)	◆		◆
Connection	terminal compartment with 8 spring-loaded terminals for wire cross section 0.5 ... 1.5 mm <sup>2</sup>	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Mass	200 g (emitter and receiver)	◆	◆	◆

**Electrical connection**





- Very clearly visible LED
- Powerful push-pull output
- Compact and stable housing
- Protection class II

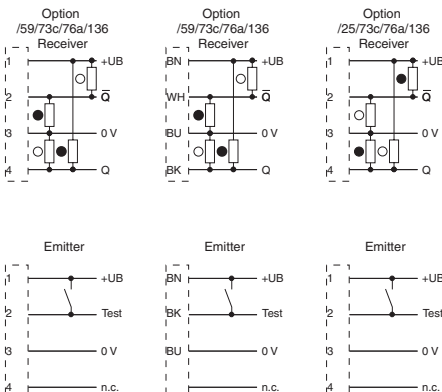


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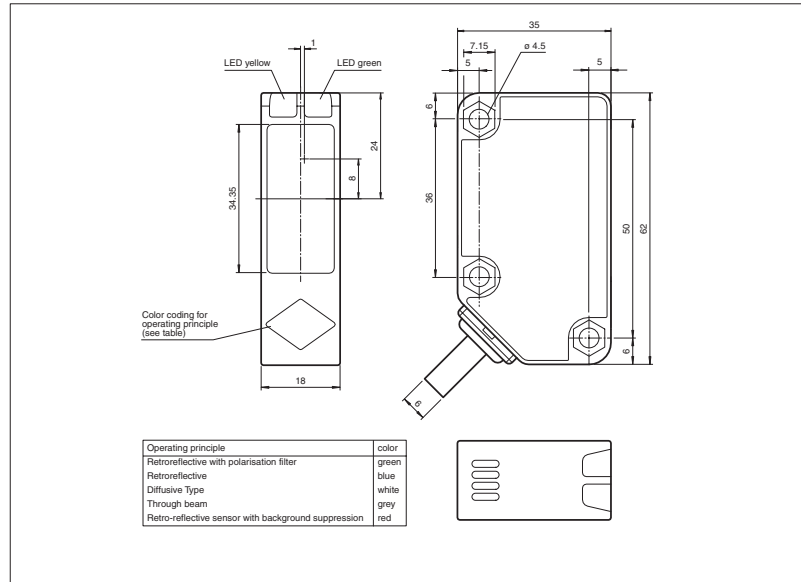
		LD31/LV31/25/73c/76a/136	LD31/LV31/73c/76a/136	LD31/LV31/76a/115/136
Effective detection range	0 ... 30 m	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Light source	LED, 630 nm	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	Emitter: ≤ 18 mA Receiver: ≤ 18 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1 Output circuit basis insulation of input circuit according to EN50178, rated insulation voltage 240 V AC	◆	◆	◆
Test input	emitter deactivation at +UB	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆
Switching frequency	≤ 250 Hz	◆	◆	◆
Ambient temperature	-30 ... 55 °C (243 ... 328 K)	◆	◆	◆
Connection	connector M12 x 1, 4-pin Emitter: fixed cable 2 m, 3-core Receiver: fixed cable 2 m, 4-core	◆	◆	◆
Material				
Housing	plastic	◆	◆	◆
Optical face	PMMA	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Mass	Emitter: 24 g Receiver: 24 g Emitter: 98 g Receiver: 132 g	◆	◆	◆

**Electrical connection**





- Operating voltage AC / DC
- Very clearly visible LED
- Protection class II
- Relay output



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4.1

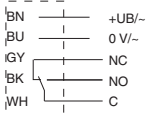
Photoelectric sensors, thru-beam sensors

		LA 31/LK31/31/115	LA31/LK31/25/31/115
Effective detection range	0 ... 30 m	◆	◆
Light type	red, modulated light	◆	◆
Light source	LED, 630 nm	◆	◆
Operating voltage	24 ... 240 V AC 12 ... 240 V DC	◆	◆
No-load supply current	Emitter: ≤ 40 mA Receiver: ≤ 3 mA	◆	◆
Power consumption	Emitter: ≤ 2 VA Receiver: ≤ 1 VA	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1 Output circuit basis insulation of input circuit according to EN50178, rated insulation voltage 240 V AC	◆	◆
Signal output	Relay, 1 alternator	◆	◆
Switching type	dark ON light ON	◆	◆
Switching current	max. 2 A	◆	◆
Switching voltage	max. 250 V AC/DC	◆	◆
Switching frequency	≤ 20 Hz	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆
Connection	Emitter: fixed cable 2 m, 2-core Receiver: fixed cable 2 m, 5-core	◆	◆
Material			
Housing	plastic	◆	◆
Optical face	PMMA	◆	◆
Protection degree	IP67	◆	◆
Mass	Emitter: 116 g Receiver: 131 g	◆	◆

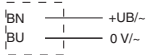
**Electrical connection**

Option /31/115

Receiver

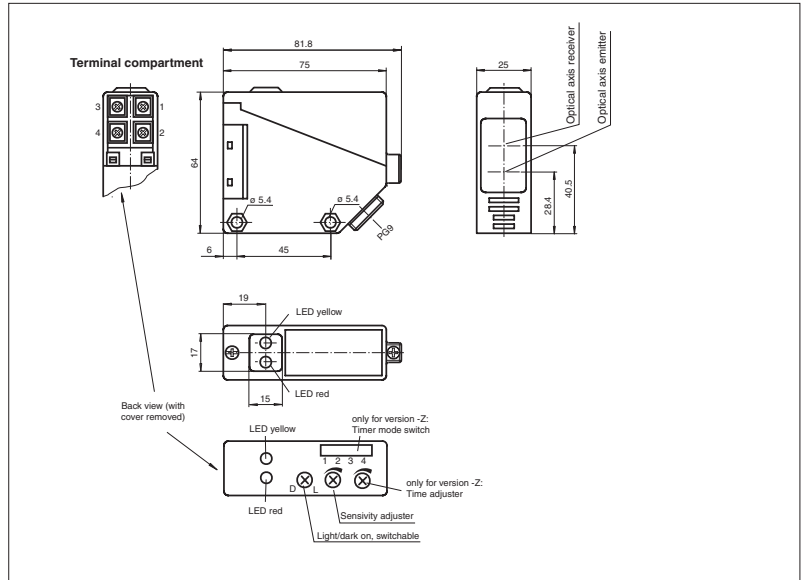


Emitter





- Light/dark ON, switchable
- Supplied with mounting accessory
- Protection degree IP67
- Timer function



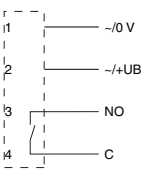
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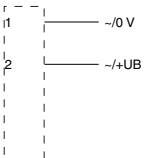
Effective detection range	0 ... 20 m	◆	◆
Light type	infrared, modulated light	◆	◆
Light source	LED	◆	◆
Operating voltage	12 ... 240 V DC / 24 ... 240 V AC (50 ... 60 Hz)	◆	◆
No-load supply current	≤ 55 mA (device)	◆	◆
Power consumption	≤ 3 VA	◆	◆
Signal output	1 relay output	◆	◆
Switching type	light/dark switching	◆	◆
Switching current	≤ 3 A	◆	◆
Switching voltage	≤ 240 V AC	◆	◆
Switching frequency	≤ 300 Hz	◆	◆
Timer function	On-/off-delay or pulse extension on choice	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆
Connection	terminal compartment P G9, ≤ 2.5 mm <sup>2</sup>	◆	◆
Material			
Housing	PBT	◆	◆
Optical face	PMMA	◆	◆
Protection degree	IP67	◆	◆
Mass	emitter: 90 g receiver: 100 g	◆	◆

**Electrical connection**

Option 31/40a/116 Receiver

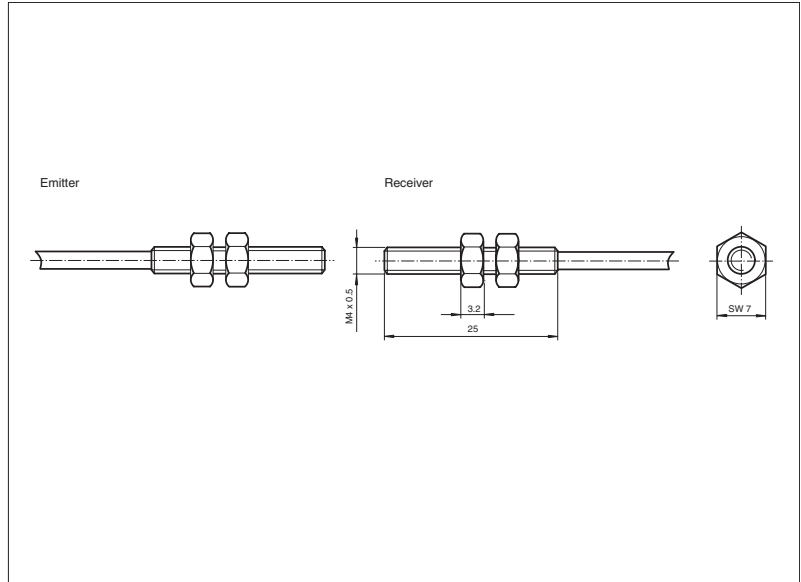


Emitter





- Miniature design in M4 housing
- Housing material high-grade steel
- Fastening nuts designed so that they cannot be over-tightened
- Signal converters SU10... or SU11... are suitable to operate



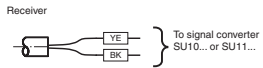
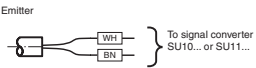
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4.1

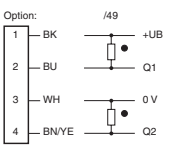
Photoelectric sensors, thru-beam sensors

		KS/KSE 10	SU 10/40a/49/116	SU 11/32/40a/82b/115	SU 11/32/40a/82b/92	SU 11/40a/49/115	SU 11/40a/49/92
Effective detection range	0 ... 500 mm	◆					
Obstacle size	6 mm	◆					
Light type	infrared, modulated light	◆					
Light source	IRED	◆					
Operating voltage	10 ... 30 V DC		◆	◆	◆	◆	◆
No-load supply current	40 mA		◆	◆	◆	◆	◆
Signal output	1 npn, 1 pnp synchronised-switching, short-circuit proof, protected against reverse polarity 1 pnp, short-circuit proof, open collector		◆	◆	◆	◆	◆
Switching type	light/dark switching		◆	◆	◆	◆	◆
Switching current	200 mA		◆	◆	◆	◆	◆
Switching voltage	30 V DC		◆	◆	◆	◆	◆
Switching frequency	70 Hz		◆	◆	◆	◆	◆
Output of the pre-fault indication	1 pnp, inactive when falling short of the stability control		◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆					
	fixed cable 2500 mm			◆		◆	
	M 12 connector, 4-pin						◆
	screw terminals		◆				
Material							
Housing	aluminium						
	PVC		◆				
	V2A		◆				
Optical face	glass		◆				
Protection degree	IP 40		◆				
	IP 65		◆	◆	◆	◆	◆
Mass	20 g (device)		◆				
	50 g		◆				
	60 g			◆	◆	◆	◆

Electrical connection

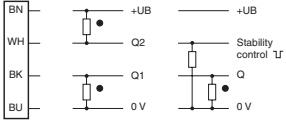


Signal converter SU10 ...

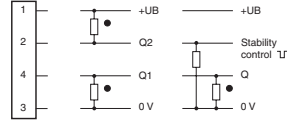


Signal converter SU11 ...

Cable connection (option 115)



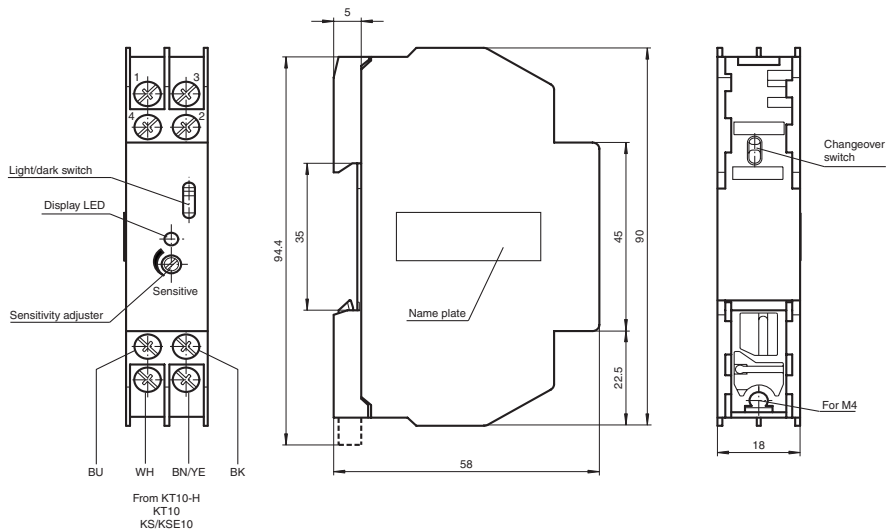
Connector (option 92)



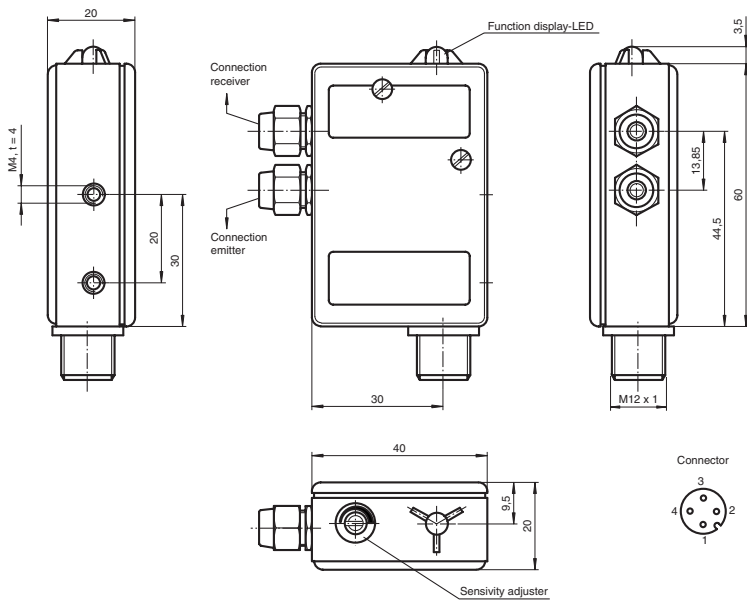
**Amplifier  
SU10/40a/49/116**



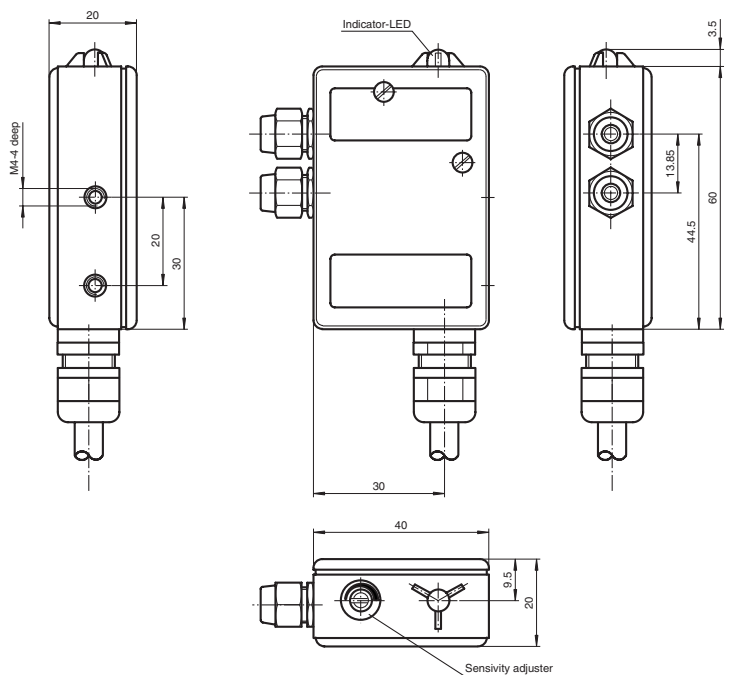
Amplifier for mounting on a standard top hat rail.



**Amplifier  
SU11.../92**

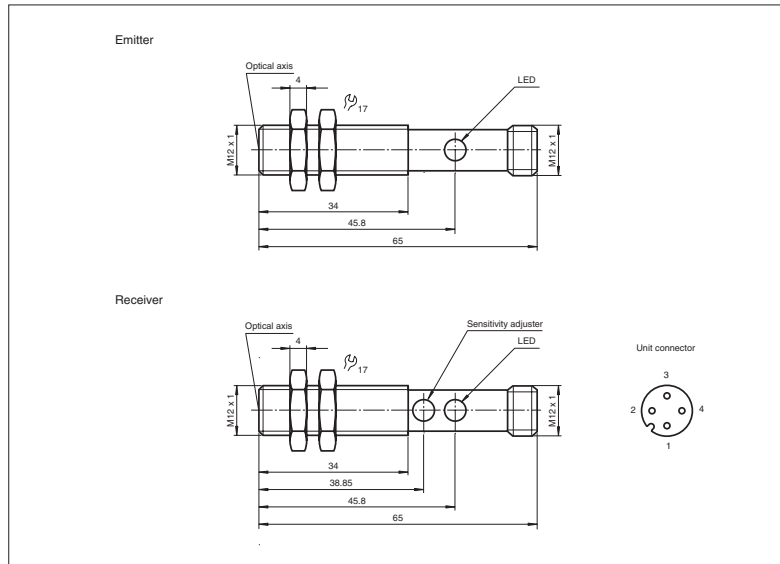


**Amplifier  
SU11.../115**





- M12 threaded housing made of brass, nickel plated
- Visible red light
- Light/dark ON, programmable
- Protection degree IP67



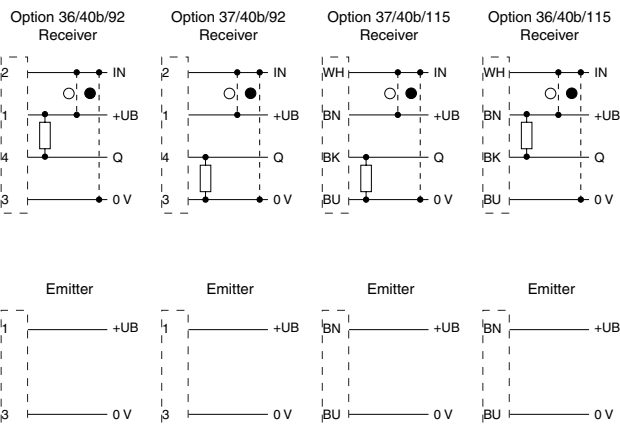
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4.1

Photoelectric sensors, thru-beam sensors

Effective detection range	0 ... 5000 mm	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Control input	Light ON: +UB Dark ON: 0 V	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Switching current	max. 300 mA	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Connection	fixed cable 2 m connector M12 x 1, 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Mass	15 g (device) 45 g (device)	◆	◆	◆	◆

Electrical connection

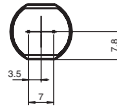
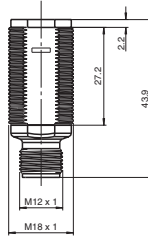




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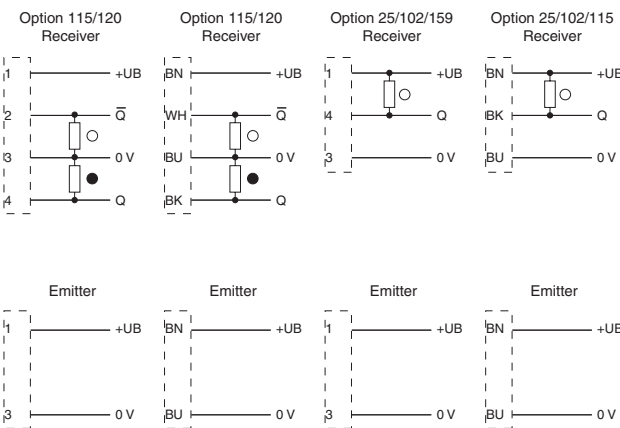


- Short design in M18 plastic housing
- 4 LEDs indicator for 360° all-round visibility
- Optimal price/power ratio
- Optical face lateral



		GD18/GV18/115/120	GD18/GV18/25/102/115	GD18/GV18/25/102/159	GD18/GV18/59/102/115	GD18/GV18/59/102/159	GD18/GV18/73/120	GD18-S/GV18-S/115/120	GD18-S/GV18-S/25/102/115	GD18-S/GV18-S/25/102/159	GD18-S/GV18-S/59/102/115	GD18-S/GV18-S/59/102/159	GD18-S/GV18-S/73/120
Effective detection range	0 ... 12 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 20 m												
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red 640 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	frontal	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	lateral												
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated insulation voltage $\dot{U}$ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, open collector		◆	◆	◆	◆							
	2 pnp, antivalent, short-circuit proof, open collectors	◆					◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON			◆	◆								
	light/dark switching	◆					◆	◆					
	light ON		◆	◆									
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Plastic connector M12 x 1 ; 3-pin		◆										
	Plastic connector M12 x 1 ; 4-pin			◆									
Housing	PC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	< 10 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	< 100 g												

**Electrical connection**



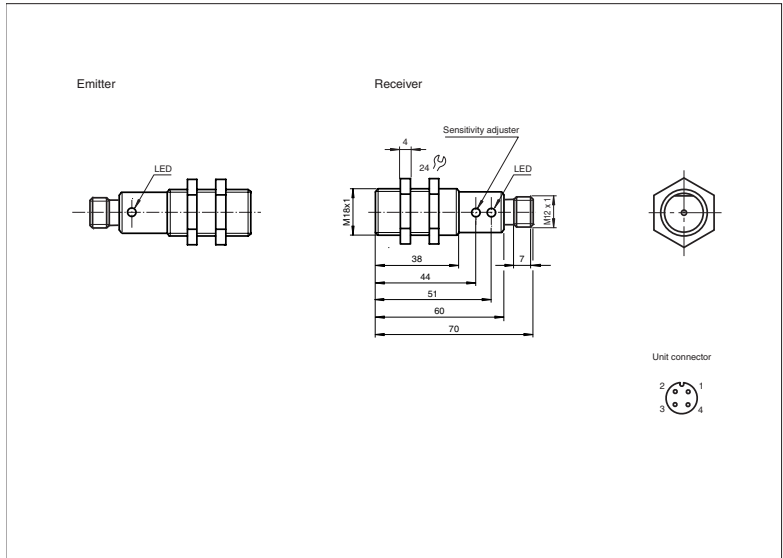
Date of edition 2008-03-20

Subject to reasonable modifications due to technical advances.

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- Dual colour indication LED
- Light/dark ON, programmable
- Sensitivity adjuster for optimal adaptation to the application
- Protection degree IP67



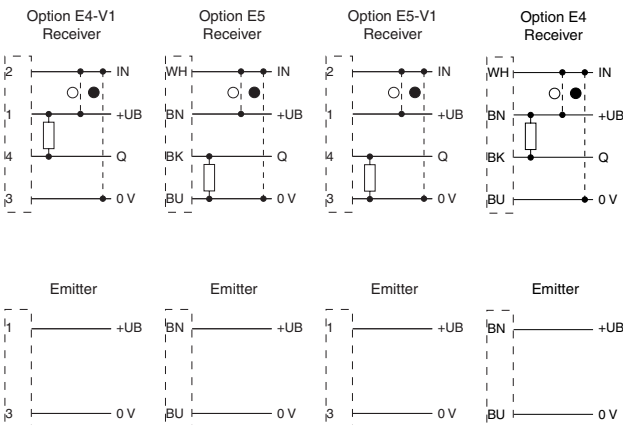
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4.1

Photoelectric sensors, thru-beam sensors

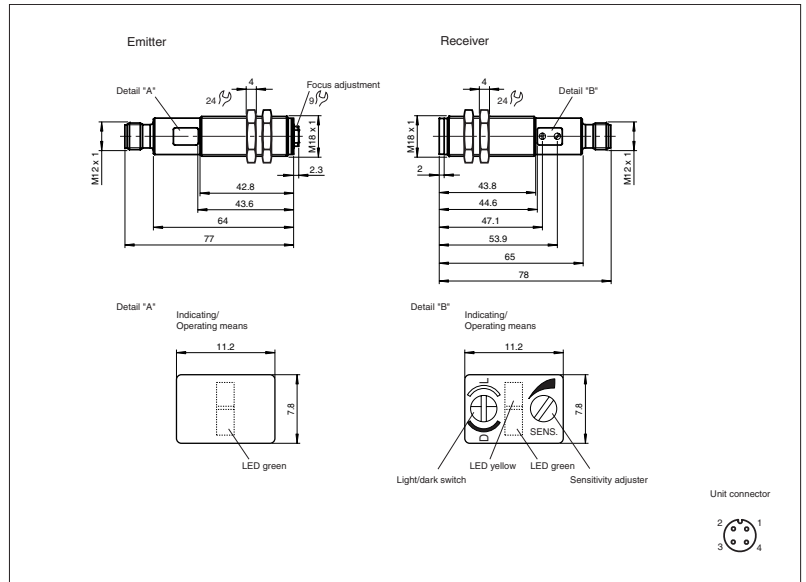
		OBE 10 M-18 GM60-S E4	OBE 10 M-18 GM60-S E4-V1	OBE 10 M-18 GM60-S E5	OBE 10 M-18 GM60-S E5-V1
Effective detection range	0 ... 10 m	◆	◆	◆	◆
Light type	IR-light 880 nm	◆	◆	◆	◆
Light source	IREL , 880 nm	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 25 mA (device)	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector			◆	◆
Switching type	Light/dark on selectable electrically switchable	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆
	connector M12 x 1, 4-pin		◆		◆
Material					
Housing	brass, nickel-plate d	◆	◆	◆	◆
Optical face	PC	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Mass	110 g per device	◆	◆	◆	◆
	45 g per device		◆		◆

Electrical connection





- M18 threaded housing made of brass, nickel plated
- Detection of very small parts in the near range
- Visible red light, pulsed LASER light
- Focusable optical system



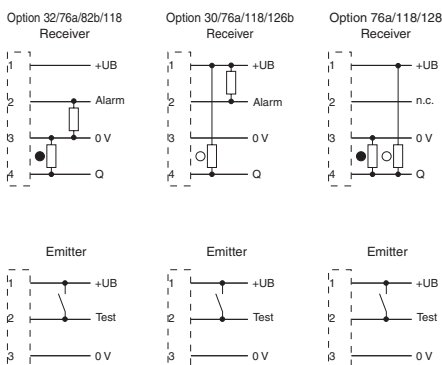
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4.1

Photoelectric sensors, thru-beam sensors

		VS18/VSE18-M-LAS/60/40a/76a/118/126b	VS18/VSE18-M-LAS/32/40a/76a/82b/118	VS18/VSE18-M-LAS/40a/76a/118/128
Effective detection range	0 ... 60 m	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Light source	laser diode Red light 650 nm	◆	◆	◆
Laser class	Laser class 1, IEC60825-1	◆	◆	◆
Optical face	frontal	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆
No-load supply current	Emitter: 20 mA, Receiver: 15 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Test input	emitter deactivation at +UB	◆	◆	◆
Signal output	Push-pull output short-circuit proof overvoltage protected 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆
Switching voltage	30 V DC	◆	◆	◆
Switching frequency	5000 Hz	◆	◆	◆
Output of the pre-fault indication	1 npn, inactive when falling short of the stability control, max. 100 mA 1 pnp, inactive when falling short of the stability control, max. 100 mA	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆
Connection	M12 connector, 4-pin (Vario-Quick)	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Optical face	plastic	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Mass	60 g (device)	◆	◆	◆

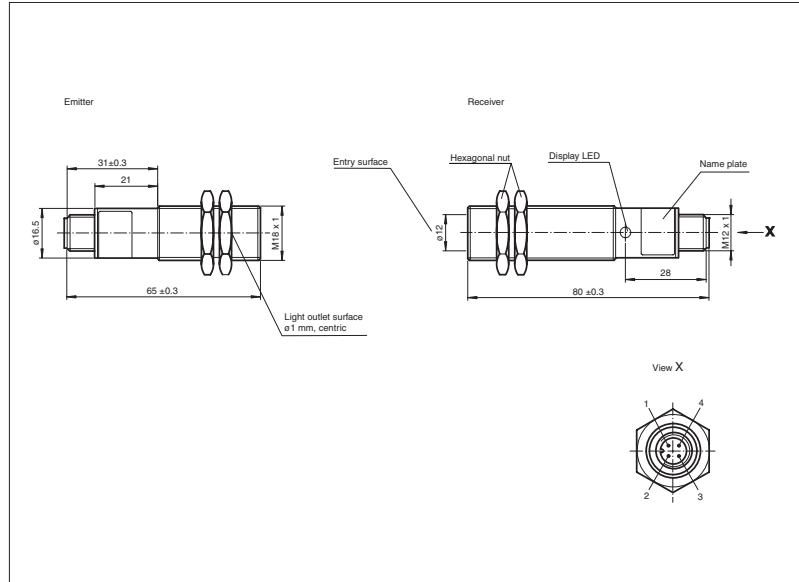
**Electrical connection**



Date of edition 2008-03-20



- Laser thru-beam sensor in the M18 housing
- Metal design
- Automatic threshold value adaptation
- Very high switching accuracy



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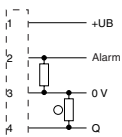
4.1

Photoelectric sensors, thru-beam sensors

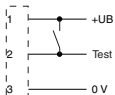
Effective detection range	0 ... 10 m	◆	E18-LAS/EV18-LAS/25/32/76a/92
Obstacle size	1.2 mm	◆	
Light type	Modulated light Laser red wave length 650 nm - 5nm/+15nm	◆	
Light source	laser diode nicht uebersetzt!	◆	
Laser class	1	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	emitter ≤ 25 mA , receiver ≤ 60 mA	◆	
Test input	emitter deactivation emitter on: 0 ... +3V emitter off: +5V ... +U <sub>B</sub>	◆	
Signal output	1 pnp, short-circuit proof, open collector	◆	
Switching type	light ON	◆	
Switching current	max. 200 mA	◆	
Switching voltage	max. 30 V DC	◆	
Switching frequency	1000 Hz	◆	
Timer function		◆	
Output of the pre-fault indication	PNP, open collector, short-circuit proof inactive: signal strength > approx. 30 % of the strength with clean optic oscillating: with typ. 0.5 Hz (max. 1 Hz) if signal strength approx. 30 % ... approx. 20 % of the strength with clean optic active: signal strength < approx. 20 % of the strength with clean optic	◆	
Ambient temperature	0 ... 50 °C (273 ... 323 K)	◆	
Connection	Metal connector M12 x 1, 4-pin	◆	
Material		◆	
Housing	brass, nickel-plated	◆	
Optical face	glass	◆	
Protection degree	IP 65	◆	
Mass	Per 45 g	◆	

Electrical connection

Option 32/76a/92 Receiver

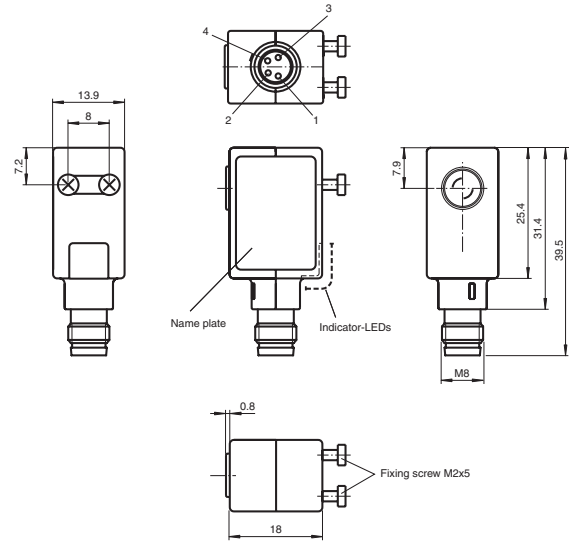


Emitter





- Miniature design
- Small light beam diameter for detection of small parts
- Visible red light
- Powerful push-pull output
- Coaxial optical system - no unusable area
- Glare protected with polarisation filter

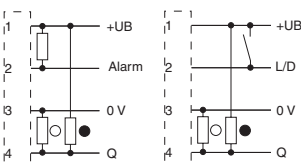


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Polarisation filter		◆	◆
Effective detection range	0 ... 400 mm	◆	◆
Reflector distance	0 ... 400 mm	◆	◆
Threshold detection range	1000 mm (with H60 reflector)	◆	◆
Light source	LED	◆	◆
Approvals	CE, cULus	◆	◆
Light type	red, modulated light	◆	◆
Function display	LED yellow, lights up when light beam is free, flashes when falling short of the stability control	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	25 mA	◆	◆
Switching type	dark ON	◆	◆
	Light/dark on selectable electrically switchable	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching current	max. 200 mA	◆	◆
Switching frequency	500 Hz	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	M8 connector, 4-pin	◆	◆
Material			
Housing	ABS GV5	◆	◆
Optical face	glass	◆	◆
Mass	15 g	◆	◆

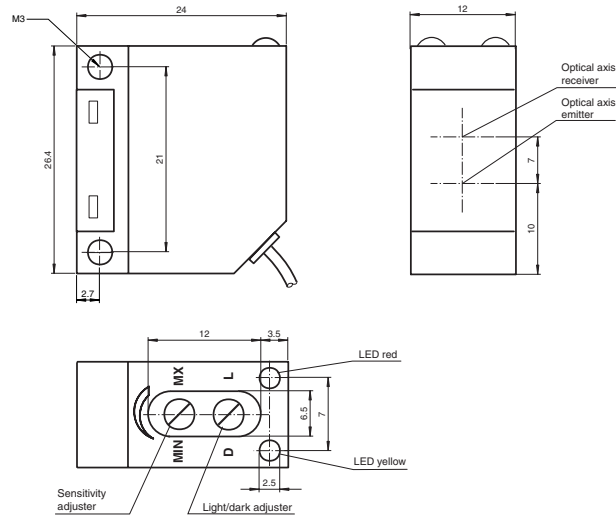
**Electrical connection**

Option 82b/95/110      Option 40b/95/110





- Miniature design
- Light/dark ON, switchable
- Pre-fault indication
- Protection degree IP67
- Mounting holes for screwing
- Infrared light design

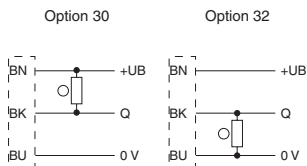


4.2

Photoelectric sensors, retro-reflective sensors

		ML5-5/4/30/115	ML5-5/4/32/115	ML5-6/30/115	ML5-6/32/115
Polarisation filter		◆	◆		
Effective detection range	0 ... 1500 mm	◆	◆		
	0 ... 2000 mm			◆	◆
Threshold detection range	2000 mm	◆	◆		
	2500 mm			◆	◆
Reference target	H50 reflector	◆	◆	◆	◆
Light source	LED, Infrared 950 nm	◆	◆	◆	◆
	LED, Red light 660 nm			◆	◆
Approvals	CE	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆
	red, modulated light			◆	◆
Function display	LED yellow: switching state	◆	◆	◆	◆
	LED red: stability control (flashing)			◆	◆
Operating elements	light/dark switch, sensitivity adjuster	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector			◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
	-25 ... 70 °C (248 ... 343 K)			◆	◆
Protection degree	IP 67 according to EN 60529	◆	◆	◆	◆
Connection	2 m cable, 3 x 0,14 mm <sup>2</sup> , PUR	◆	◆	◆	◆
Material					
Housing	Polycarbonate	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Mass	20 g	◆	◆	◆	◆

Electrical connection



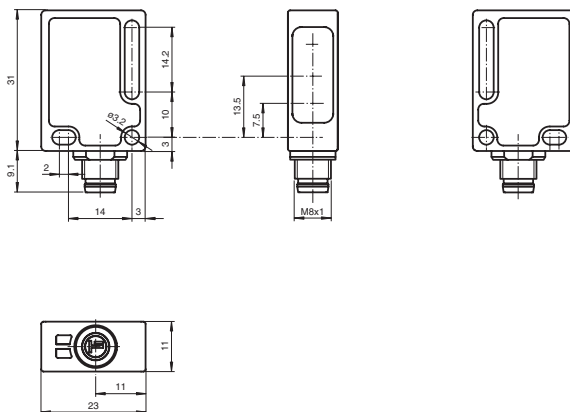
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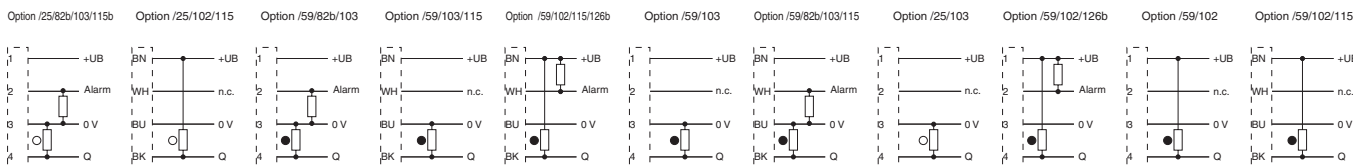


- **Miniature design**
- **Automatic adjustment of sensitivity via Teach-In**
- **Reliable, even under the toughest cleaning conditions - certified as per ECOLAB**
- **IP69K Steam jet proof**
- **Clearly visible function indicators**
- **Flashing power on LED in case of short-circuit**



		ML7-55/25/102/115	ML7-55/25/103/115b	ML7-55/25/82b/103/115b	ML7-55/33/59/82b/103/115b	ML7-55/59/102/115	ML7-55/59/102/115/126b	ML7-55/59/102/115b/126b	ML7-55/59/102/126b/143	ML7-55/59/102/143	ML7-55/59/103/115	ML7-55/59/103/143	ML7-55/59/82b/103/115	ML7-55/59/82b/103/115b	ML7-55/59/82b/103/143
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.03 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP 67, IP 69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M12 connector, 4-pin fixed cable 300 mm with M12 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material															
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 30 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

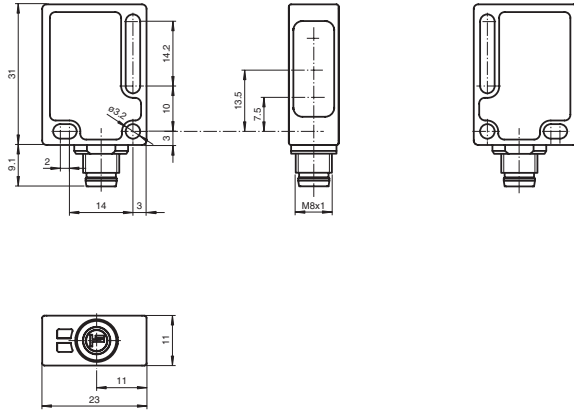
**Electrical connection**



Date of edition 2008-03-20



- Miniature design
- Automatic adjustment of sensitivity via Teach-In
- Reliable, even under the toughest cleaning conditions - certified as per ECOLAB
- IP69K Steam jet proof
- Clearly visible function indicators
- Flashing power on LED in case of short-circuit

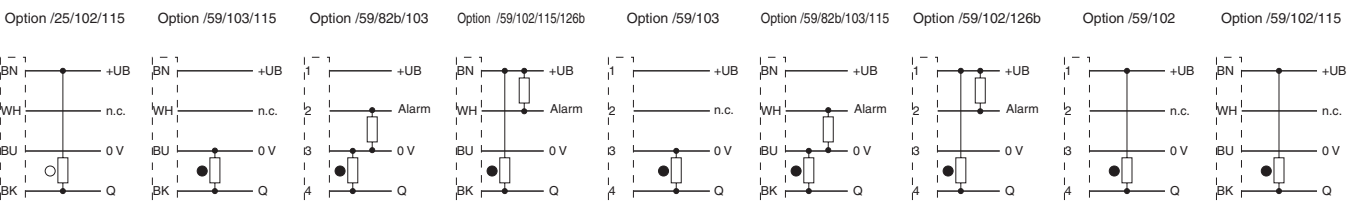


4.2

Photoelectric sensors, retro-reflective sensors

		ML7-6/25/102/115	ML7-6/59/102/115	ML7-6/59/102/115b/126b	ML7-6/59/102/115/126b	ML7-6/59/102/126b/143	ML7-6/59/102/143	ML7-6/59/103/115	ML7-6/59/103/143	ML7-6/59/82b/103/115	ML7-6/59/82b/103/115b	ML7-6/59/82b/103/143
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.02 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67, IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M12 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material												
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 30 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection

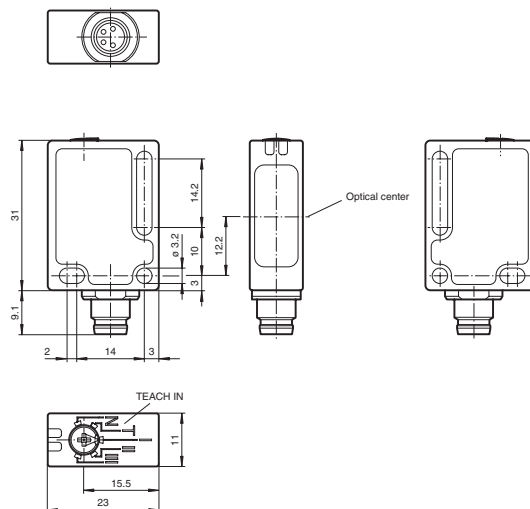


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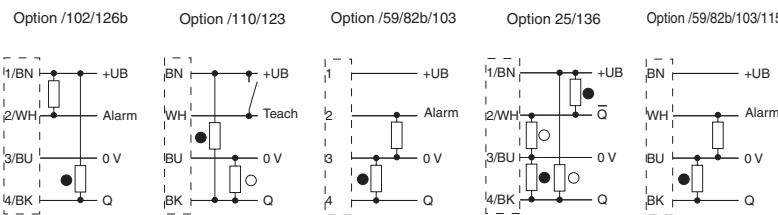
- **Miniature design**
- **Reliable recognition of reflecting objects and clear glass**
- **Reliable, even under the toughest cleaning conditions - certified as per ECOLAB**
- **IP69K Steam jet proof**
- **Two machines in one: clear glass recognition or reflection operating mode with long range**
- **TEACH-IN switch for setting the contrast detection levels**



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		ML7-54-G/102/115b/126b	ML7-54-G/102/115/126b	ML7-54-G/102/126b/143	ML7-54-G/25/110/23/143	ML7-54-G/25/136/115	ML7-54-G/25/136/115b	ML7-54-G/25/136/143	ML7-54-G/25b/103/115	ML7-54-G/25b/103/115b	ML7-54-G/25b/103/143
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Glass detection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3.5 m in TEACH mode 0 ... 5.7 m at switch position "N"	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0 ... 3.5 m in TEACH mode 0 ... 5.7 m at switch position "N"	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	7.6 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow: switching state; Stability control; Teach-In	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	5-step switch for setting the contrast detection levels.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA at 24 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector 2 Push-pull outputs, complementary, short-circuit proof, reverse polarity-protected	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1 kHz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67, IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 m with M12x1 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material											
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	10 g 30 g 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**

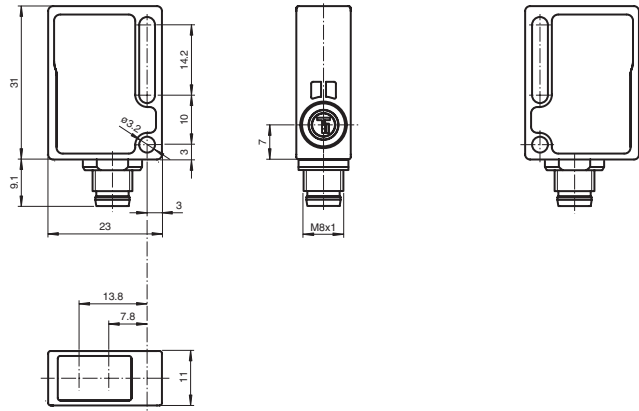


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4.2 Photoelectric sensors, retro-reflective sensors



- Miniature design
- Automatic adjustment of sensitivity via Teach-In
- Reliable, even under the toughest cleaning conditions - certified as per ECOLAB
- IP69K Steam jet proof
- Clearly visible function indicators
- Flashing power on LED in case of short-circuit

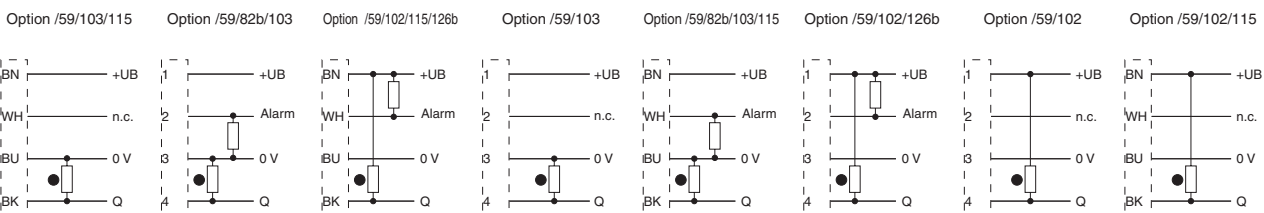


4.2

Photoelectric sensors, retro-reflective sensors

Polarisation filter		ML71-55/59/102/115	ML71-55/59/102/115b/126b	ML71-55/59/102/115/126b	ML71-55/59/102/126b/143	ML71-55/59/102/143	ML71-55/59/103/115	ML71-55/59/103/143	ML71-55/59/82b/103/115	ML71-55/59/82b/103/115b	ML71-55/59/82b/103/143
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.03 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP 67, IP 69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	fixed cable 200 mm with M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material											
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	approx. 30 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	approx. 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection

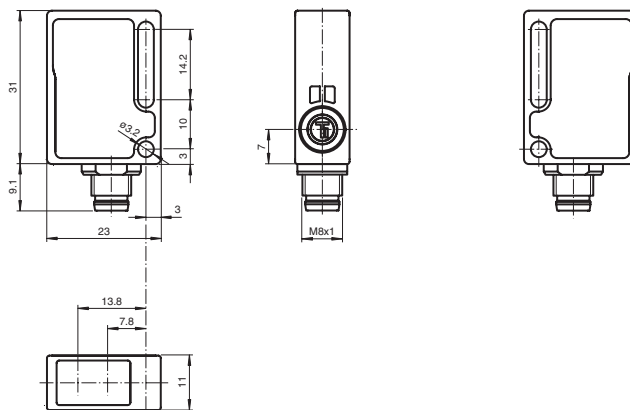


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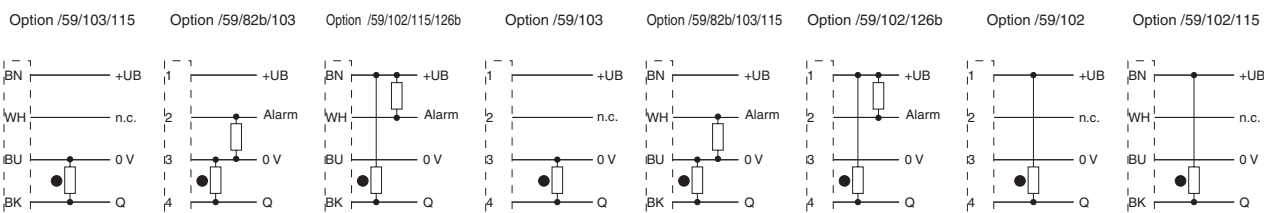


- **Miniature design**
- **Automatic adjustment of sensitivity via Teach-In**
- **Reliable, even under the toughest cleaning conditions - certified as per ECOLAB**
- **IP69K Steam jet proof**
- **Clearly visible function indicators**
- **Flashing power on LED in case of short-circuit**



		ML71-6/59/102/115	ML71-6/59/102/115b/126b	ML71-6/59/102/115/126b	ML71-6/59/102/126b/143	ML71-6/59/102/143	ML71-6/59/103/115	ML71-6/59/103/143	ML71-6/59/82b/103/115	ML71-6/59/82b/103/115b	ML71-6/59/82b/103/143
Polarisation filter											
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.02 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67, IP69K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M 12 connector, 4-pin plastic connector M 8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material											
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 30 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

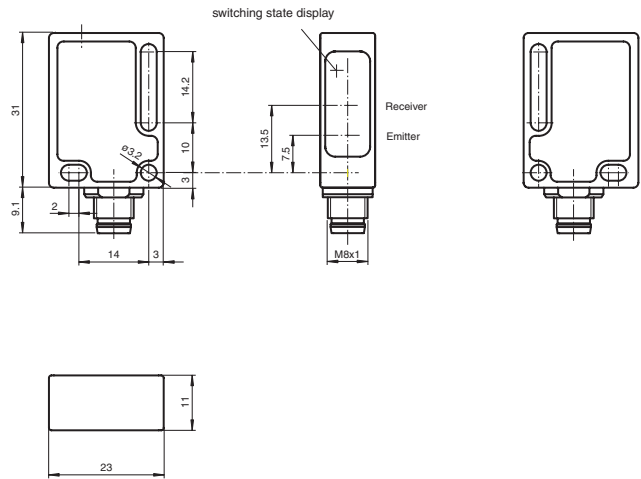
**Electrical connection**



Date of edition 2008-03-20



- Miniature design
- Flexible mounting possibilities due to slotted hole
- Waterproof, protection class IP67
- Protection class II
- Yellow LED indicator behind the front panel
- ML8-55/102/115

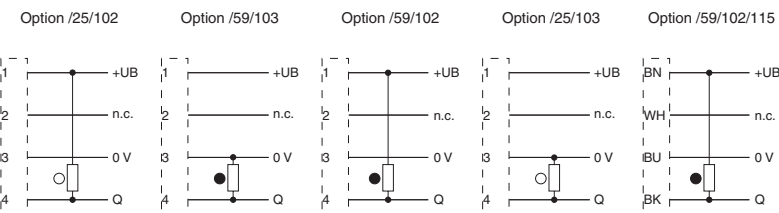


4.2

Photoelectric sensors, retro-reflective sensors

		ML8-55/102/115	ML8-55/102/138/143	ML8-55/102/143	ML8-55/103/115b	ML8-55/103/138/143	ML8-55/103/143	ML8-55/25/102/143	ML8-55/25/103/115b	ML8-55/25/103/115b/138	ML8-55/25/103/138/143	ML8-55/25/103/143
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.02 ... 3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow: switching state	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 12 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 300 mm with M12 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material												
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 30 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection



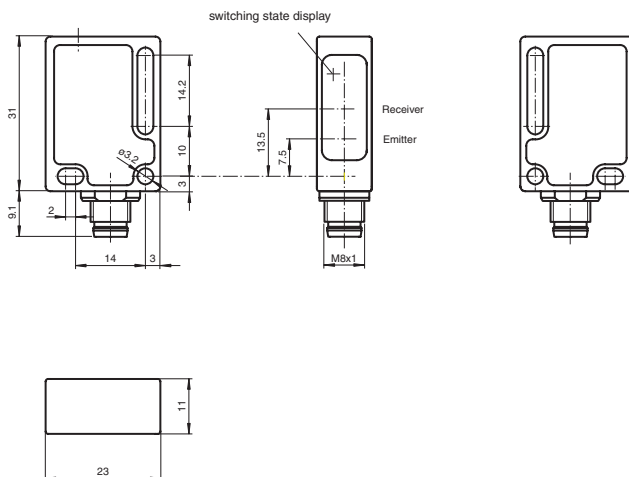
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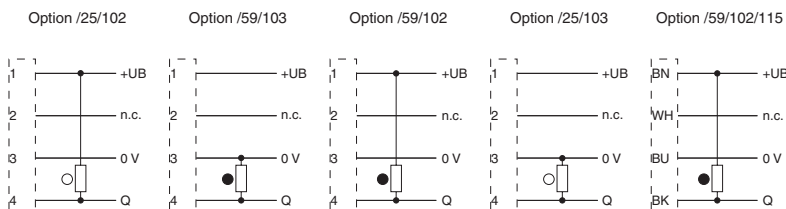


- **Miniature design**
- **Yellow LED indicator behind the front panel**
- **Flexible mounting possibilities due to slotted hole**
- **Waterproof, protection class IP67**
- **Protection class II**

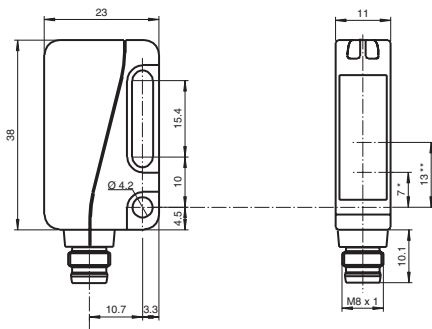


		ML8-6/102/115	ML8-6/102/143	ML8-6/103/143	ML8-6/103/156	ML8-6/25/102/143	ML8-6/25/103/143
Polarisation filter							
Effective detection range	0 ... 3 m	◆	◆	◆	◆	◆	◆
Reflector distance	0.02 ... 3 m	◆	◆	◆	◆	◆	◆
Threshold detection range	3.5 m with reflector H85-2	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Function display	LED yellow: switching state	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆
No-load supply current	< 12 mA	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m plastic connector M8, 3-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 50 g	◆	◆	◆	◆	◆	◆

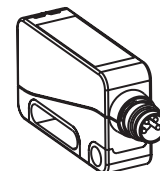
**Electrical connection**



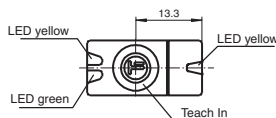
Date of edition 2008-03-20



\* optical axis transmitter  
\*\* optical axis receiver



- Ultra bright LEDs for power on, stability control and switching state
- Flashing power on LED in case of short-circuit
- TEACH-IN
- Not sensitive to ambient light, even with switched energy saving lamps
- Protected against mutual interference
- Protection class II



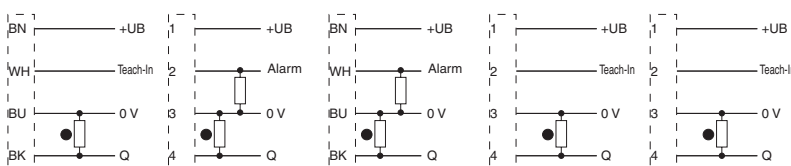
4.2

Photoelectric sensors, retro-reflective sensors

		ML9-54/59/103/15/123	ML9-54/59/103/15a/123	ML9-54/59/103/123/143	ML9-54/59/62b/103/115	ML9-54/59/62b/103/115a	ML9-54/59/62b/103/143
Polarisation filter		◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 5 m	◆	◆	◆	◆	◆	◆
Threshold detection range	6 m with reflector H85-2	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA at 24 V	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M8 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆
Mass	approx. 15 g approx. 25 g approx. 50 g	◆	◆	◆	◆	◆	◆

Electrical connection

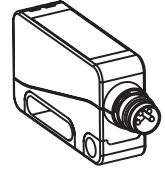
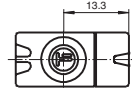
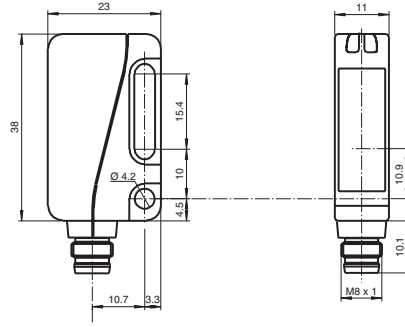
Option 59/103/115/123    Option 59/82b/103/115a    Option 59/82b/103/115    Option 59/103/123/143    Option 59/103/115a/123



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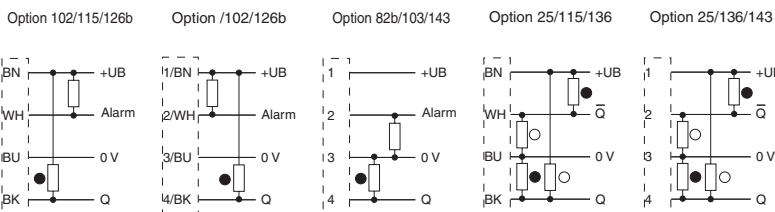


- Ultra bright LEDs for power on, stability control and switching state
- Flashing power on LED in case of short-circuit
- TEACH-IN
- Automatic adjustment in case of soiling in contrast detection mode
- Not sensitive to ambient light, even with switched energy saving lamps
- Protected against mutual interference

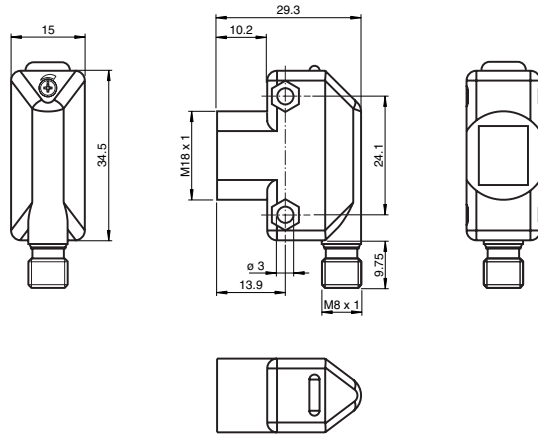


		ML9-54-G/102/115/126b	ML9-54-G/82b/103/115	ML9-54-G/25/115/136	ML9-54-G/25/136/143
Polarisation filter		◆	◆	◆	◆
Glass detection		◆	◆	◆	◆
Effective detection range	0 ... 3.5 m in TEACH mode 0 ... 5.7 m in normal mode	◆	◆	◆	◆
Reflector distance	0 ... 3.5 m in TEACH mode 0 ... 5.7 m in normal mode	◆	◆	◆	◆
Threshold detection range	7.6 m with reflector H85-2	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Function display	LED yellow: switching state ; Stability control ; Teach-In	◆	◆	◆	◆
Operating elements	Teach-In key	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆
No-load supply current	< 20 mA at 24 V DC	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector 2 Push-pull outputs, complementary, short-circuit proof, reverse polarity-protected	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M8 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆
Material					
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆
Optical face	glass PMMA	◆	◆	◆	◆
Mass	approx. 25 g	◆	◆	◆	◆

**Electrical connection**



Date of edition 2008-03-20



- Miniature design
- Ultra bright LEDs for power on, stability control and switching state
- Front side mounting with M18-thread or side mounting holes
- Adjustable sensitivity
- Sturdy, waterproof plastic housing

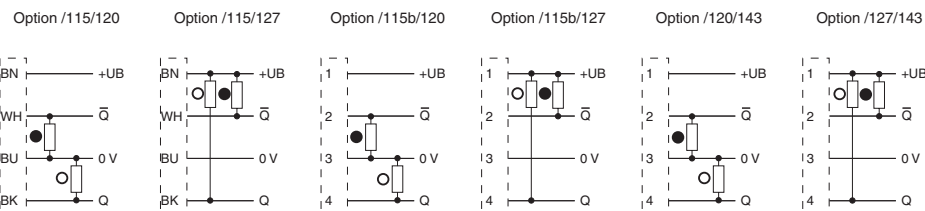


4.2

Photoelectric sensors, retro-reflective sensors

		ML17-54/115b/120	ML17-54/115b/127	ML17-54/115/120	ML17-54/115/127	ML17-54/120/143	ML17-54/127/143	ML17-6/115/120	ML17-6/115/127
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3.5 m	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	0 ... 6.5 m							◆	◆
	5 m	◆	◆	◆	◆	◆	◆		
	9 m								
Reference target	H50 reflector	◆	◆	◆	◆	◆	◆	◆	◆
Light source	Visible red light 626 nm	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆
Light type	Visible red light 626 nm	◆	◆	◆	◆	◆	◆	◆	◆
	Visible red light 626 nm polarisation filter	◆	◆	◆	◆	◆	◆		
Function display	LED yellow, lights up with receiver lit	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	sensitivity adjuster	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 25 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	2 npn short-circuit proof, protected against reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
	2 pnp, short-circuit proof, protected against reverse polarity, open collectors								
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 55 °C (253 ... 328 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆
	plastic connector M8, 4-pin					◆	◆		
	150 mm cable with M12 connector, 4-pin	◆	◆	◆	◆			◆	◆
Material									
Housing	ABS	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection



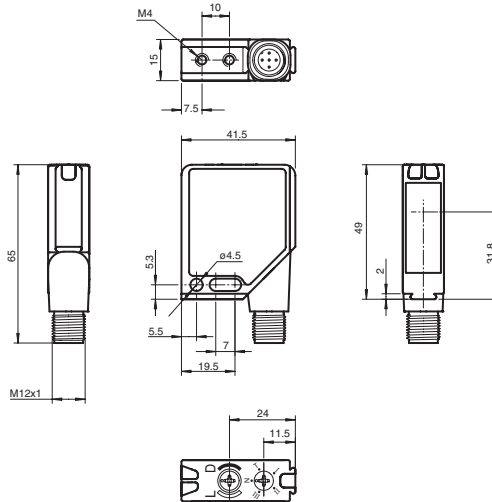
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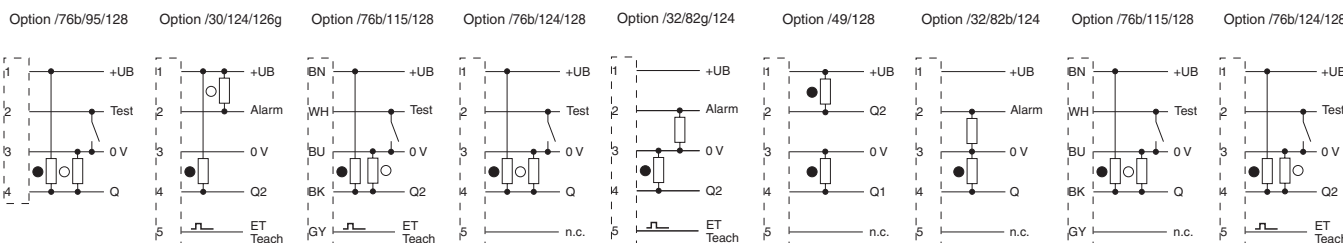


- Ultra bright LEDs for power on, stability control and switching state
- Flashing power on LED in case of short-circuit
- Not sensitive to ambient light, even with switched energy saving lamps
- Multiple device installation possible, no mutual interference
- Protection class II

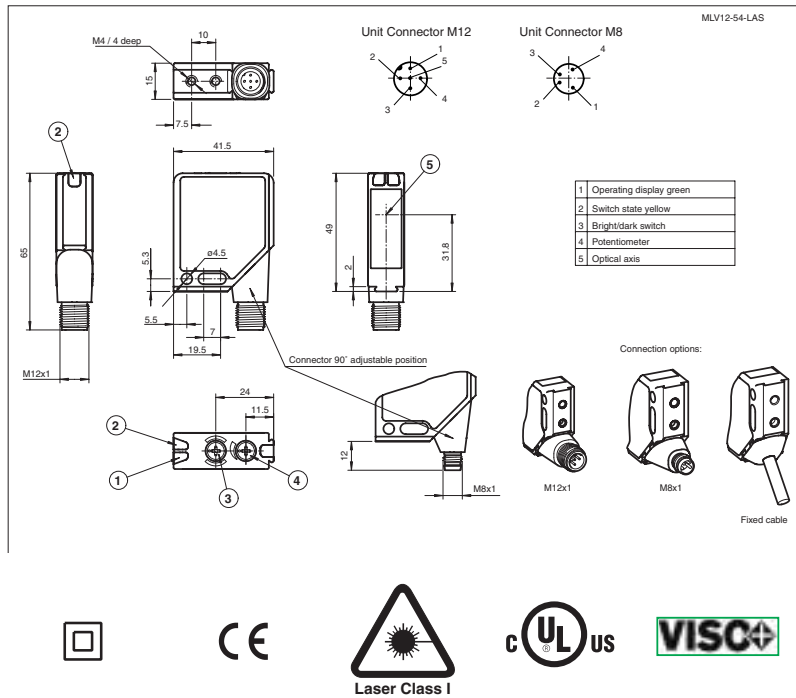


Polarisation filter		MLV 12-54/32/82b/124	MLV 12-54/49/124	MLV 12-54/76b/115/128	MLV 12-54/76b/124/128	MLV 12-54/76b/95/128	MLV 12-54-G/80/124/126g	MLV 12-54-G/82/82g/124	MLV 12-54-G/76b/115/128	MLV 12-54-G/76b/124/128	MLV 12-54-G/76b/95/128
Glass detection		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 4.2 m										
	0 ... 6.5 m										
Reflector distance	0 ... 4.2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	0.01 ... 6.5 m										
Threshold detection range	5.6 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	9 m										
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	2 LEDs yellow for switching state, stability control, Teach-In and contrast detection mode	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 LEDs yellow, light up when light beam is free, flash when falling short of the stability control, off when light beam is interrupted	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	rotary switch for light/dark, sensitivity adjuster	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	rotary switch for light/dark, 5-step switch for contrast recognition adjustment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	max. 40 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	max. 55 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1 NPN and 1 PNP output, direct switching, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 0.2 A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2500 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Metal connector M12, 5-pin, 90° convertible	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Metal connector M8, 4-pin, may be rotated 90°	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing	Frame: die-cast zinc, nickel-plated, Lateral: plastic PC, glass-fiber reinforced	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**



Date of edition: 2008-03-20



- Ultra bright LEDs for power on, stability control and switching state
- Flashing power on LED in case of short-circuit
- Visible red light, pulsed LASER light
- Not sensitive to ambient light, even with switched energy saving lamps
- Multiple device installation possible, no mutual interference
- Powerful push-pull output



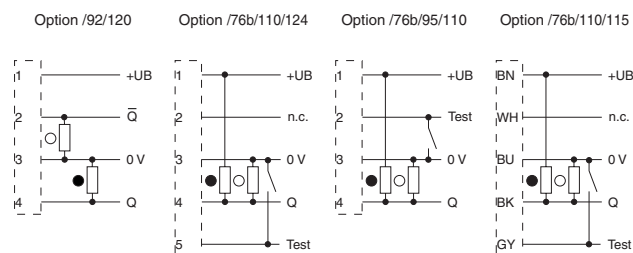
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4.2

Photoelectric sensors, retro-reflective sensors

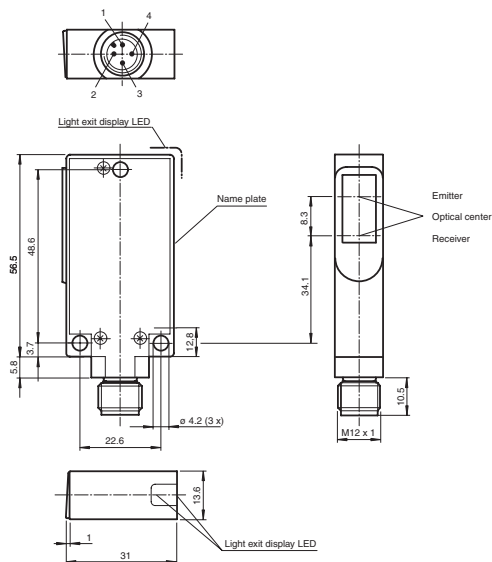
	MLV 12-54-LAS / 76b / 110 / 115	MLV 12-54-LAS / 76b / 110 / 124	MLV 12-54-LAS / 76b / 95 / 110	MLV 12-54-LAS / 92 / 120	MLV 12-54-LAS - 300 / 76b / 110 / 124	MLV 12-54-LAS - 300 / 76b / 95 / 110
Polarisation filter	◆	◆	◆	◆	◆	◆
Effective detection range	◆	◆	◆	◆	◆	◆
Reflector distance	◆	◆	◆	◆	◆	◆
Threshold detection range	◆	◆	◆	◆	◆	◆
Reference target	◆	◆	◆	◆	◆	◆
Light source	◆	◆	◆	◆	◆	◆
Approvals	◆	◆	◆	◆	◆	◆
Light type	◆	◆	◆	◆	◆	◆
Laser class	◆	◆	◆	◆	◆	◆
Function display	◆	◆	◆	◆	◆	◆
Operating elements	◆	◆	◆	◆	◆	◆
Operating voltage	◆	◆	◆	◆	◆	◆
No-load supply current	◆	◆	◆	◆	◆	◆
Switching type	◆	◆	◆	◆	◆	◆
Signal output	◆	◆	◆	◆	◆	◆
Switching voltage	◆	◆	◆	◆	◆	◆
Switching current	◆	◆	◆	◆	◆	◆
Switching frequency	◆	◆	◆	◆	◆	◆
Ambient temperature	◆	◆	◆	◆	◆	◆
Protection degree	◆	◆	◆	◆	◆	◆
Connection	◆	◆	◆	◆	◆	◆
Material	◆	◆	◆	◆	◆	◆
Housing	◆	◆	◆	◆	◆	◆
Optical face	◆	◆	◆	◆	◆	◆
Mass	◆	◆	◆	◆	◆	◆

Electrical connection





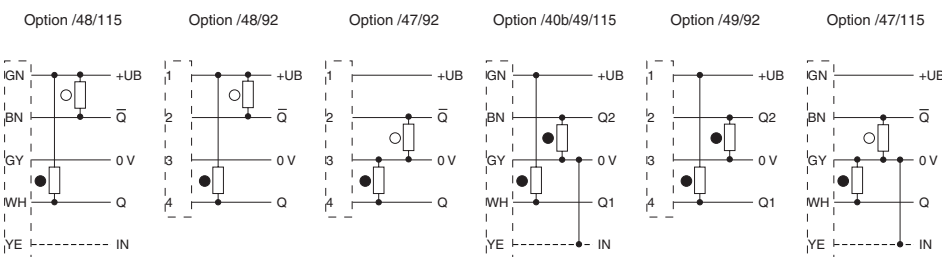
- Sturdy aluminium housing
  - Scratch-resistant and solvent resistant optical covering made of glass
  - Pre-fault indication
  - Glare protected with polarisation filter
- MLV40-54...



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		M LV 40-54/40b/49/115	M LV 40-54/47/115	M LV 40-54/7/92	M LV 40-54/48/115	M LV 40-54/48/92	M LV 40-54/49/92	M LV 40-6/40b/49/115	M LV 40-6/47/115	M LV 40-6/47/92	M LV 40-6/48/115	M LV 40-6/48/92
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0.1 ... 1000 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.1 ... 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	100 ... 1000 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	100 ... 2000 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2000 mm (with H60 reflector)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	4 m (with H60 reflector)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	IRE D	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	LED	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	40 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	light/dark switching	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn and 1 npn short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 npn antivalent, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 pnp, antivalent, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material	Housing	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Optical face	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

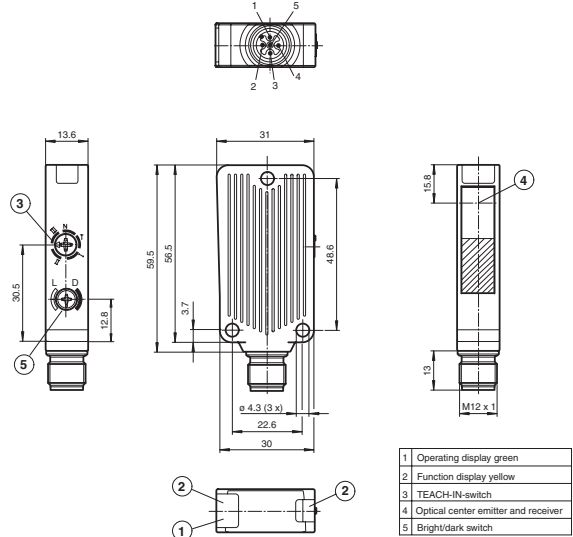
**Electrical connection**



Date of edition 2008-03-20



- Reliable recognition of reflecting objects and clear glass
- Extremely high switching frequency
- Two machines in one: clear glass recognition or reflection operating mode with long range
- Clearly visible function indicators
- TEACH-IN switch for setting the contrast detection levels
- Automatic adjustment in case of soiling in contrast detection mode

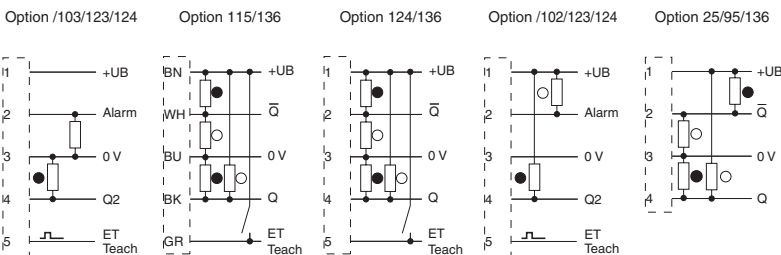


4.2

Photoelectric sensors, retro-reflective sensors

		MLV 41-54-G/10/2/1 23/12/4/1 26/9	MLV 41-54-G/25/1/1 5/1 23/136	MLV 41-54-G/25/1/2/3/1 24/136	MLV 41-54-G/25/1/6 a/1 24/136	MLV 41-54-G/25/5/1/36	MLV 41-54-G/25 b/1 0/3/1 23/12/4
Polarisation filter		◆	◆	◆	◆	◆	◆
Glass detection		◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 4 m in TEACH mode 0 ... 5.2 m at switch position "N"	◆	◆	◆	◆	◆	◆
Reflector distance	0 ... 4 m in TEACH mode 0 ... 5.2 m at switch position "N"	◆	◆	◆	◆	◆	◆
Threshold detection range	6.5 m	◆	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Function display	2 LEDs yellow for switching state, stability control, Teach-In and contrast detection mode	◆	◆	◆	◆	◆	◆
Operating elements	rotary switch for light/dark, 5-step switch for contrast recognition adjustment 5-step switch for setting the contrast detection levels.	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC Power from Class 2 Power Source	◆	◆	◆	◆	◆	◆
No-load supply current	max. 35 mA	◆	◆	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector 2 Push-pull outputs, complementary, short-circuit proof, reverse polarity-protected	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2500 mm Metal connector M12 x 1, 5-pin Metal connector M8, 4-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	aluminium, Delta-Seal coated	◆	◆	◆	◆	◆	◆
Optical face	glass pane	◆	◆	◆	◆	◆	◆
Mass	100 g 50 g	◆	◆	◆	◆	◆	◆

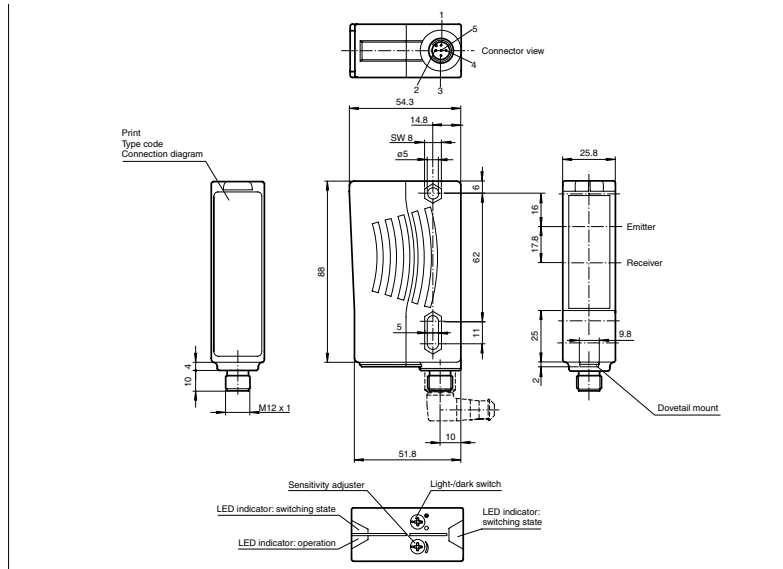
Electrical connection







- Visible red light, pulsed LASER light
- Ultra bright LEDs for power on, stability control and switching state
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class II
- Waterproof, protection class IP67
- Powerful push-pull output

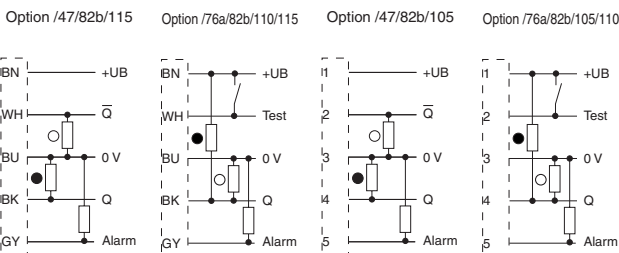


4.2

Photoelectric sensors, retro-reflective sensors

		RL28-55-LAS/47/82b/105	RL28-55-LAS/47/82b/115	RL28-55-LAS/76a/82b/105/110	RL28-55-LAS/76a/82b/110/115
Polarisation filter		◆	◆	◆	◆
Effective detection range	0 ... 30 m	◆	◆	◆	◆
Reflector distance	0.3 ... 30 m	◆	◆	◆	◆
Threshold detection range	42 m (with reflector MH82)	◆	◆	◆	◆
Reference target	MH82 reflector	◆	◆	◆	◆
Light source	laser diode, 650 nm	◆	◆	◆	◆
Approvals	CE	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Laser class	1 acc. to IEC 60825-1	◆	◆	◆	◆
Function display	2 LEDs yellow, light up when light beam is free, flash when falling short of the stability control, off when light beam is interrupted	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 35 mA	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity 2 pnp, antivalent, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 100 mA max. 200 mA	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	2.5 m fixed cable, 5-core, Euro norm fixed cable 2500 mm plastic connector M12 x 1, 5-pin	◆	◆	◆	◆
Material					
Housing	Plastic ABS	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆
Mass	80 g	◆	◆	◆	◆

Electrical connection



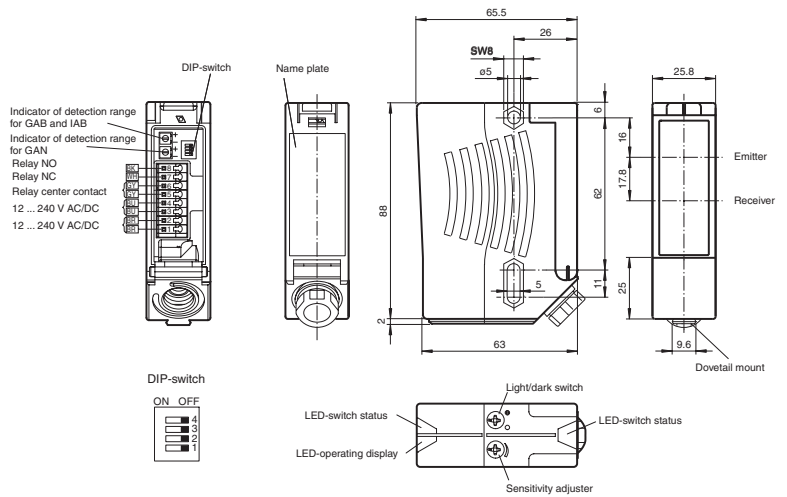
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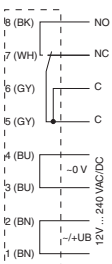
- Ultra bright LEDs for power on, stability control and switching state
- Not sensitive to ambient light, even with switched energy saving lamps
- Waterproof, protection class IP67
- Protection class II
- Programmable time function GAN, GAB, IAB, as well as GAN-GAB and GAN-IAB as double function RLK28-55...-Z...



		RLK28-55-31/116	RLK28-55-Z/31/116	RLK28-55-LA-S-Z/31/116
Polarisation filter		◆	◆	◆
Effective detection range	0 ... 17 m 0 ... 30 m	◆	◆	◆
Reflector distance	0.05 ... 17 m 0.3 ... 30 m	◆	◆	◆
Threshold detection range	21 m 42 m (with reflector MH82)	◆	◆	◆
Reference target	H85-2 reflector MH82 reflector	◆	◆	◆
Light source	laser diode, 650 nm LED, 660 nm	◆	◆	◆
Approvals	CE CE, cULus	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Laser class	1 acc. to IEC 60825-1	◆	◆	◆
Function display	2 LEDs yellow, light up when light beam is free, flash when falling short of the stability control, off when light beam is interrupted	◆	◆	◆
Operating voltage	12 ... 240 V AC/DC	◆	◆	◆
Switching type	Light/dark ON, switchable light/dark ON, switchable (Switchable, The light/dark switch is only activated if the other one is in position 'dark ON'.)	◆	◆	◆
Signal output	Relay, 1 alternator	◆	◆	◆
Switching voltage	max. 250 V AC/DC	◆	◆	◆
Switching current	max. 2 A	◆	◆	◆
Switching frequency	25 Hz	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K) -40 ... 60 °C (233 ... 333 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	terminal compartment with 8 spring-loaded terminals for wire cross section 0.5 ... 1.5 mm <sup>2</sup> , insulation stripping 7.5 ... 8.5 mm, cable gland M16 x 1.5	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆
Mass	112 g 120 g	◆	◆	◆

**Electrical connection**

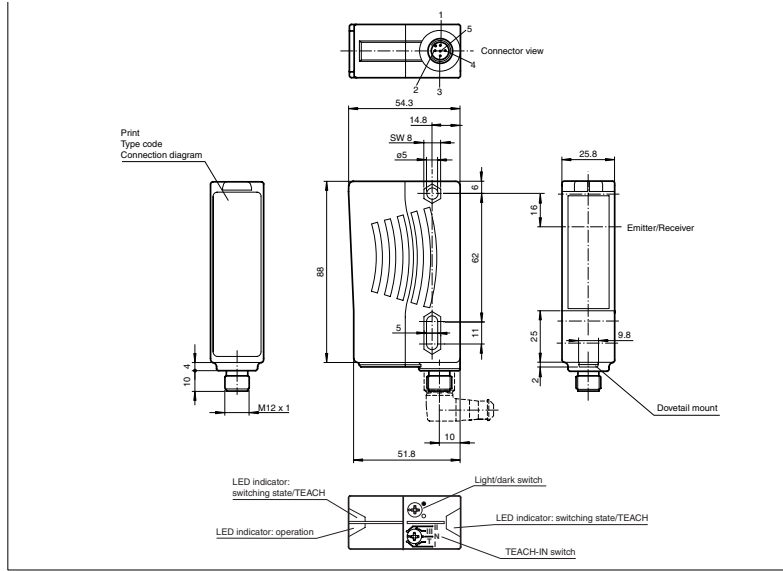
Option /31/116



Date of edition 2008-03-20



- Detection of transparent objects, i.e. clear glass, PET and transparent foils
- TEACH-IN switch for setting the contrast detection levels
- Automatic adjustment in case of soiling in contrast detection mode
- Ultra bright LEDs for power on, stability control and switching state
- Waterproof, protection class IP67
- Protection class II

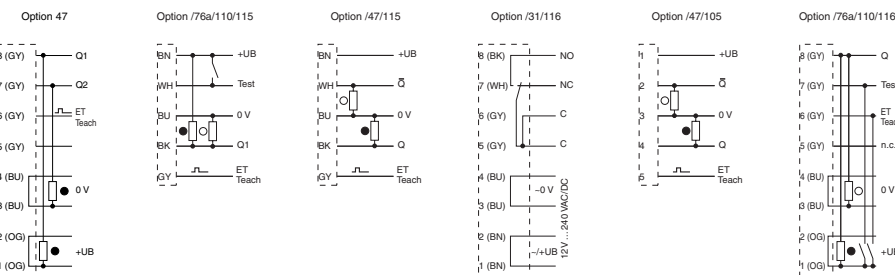


4.2

Photoelectric sensors, retro-reflective sensors

	RL28-54-G/47/105	RL28-54-G/47/115	RL28-54-G/76/10/115	RL28-54-G-Z/47/116	RL28-54-G-Z/76/10/116	RLK28-54-G/31/116
Polarisation filter	◆	◆	◆	◆	◆	◆
Glass detection	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 5.6 m	◆	◆	◆	◆	◆
Threshold detection range	7 m	◆	◆	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆
Function display	2 LEDs yellow for switching state, stability control, Teach-In and contrast detection mode	◆	◆	◆	◆	◆
Operating elements	rotary switch for light/dark, 5-step switch for contrast recognition adjustment	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆
Signal output	Relay, 1 alternator	◆	◆	◆	◆	◆
	1 push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆
Switching voltage	2 pnp, antivalent, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆	◆	◆
	max. 250 V AC/DC	◆	◆	◆	◆	◆
Switching current	max. 30 V DC	◆	◆	◆	◆	◆
	max. 100 mA	◆	◆	◆	◆	◆
	max. 2 A	◆	◆	◆	◆	◆
	max. 200 mA	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆
	25 Hz	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Connection	fixed cable 2500 mm	◆	◆	◆	◆	◆
	terminal compartment with 8 spring-loaded terminals	◆	◆	◆	◆	◆
	plastic connector M12 x 1, 5-pin	◆	◆	◆	◆	◆
Material		◆	◆	◆	◆	◆
Housing	Plastic ABS	◆	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆	◆
	70 g	◆	◆	◆	◆	◆
	90 g	◆	◆	◆	◆	◆

Electrical connection

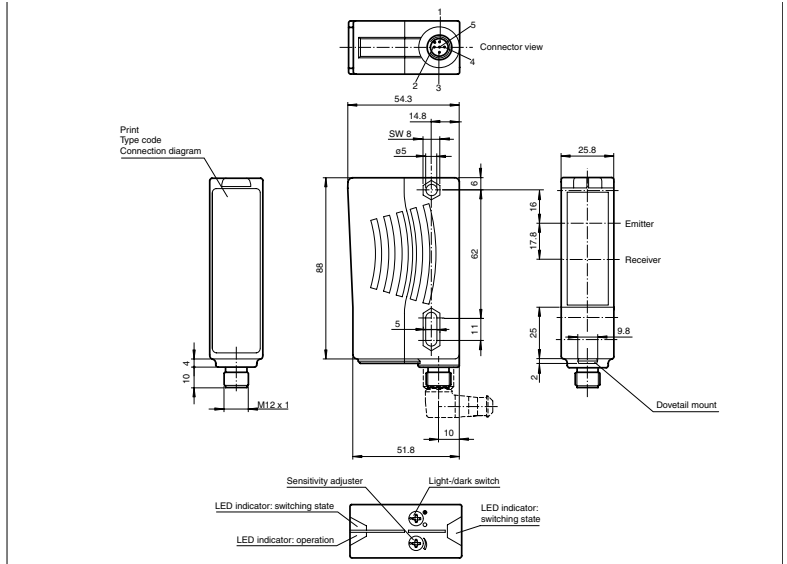


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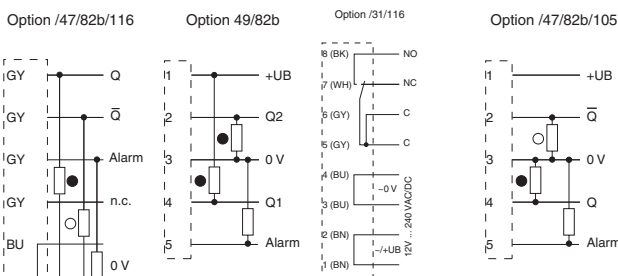
- **Foreground suppression, suited to recording of sheet-shrink-wrapped objects**
- **Ultra bright LEDs for power on, stability control and switching state**
- **Not sensitive to ambient light, even with switched energy saving lamps**
- **Waterproof, protection class IP67**
- **Protection class II**
- **Programmable time function GAN, GAB, IAB, as well as GAN-GAB and GAN-IAB as double function**



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Polarisation filter				
Foreground suppression				
Effective detection range	0 ... 13 m	◆	◆	◆
Reflector distance	0.5 ... 13 m (blind range 0 ... 0.2 m faded out)	◆	◆	◆
Threshold detection range	17 m	◆	◆	◆
Reference target	H85-2 reflector	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Function display	2 LEDs yellow, light up when light beam is free, flash when falling short of the stability control, off when light beam is interrupted	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
	12 ... 240 V AC/DC			
No-load supply current	≤ 40 mA	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆
	light/dark ON, switchable (Switchable, The light/dark switch is only activated if the other one is in position 'dark ON'.)			
Signal output	Relay, 1 alternator	◆	◆	◆
	1 npn, 1 pnp synchronised switching, short-circuit proof, protected against reverse polarity, open collectors			
	2 npn, antivalent, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆
Switching voltage	max. 250 V AC/DC	◆	◆	◆
	max. 30 V DC			
Switching current	max. 2 A	◆	◆	◆
	max. 200 mA			
Switching frequency	1000 Hz	◆	◆	◆
	25 Hz			
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	terminal compartment with 8 spring-loaded terminals plastic connector M12 x 1, 5-pin	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	plastic	◆	◆	◆
	Plastic pane			
Mass	approx. 112 g			
	112 g			
	70 g	◆	◆	◆

**Electrical connection**



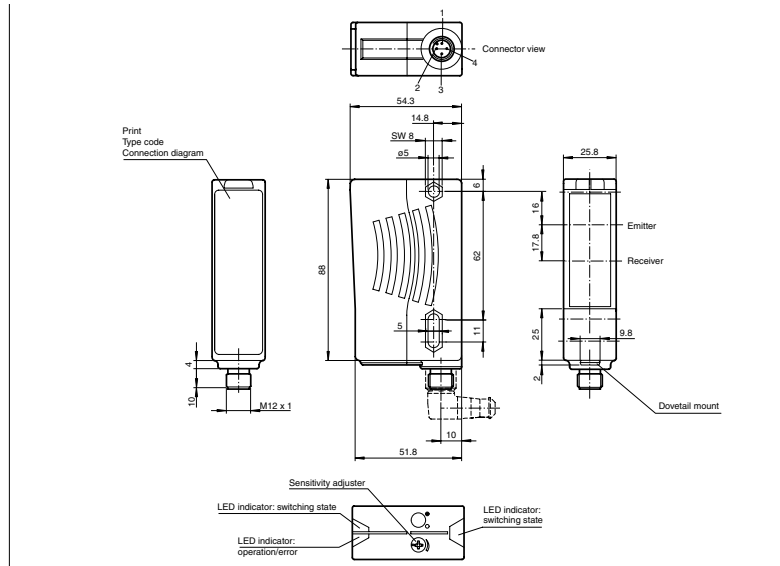
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- Sensor with AS interface according to Spec. 2.11
- Ultra bright LEDs for power on, stability control and switching state
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class II
- Waterproof, protection class IP67



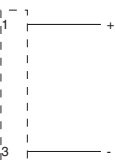
4.2

Photoelectric sensors, retro-reflective sensors

		RL28-55-B3B/73c	RL28-55-LAS-B3B/73c	RL28-55-V-B3B/73c
Polarisation filter		◆	◆	◆
Foreground suppression				◆
Effective detection range	0 ... 13 m			◆
	0 ... 17 m	◆		
	0 ... 30 m			
Reflector distance	0.05 ... 17 m	◆	◆	
	0.3 ... 30 m			
	0.5 ... 13 m (blind range 0 ... 0.2 m faded out)		◆	
Threshold detection range	17 m			◆
	21 m	◆		
	42 m (with reflector MH82)		◆	
Reference target	H85-2 reflector	◆		◆
	MH82 reflector		◆	
Light source	Laser diode, 650 nm		◆	
	LED, 660 nm	◆		◆
Approvals	CE		◆	
	CE, cULus	◆		◆
Light type	red, modulated light	◆	◆	◆
Laser class	1 acc. to IEC 60825-1		◆	
Function display	LED yellow: 1. LED lits constantly: signal > 2 x switching point (function reserve) 2. LED flashes: signal between 1 x switching point and 2 x switching point 3. LED off: signal < switching point	◆	◆	◆
Operating elements	sensitivity adjuster (Adjustment to < 25% of the effective operating range)	◆		◆
Operating voltage	26.5 ... 31.6 V via AS-Interface network, min. 18.5 V	◆	◆	◆
No-load supply current	≤ 40 mA	◆	◆	◆
Switching type	Light/dark ON, switchable via AS-i bus system	◆	◆	◆
Signal output	AS-Interface	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)		◆	
	-40 ... 60 °C (233 ... 333 K)	◆		◆
Protection degree	IP 67	◆	◆	◆
Connection	Plastic connector M12 x 1, 4-pin	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	plastic	◆		◆
	Plastic pane		◆	
Mass	70 g	◆		◆
	80 g		◆	

Electrical connection

Option AS-Interface

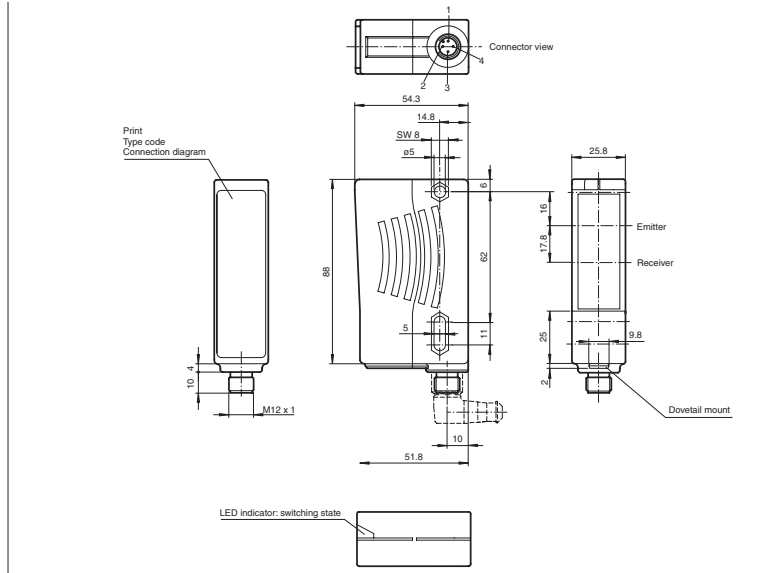


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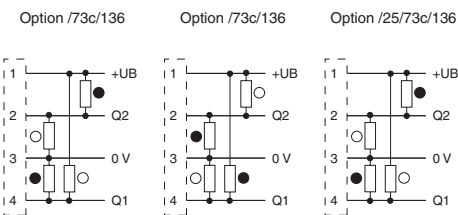


- Very clearly visible LED
  - Powerful push-pull output
  - Optimal price/power ratio
  - Protection class II
  - Foreground suppression, suited to recording of sheet-shrink-wrapped objects
- RL29-55-V...



		RL29-55/115b/136	RL29-55/25/73c/136	RL29-55/73c/136	RL29-55-V/115b/136	RL29-55-V/73c/136	RL29-55-V/25/73c/136
Polarisation filter		◆	◆	◆	◆	◆	◆
Foreground suppression		◆	◆	◆	◆	◆	◆
Effective detection range	0.1 ... 7 m	◆	◆	◆	◆	◆	◆
	0.4 ... 6 m						
Threshold detection range	10 m	◆	◆	◆	◆	◆	◆
	8 m						
Reference target	H85 reflector	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Function display	LED yellow, light with free light beam, flashes when falling short of the stability control	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆	◆	◆
	≤ 40 mA						
Switching type	dark ON	◆	◆	◆	◆	◆	◆
	light ON						
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	Plastic connector M 12 x 1, 4-pin	◆	◆	◆	◆	◆	◆
	0.2 m fixed cable with M 12 connector, 4-pin						
Material							
Housing	Plastic ABS	◆	◆	◆	◆	◆	◆
Optical face	plastic	◆	◆	◆	◆	◆	◆
Mass	70 g	◆	◆	◆	◆	◆	◆
	90 g						

Electrical connection

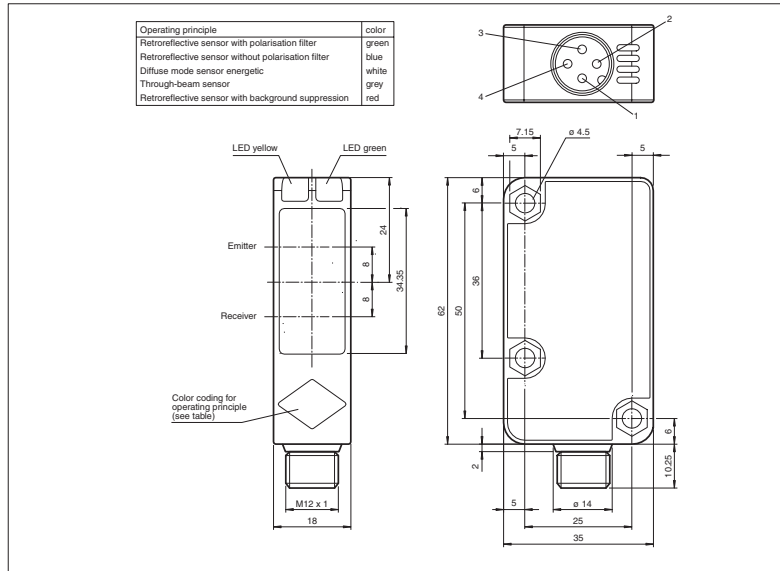


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- Compact and stable housing
- Glare protected with polarisation filter
- Very clearly visible LED
- Powerful push-pull output
- Protection class II



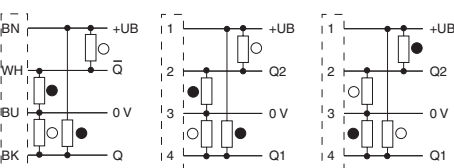
4.2

Photoelectric sensors, retro-reflective sensors

		RL 31-54/1 15/136	RL 31-54/1 15b/136	RL 31-54/2 5/7 3c/136	RL 31-54/7 3c/136
Polarisation filter		◆	◆	◆	◆
Effective detection range	0 ... 9000 mm	◆	◆	◆	◆
Reflector distance	20 ... 9000 mm	◆	◆	◆	◆
Threshold detection range	12 m with reflector C1 10-2	◆	◆	◆	◆
Reference target	reflector C1 10-2	◆	◆	◆	◆
Light source	LED, 630 nm	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Function display	LED yellow: 1. LED lit constantly; signal > 2 x switching point (function reserve) 2. LED flashes; signal between 1 x switching point and 2 x switching point 3. LED off; signal < switching point	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆
	light ON	◆	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆
Ambient temperature	-30 ... 55 °C (243 ... 328 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆
	fixed cable with plug connector M12 x 1, 4 pin	◆	◆	◆	◆
	connector M12 x 1, 4-pin	◆	◆	◆	◆
Material					
Housing	plastic	◆	◆	◆	◆
Optical face	PMM A	◆	◆	◆	◆
Mass	133 g	◆	◆	◆	◆
	24 g	◆	◆	◆	◆

Electrical connection

Option 59/115/136    Option /59/73c/136    Option /25/73c/136

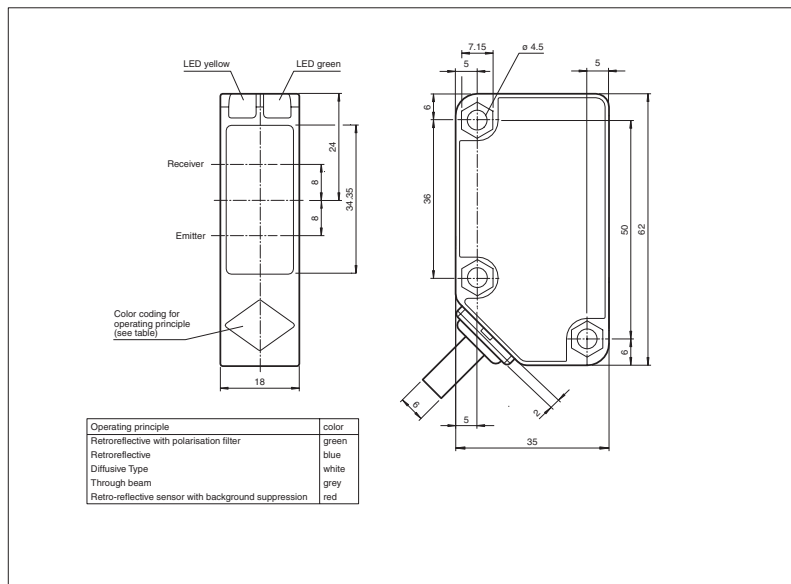


The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

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- Operating voltage AC / DC
- Very clearly visible LED
- Relay output
- Compact and stable housing
- Protection class II



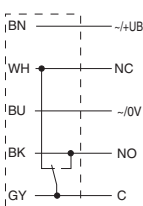
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Date of edition 2008-03-20

		RLK31-54/25/31/115	RLK31-54/31/115	RLK31-625/31/115	RLK31-6/31/115
Polarisation filter		◆	◆		
Effective detection range	0 ... 9000 mm	◆	◆		
Reflector distance	14 m			◆	◆
	20 ... 9000 mm	◆	◆		
	200 ... 14000 mm			◆	◆
Threshold detection range	12 m with reflector C110-2	◆	◆		
	16.5 m with reflector H85-2			◆	◆
Reference target	reflector C110-2	◆	◆		
	H85-2 reflector			◆	◆
Light source	LED, 630 nm	◆	◆		
	LED, 630 nm polarised			◆	◆
Approvals	CE, cULus	◆	◆		
Light type	red, modulated light	◆	◆		
Function display	LED yellow:	◆	◆		
	1. LED lit constantly: signal > 2 x switching point (function reserve)			◆	◆
	2. LED flashes: signal between 1 x switching point and 2 x switching point			◆	◆
	3. LED off: signal < switching point			◆	◆
Operating voltage	24 ... 240 V AC	◆	◆		
	12 ... 240 V DC			◆	◆
No-load supply current	≤ 40 mA	◆	◆		
Switching type	dark ON			◆	◆
	light ON	◆	◆		
Signal output	Relay, 1 alternator	◆	◆		
Switching voltage	max. 250 V AC/DC	◆	◆		
Switching current	max. 2 A	◆	◆		
Switching frequency	20 Hz	◆	◆		
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆		
Protection degree	IP67	◆	◆		
Connection	fixed cable 2 m, 5-core	◆	◆		
Material					
Housing	plastic	◆	◆		
Optical face	PMMA	◆	◆		
Mass	154 g	◆	◆		

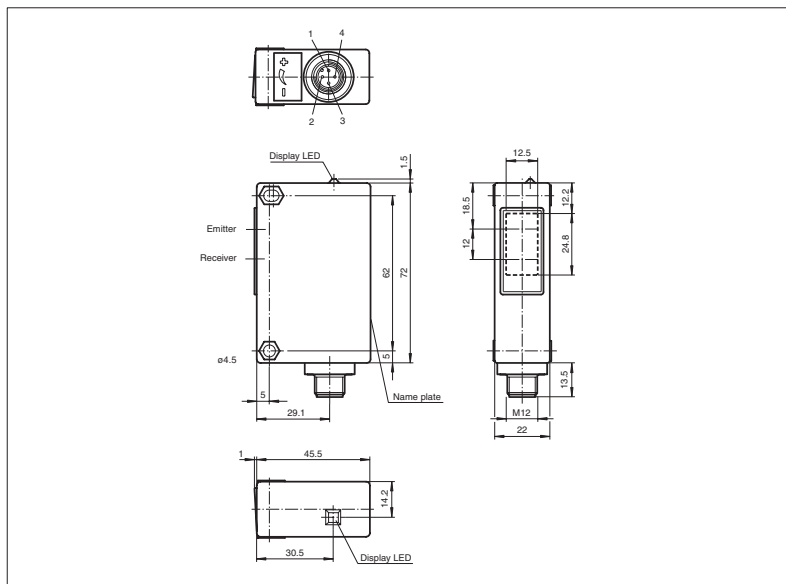
**Electrical connection**

Option 31/115





- Glare protected with polarisation filter
- Excellent optical performance data
- Scratch-resistant and solvent resistant optical covering made of glass
- Sleek design, special for storage and conveyor systems

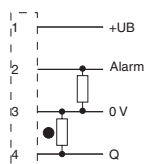


4.2

Polarisation filter									RL 32-54/32/73c/82b
Effective detection range	0.1 ... 4 m								♦
Reflector distance	0.1 ... 4 m								♦
Threshold detection range	8 m (with H85 reflector)								♦
Light source	LED								♦
Approvals	CE, cULus								♦
Light type	red, modulated light								♦
Function display	LED yellow, lights up when light beam is unblocked, flashes when falling short of the stability control								♦
Operating voltage	10 ... 30 V DC								♦
No-load supply current	40 mA at 30 V DC								♦
Switching type	dark ON								♦
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector								♦
Switching voltage	30 V DC								♦
Switching current	max. 200 mA								♦
Switching frequency	250 Hz								♦
Ambient temperature	-20 ... 60 °C (253 ... 333 K)								♦
Protection degree	IP 65								♦
Connection	Plastic connector M12 x 1, 4-pin								♦
Material									♦
Housing	Terluran GV 15								♦
Optical face	glass								♦
Mass	60 g								♦

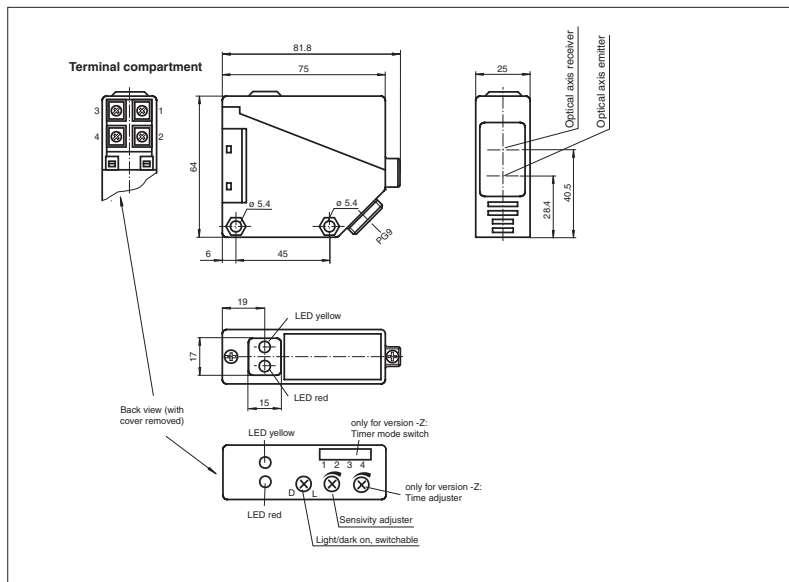
**Electrical connection**

Option /32/73c/82b





- Visible red light
- Light/dark ON, switchable
- Protection degree IP67

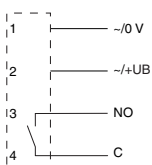


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		RLK39-54/31/40a/116	RLK39-54-Z/31/40a/116	RLK39-55/31/35/40a/116	RLK39-55-Z/31/35/40a/116
Polarisation filter		◆	◆		
Effective detection range	0 ... 20 m	◆	◆	◆	◆
Reflector distance	0 ... 7 m	◆	◆		
	100 ... 9000 mm	◆	◆		
Threshold detection range	3 ... 20 m			◆	◆
	25 m			◆	◆
Reference target	H85 reflector	◆	◆	◆	◆
Light source	LED	◆	◆	◆	◆
Approvals	CE	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Function display	LED yellow: switching state	◆	◆	◆	◆
	LED red: pre-fault indication	◆	◆	◆	◆
Operating elements	sensitivity adjuster	◆	◆	◆	◆
Operating voltage	12 ... 240 V DC	◆	◆	◆	◆
	24 ... 240 V AC (50 ... 60 Hz)	◆	◆	◆	◆
No-load supply current	≤ 35 mA	◆	◆		
	≤ 55 mA			◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Signal output	1 relay output	◆	◆	◆	◆
Switching voltage	≤ 240 V AC	◆	◆	◆	◆
Switching current	≤ 3 A	◆	◆	◆	◆
	max. 3 A			◆	◆
Switching frequency	≤ 25 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>	◆	◆	◆	◆
Material					
Housing	PBT	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Mass	110 g	◆	◆	◆	◆

**Electrical connection**

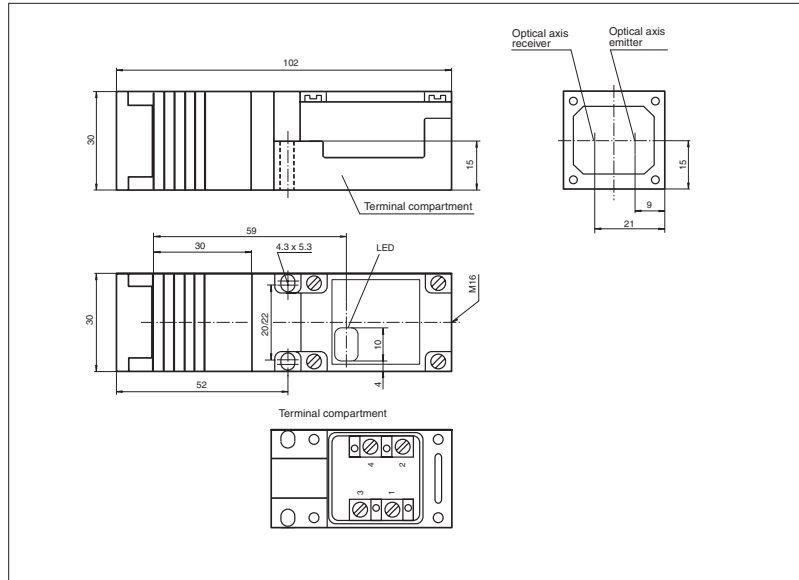
Option 31/40a/116



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- Light/dark ON parameterisable
- Visible red light
- Glare protected with polarisation filter
- Pre-fault indication and output (dynamic and static)
- Protected against mutual interference
- Removable terminal compartment



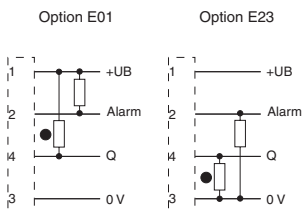
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4.2

Photoelectric sensors, retro-reflective sensors

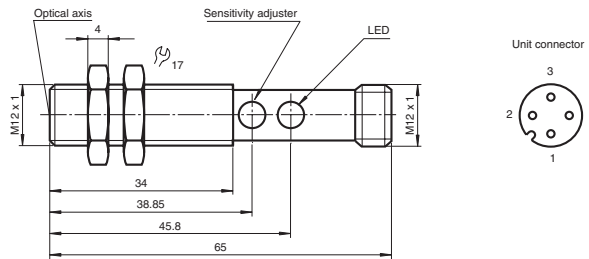
Polarisation filter		◆	◆
Effective detection range	0 ... 3000 mm	◆	◆
Reflector distance	200 ... 3000 mm	◆	◆
Threshold detection range	6 m	◆	◆
Reference target	reflector C1 10-2	◆	◆
Light source	LED	◆	◆
Approvals	CE	◆	◆
Light type	red, modulated light	◆	◆
Function display	LED yellow: switching state LED red: stability control (flashing)	◆	◆
Operating elements	programming switch: bright/dark changeover switch selection of the operating frequency selection of the switching frequency pulse extension stability control dynamic/static	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 35 mA	◆	◆
Switching type	Light/dark ON, switchable	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching current	≤ 200 mA	◆	◆
Switching frequency	≤ 1.5 kHz / 200 Hz switchable	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP 67	◆	◆
Connection	terminal compartment M16, core cross-section ≤ 2,5 mm <sup>2</sup>	◆	◆
Material			
Housing	PBT	◆	◆
Optical face	Scratch resistant mineral glass lens	◆	◆
Mass	100 g	◆	◆

Electrical connection



Date of edition 2008-03-20





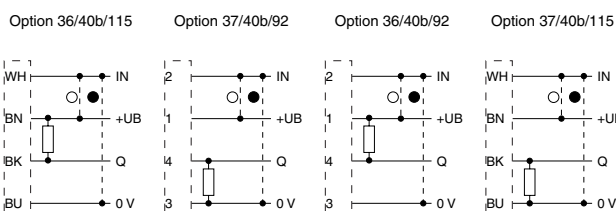
- M12 threaded housing made of brass, nickel plated
  - Visible red light
  - Light/dark ON, programmable
  - Protection degree IP67
  - Glare protected with polarisation filter
- GLV12-54...



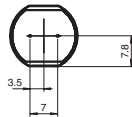
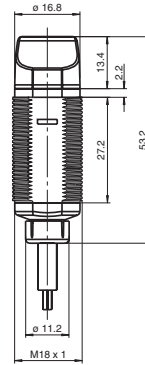
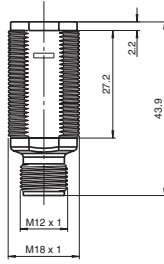
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		GLV12-54/36/40b/115	GLV12-54/36/40b/92	GLV12-54/37/40b/115	GLV12-54/37/40b/92	GLV12-6/3/6/40b/115	GLV12-6/3/6/40b/92	GLV12-6/3/7/40b/115	GLV12-6/3/7/40b/92
Polarisation filter		◆	◆	◆	◆				
Effective detection range	0 ... 1000 mm	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0 ... 2000 mm	◆	◆	◆	◆	◆	◆	◆	◆
	50 ... 1000 mm	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	50 ... 2000 mm	◆	◆	◆	◆	◆	◆	◆	◆
	1200 mm	◆	◆	◆	◆	◆	◆	◆	◆
	2500 mm	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	H85 reflector	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow: switching state	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	sensitivity adjuster	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆	◆	◆	◆	◆
Control input	Light ON: +UB, Dark ON: 0 V	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 300 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 700 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆
	connector M12 x 1, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆
Material	Housing	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆
	Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆
Mass	15 g	◆	◆	◆	◆	◆	◆	◆	◆
	45 g	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**



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- Short design in M18 plastic housing
- 4 LEDs indicator for 360° all-round visibility
- Optical face lateral  
GLV18-55-S...



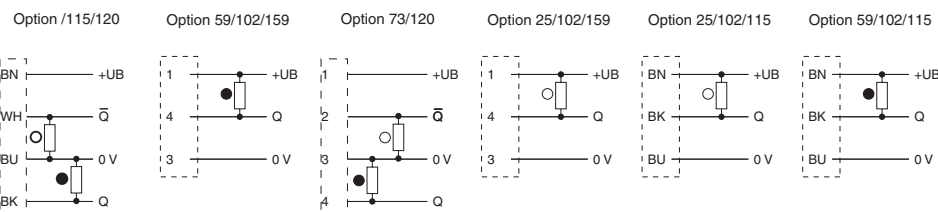
4.2

Photoelectric sensors, retro-reflective sensors

		GLV18-55/115/120	GLV18-55/25/102/115	GLV18-55/25/102/159	GLV18-55/59/102/115	GLV18-55/59/102/159	GLV18-55/73/120	GLV18-55-S/115/120	GLV18-55-S/25/102/115	GLV18-55-S/25/102/159	GLV18-55-S/59/102/115	GLV18-55-S/59/102/159	GLV18-55-S/73/120
Polarisation filter		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Effective detection range	0 ... 3.5 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.05 ... 3.5 m 0.05 ... 6.5 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	4.5 m with reflector C110-2 9 m with reflector H85	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reference target	reflector C1 10-2 H85-2 reflector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red 640 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus Listed 57M3 (Only in association with UL Class 2 power supply)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	frontal lateral	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow: lights up, when receiving the light beam ; flashes when falling short of the stability control; OFF when light beam is interrupted	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light/dark switching light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, open collector 2 pnp, antivalent, short-circuit proof, open collectors	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m Plastic connector M12 x 1 ; 3-pin Plastic connector M12 x 1 ; 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Housing	PC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	< 10 g < 100 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

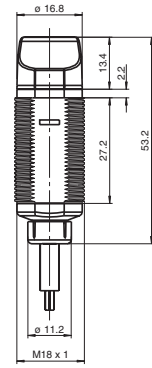
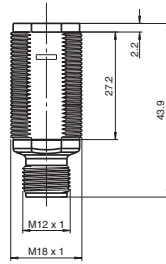
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Electrical connection

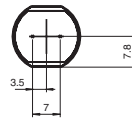


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- Short design in M18 plastic housing
  - 4 LEDs indicator for 360° all-round visibility
  - Optimal price/power ratio
  - Optical face lateral
- GLV18-6-S...



		GLV18-6/S/9/102/159	GLV18-6/S/9/102/115	GLV18-6/S/2/5/102/159	GLV18-6/S/2/5/102/115	GLV18-6/S/15/120	GLV18-6/S/7/3/120	GLV18-6-S/25/102/115	GLV18-6-S/25/102/159	GLV18-6-S/59/102/115	GLV18-6-S/59/102/159	GLV18-6-S/115/120	GLV18-6-S/73/120
Polarisation filter													
Effective detection range	0 ... 5.5 m	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Reflector distance	0.05 ... 5.5 m	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Threshold detection range	0.05 ... 6.5 m												
	6.5 m with reflector C110-2	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	8 m with reflector C110-2	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Reference target	reflector C110-2	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Light source	LED, red 640 nm	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Approvals	CE, cULus Listed 57M3 (Only in association with UL Class 2 power supply)	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Light type	red, modulated light	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Optical face	frontal	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	lateral	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Function display	LED yellow: lights up, when receiving the light beam; flashes when falling short of the stability control; OFF when light beam is interrupted	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Operating voltage	10 ... 30 V DC	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
No-load supply current	< 20 mA	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Switching type	dark ON	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	light/dark switching												
	light ON												
Signal output	1 npn, short-circuit proof, open collector	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	2 pnp, antivalent, short-circuit proof, open collectors												
Switching voltage	max. 30 V DC	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Switching current	max. 100 mA	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Switching frequency	500 Hz	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Protection degree	IP67	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Connection	fixed cable 2 m												
	Plastic connector M12 x 1; 3-pin	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Plastic connector M12 x 1; 4-pin												
Material													
	Housing PC	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Optical face PMMA	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Mass	< 10 g	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	< 100 g												

Electrical connection

Option /115/120

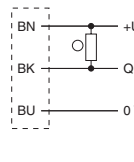
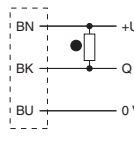
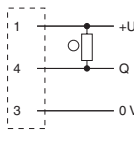
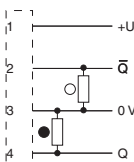
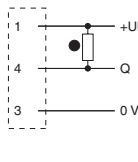
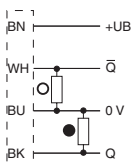
Option 59/102/159

Option 73/120

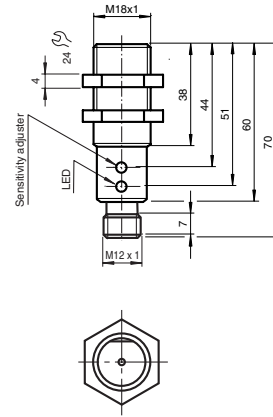
Option 25/102/159

Option 59/102/115

Option 25/102/115



Date of edition 2008-03-20



Unit connector



- Dual colour indication LED
- Glare protected with polarisation filter
- Light/dark ON, programmable
- Sensitivity adjuster for optimal adaptation to the application
- Protection degree IP67
- Strong metallic housing in cylindrical shape M18 x 1

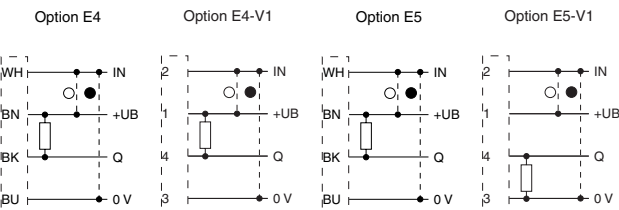


4.2

Photoelectric sensors, retro-reflective sensors

		OBS4000-18GM60-E4	OBS4000-18GM60-E4-V1	OBS4000-18GM60-E5	OBS4000-18GM60-E5-V1
Polarisation filter		◆	◆	◆	◆
Effective detection range	0 ... 4 m	◆	◆	◆	◆
Reflector distance	0 ... 4000 mm	◆	◆	◆	◆
Reference target	H50 reflector	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆
Light type	Red light 660 nm	◆	◆	◆	◆
Function display	dual colour-LED, yellow/green yellow: switching state grün: power on flashing: stability control	◆	◆	◆	◆
Operating elements	sensitivity adjuster	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆
Switching type	Light/dark on selectable electrically switchable	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	fixed cable 2 m connector M12 x 1, 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Optical face	PC	◆	◆	◆	◆
Mass	110 g	◆	◆	◆	◆
	45 g				

Electrical connection



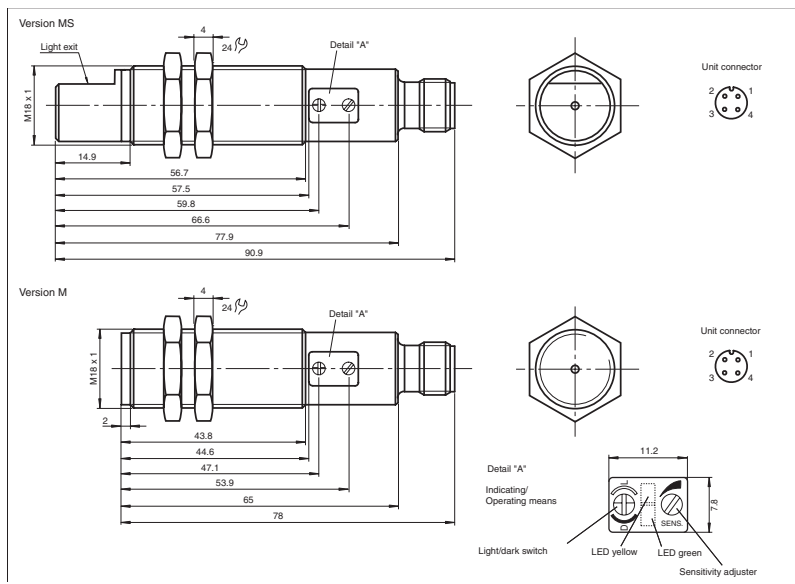
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Date of edition 2008-03-20

The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.



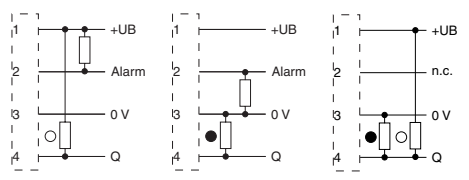
- Clearly arranged control panel with very light LED display
- Flashing power on LED in case of short-circuit
- Multiple device installation possible, no mutual interference
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class II
- M18 threaded housing made of brass, nickel plated



Polarisation filter		VL18-54-M/30/40a/118/126b	VL18-54-M/32/40a/82b/118	VL18-54-M/40a/118/128	VL18-54-M S/30/40a/118/126b	VL18-54-M S/32/40a/82b/118	VL18-54-M S/40a/118/128	VL18-54-M -LAS/32/40a/82b/118	VL18-54-M -LAS/40a/118/128	VL18-54-M -LAS/30/40a/118/126b
Effective detection range	0 ... 18 m with reflector H85 0 ... 3.5 m	◆	◆	◆	◆	◆	◆	◆	◆	◆
Reflector distance	0.06 ... 18 m with reflector H85	◆	◆	◆	◆	◆	◆	◆	◆	◆
Threshold detection range	20 m with reflector H85 4 m	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	laser diode Red light 660 nm LED, Red light 660 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆
Laser class	Laser class 1, IEC60825-1	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	frontal lateral	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function display	LED yellow, light with free light beam, flashes when falling short of the stability control, OFF when light beam is interrupted	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating elements	Sensitivity adjuster, light/dark switch	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA < 35 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output short-circuit proof overvoltage protected 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K) -25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material										
Housing	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	plastic	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**

Option 30/40a/118/126b    Option 32/40a/82b/118    Option 40a/118/128



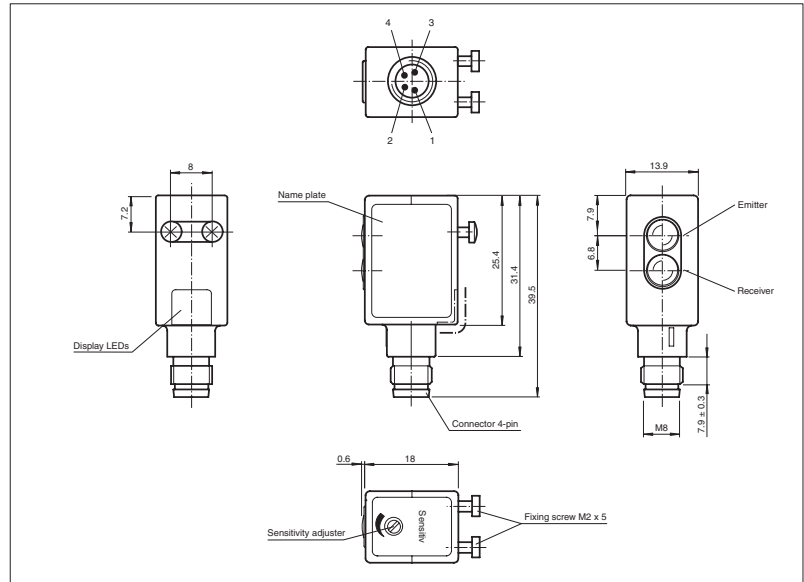
Date of edition 2008-03-20

Subject to reasonable modifications due to technical advances.

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- Miniature design
  - Powerful push-pull output
  - sensitivity adjuster
  - Not sensitive to ambient light, even with switched energy saving lamps
  - Infrared light design
- ML4.1-8-400-IR/40b/95/110



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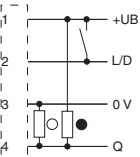
4.3

Photoelectric sensors, diffused mode sensors, energetic

Sensing range adjustment		◆	◆
Detection range	4 ... 400 mm 5 ... 400 mm	◆	◆
Light source	IREL LED	◆	◆
Light type	infrared, modulated light red, modulated light	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	25 mA	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆
Switching type	Light/dark on selectable electrically switchable	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching current	max. 200 mA	◆	◆
Switching frequency	500 Hz	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆
Protection degree	IP 65	◆	◆
Connection	M8 connector, 4-pin	◆	◆
Material			
Housing	ABS GV5	◆	◆
Optical face	glass	◆	◆
Mass	15 g	◆	◆

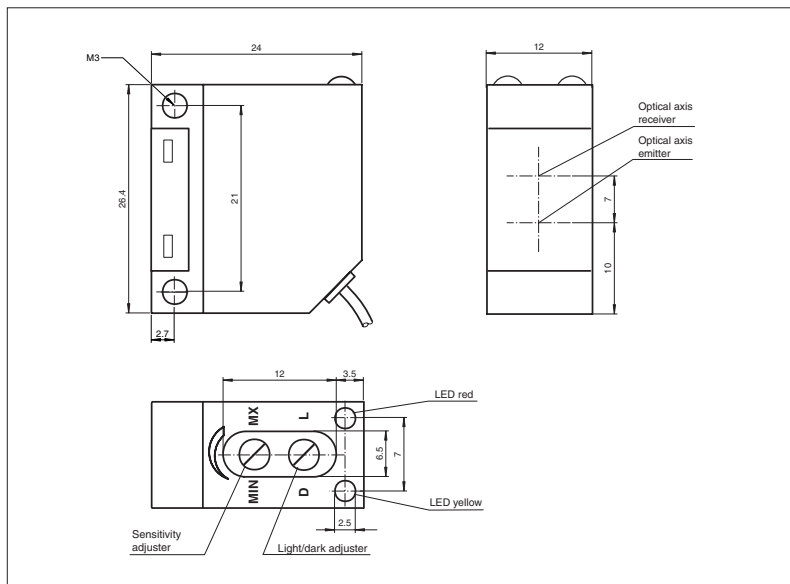
**Electrical connection**

Option 40b/95/110





- Miniature design
- Infrared light design
- Light/dark ON, switchable
- Pre-fault indication
- Protection degree IP67
- Mounting holes for screwing



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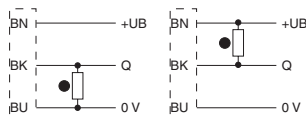
Date of edition 2008-03-20

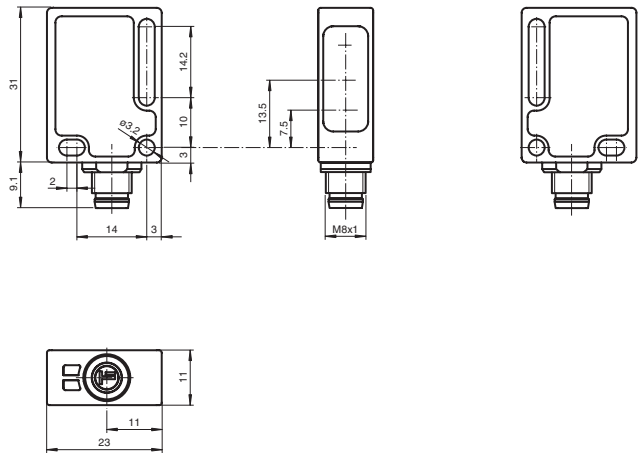
		ML5-8-400/30/115	ML5-8-400/32/115
Sensitivity adjustment		◆	◆
Sensing range adjustment		◆	◆
Detection range	0 ... 400 mm	◆	◆
Light source	LED, Infrared 950 nm	◆	◆
Light type	infrared, modulated light	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 30 mA	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	light/dark ON, switchable	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching current	max. 200 mA	◆	◆
Switching frequency	≤ 500 Hz	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP67 according to EN 60529	◆	◆
Connection	2 m cable, 3 x 0,14 mm <sup>2</sup> , PUR	◆	◆
Material			
Housing	Poly carbonate	◆	◆
Optical face	PMMA	◆	◆
Mass	20 g	◆	◆

**Electrical connection**

Option /32/115

Option 30





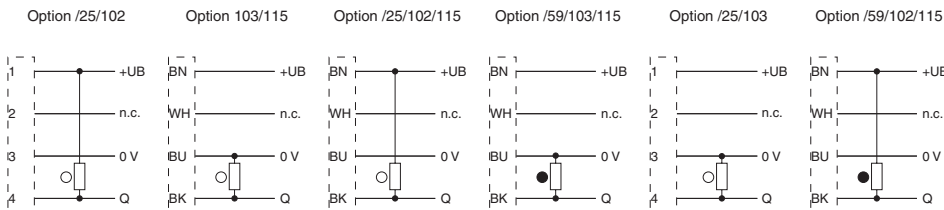
- Miniature design
- Automatic adjustment of sensitivity via Teach-In
- Reliable, even under the toughest cleaning conditions - certified as per ECOLAB
- IP69K Steam jet proof
- Clearly visible function indicators
- Flashing power on LED in case of short-circuit



4.3

		ML7-8-200/25/10 2/1 15	ML7-8-200/25/10 2/1 15b	ML7-8-200/25/10 2/1 43	ML7-8-200/25/10 3/1 15	ML7-8-200/25/10 3/1 15b	ML7-8-200/25/10 3/1 43	ML7-8-200/59/10 2/1 15	ML7-8-200/59/10 3/1 15
Teach-In		◆	◆	◆	◆	◆	◆	◆	◆
Detection range	20 ... 200 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	1 PNP output, short-circuit proof, protected from reverse polarity, open collector								
	dark ON							◆	◆
	light ON								
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP 67, IP 69K	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆		◆		◆		◆	◆
	fixed cable 200 mm with M12 connector, 4-pin		◆						
	plastic connector M8, 4-pin			◆			◆		
Material									
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g			◆			◆		
	approx. 30 g		◆						
	approx. 50 g	◆			◆			◆	◆

Electrical connection



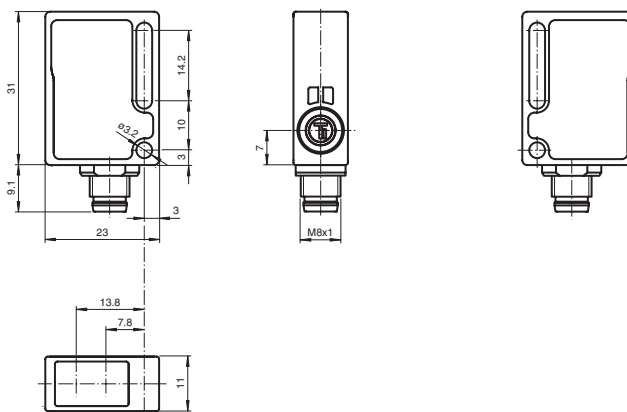
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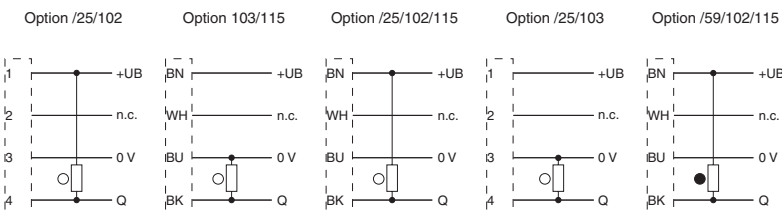


- **Miniature design**
- **Automatic adjustment of sensitivity via Teach-In**
- **Reliable, even under the toughest cleaning conditions - certified as per ECOLAB**
- **IP69K Steam jet proof**
- **Clearly visible function indicators**
- **Flashing power on LED in case of short-circuit**



		ML71-8-200/25/102/115	ML71-8-200/25/102/115b	ML71-8-200/25/103/143	ML71-8-200/25/103/115	ML71-8-200/25/103/115b	ML71-8-200/25/103/143	ML71-8-200/59/102/115
Teach-In		◆	◆	◆	◆	◆	◆	◆
Detection range	20 ... 200 mm	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67, IP69K	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m fixed cable 200 mm with M12 connector, 4-pin plastic connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆
Material								
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g approx. 30 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆

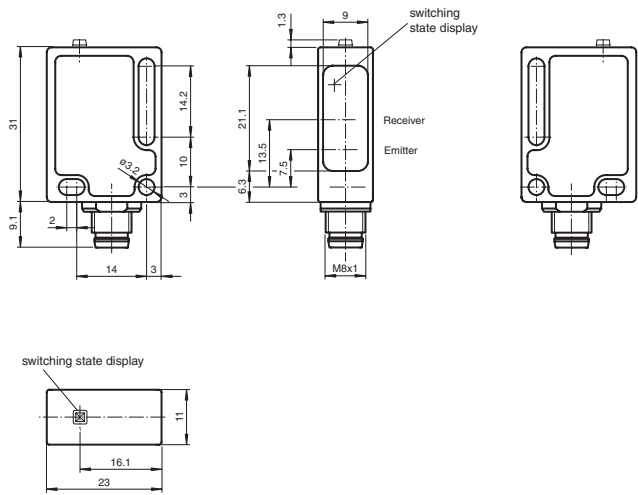
**Electrical connection**



Date of edition 2008-03-20



- Miniature design
- Flexible mounting possibilities due to slotted hole
- Waterproof, protection class IP67
- Protection class II
- Yellow LED indicator behind the front panel

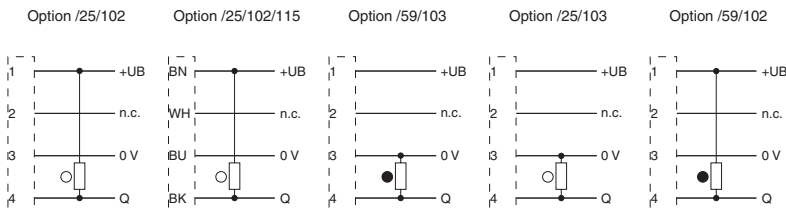


4.3

Photoelectric sensors, diffused mode sensors, energetic

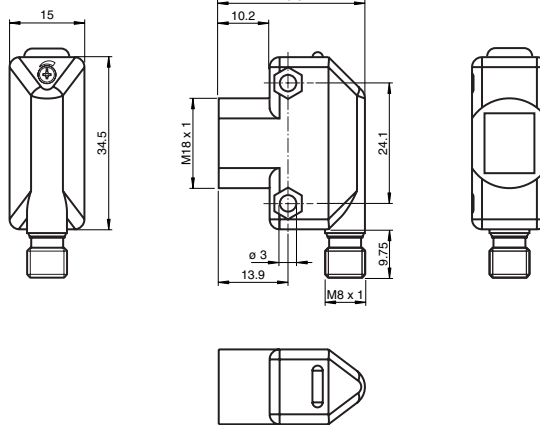
Detection range	20 ... 200 mm	ML8-8-200-RT/02/15	ML8-8-200-RT/02/138/143	ML8-8-200-RT/02/143	ML8-8-200-RT/03/115b	ML8-8-200-RT/03/138/143	ML8-8-200-RT/03/143	ML8-8-200-RT/03/156	ML8-8-200-RT/02/143	ML8-8-200-RT/03/115b	ML8-8-200-RT/03/143	ML8-8-200-RT/03/156
Light source	LED, red	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	1 PNP output, short-circuit proof, protected from reverse polarity, open collector											
	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	light ON											
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆										
	fixed cable 300 mm with M12 connector, 4-pin				◆							
	Plastic connector M8, 3-pin							◆				
	plastic connector M8, 4-pin		◆	◆		◆	◆			◆	◆	
Material												
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	approx. 50 g	◆										

Electrical connection



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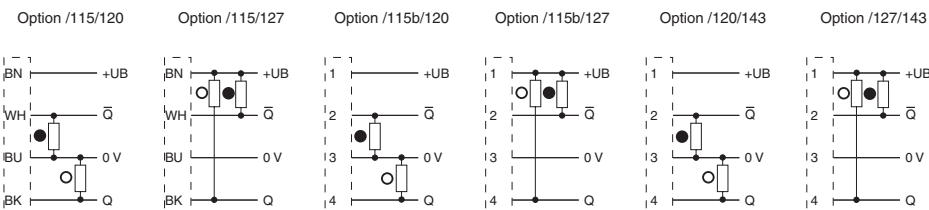
- Miniature design
- Ultra bright LEDs for power on and switching state
- Sensing range adjustable
- Front side mounting with M18-thread or side mounting holes
- Sturdy, waterproof plastic housing



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		ML17-8-450/115/120	ML17-8-450/115/127	ML17-8-450/115b/120	ML17-8-450/115b/127	ML17-8-450/120/143	ML17-8-450/127/143
Sensing range adjustment		◆	◆	◆	◆	◆	◆
Detection range	10 ... 450 mm	◆	◆	◆	◆	◆	◆
Light source	LED 950 nm	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆
No-load supply current	< 25 mA	◆	◆	◆	◆	◆	◆
Signal output	2 npn short-circuit proof, protected against reverse polarity, open collector 2 pnp, short-circuit proof, protected against reverse polarity, open collectors	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 55 °C (253 ... 328 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m plastic connector M8, 4-pin 150 mm cable with M12 connector, 4-pin 150 mm PVC cable with V1 connector 150 mm cable with M12 connector, 4-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆

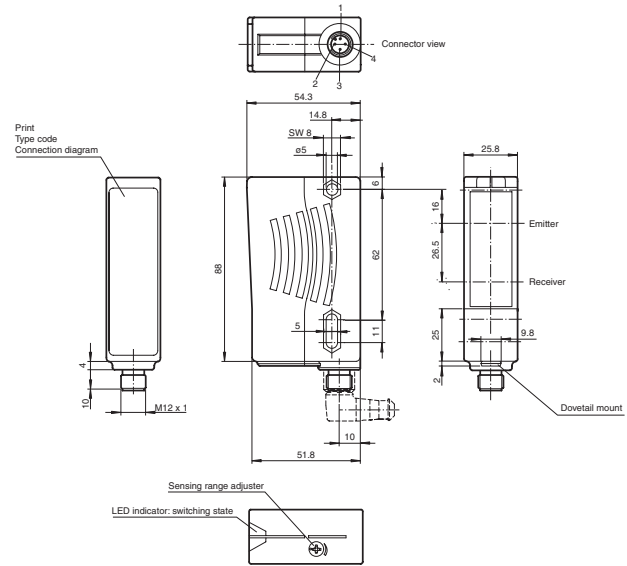
**Electrical connection**



Date of edition 2008-03-20



- Very clearly visible LED
- Good alignability due to red transmission LED
- Powerful push-pull output
- Optimal price/power ratio
- Protection class II



4.3

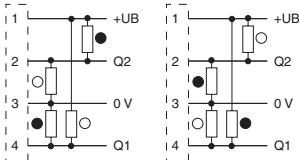
Photoelectric sensors, diffused mode sensors, energetic

Sensing range adjustment		◆	◆	◆
Detection range	20 ... 2000 mm, adjustable	◆	◆	◆
Light source	LED 660 nm	◆	◆	◆
Black/White difference (6%/90%)	< 40 %	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
Protection class	2, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
No-load supply current	≤ 40 mA	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆
Switching type	dark ON	◆	◆	◆
	light ON	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆
Switching frequency	125 Hz	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆
Protection degree	IP 65	◆	◆	◆
Connection	Plastic connector M12 x 1, 4-pin with 0.2 m fixed cable and M12 connector, 4-pin	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	plastic	◆	◆	◆
Mass	70 g	◆	◆	◆

Electrical connection

Option /73c/136

Option /59/73c/136



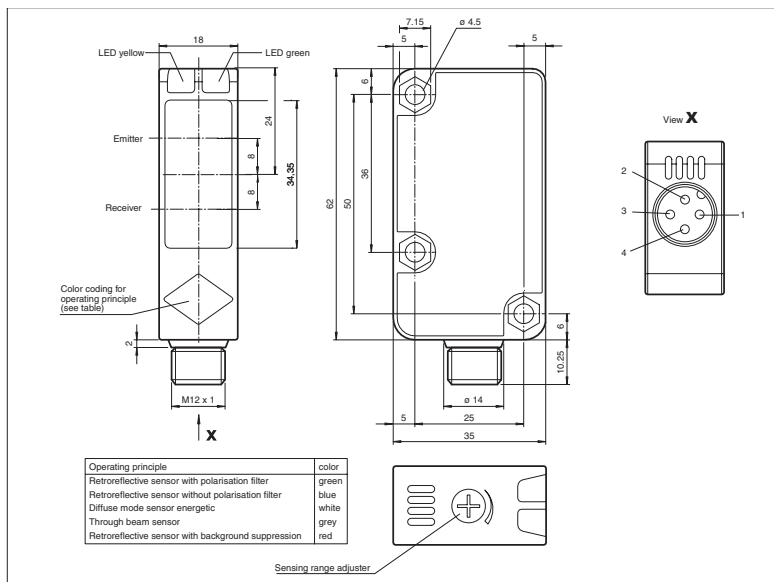
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

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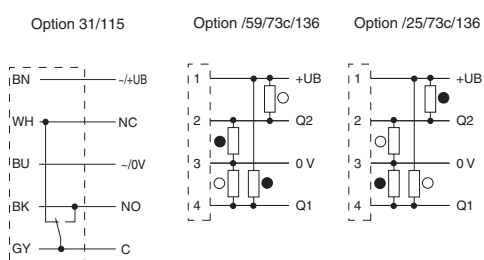


- **Very clearly visible LED**
- **Compact and stable housing**
- **Protection class II**
- **Operating voltage AC / DC**  
 RLK31-8-1200-RT/31/115  
 RLK31-8-1200-RT/31/59/115



		◆ RL31-8-1200-RT/59/73c/136	◆ RL31-8-1200-RT/73c/136	◆ RLK31-8-1200-RT/31/115	◆ RLK31-8-1200-RT/31/59/115
Sensing range adjustment		◆	◆	◆	◆
Detection range	0 ... 1200 mm adjustable	◆	◆	◆	◆
Light source	LED, 630 nm	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC 24 ... 240 V AC 12 ... 240 V DC	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1 Output circuit basis insulation of input circuit according to EN50178, rated insulation voltage 240 V AC	◆	◆	◆	◆
No-load supply current	≤ 20 mA ≤ 40 mA	◆	◆	◆	◆
Power consumption	≤ 2 VA	◆	◆	◆	◆
Signal output	Relay, 1 alternator	◆	◆	◆	◆
Switching type	2 Push-pull outputs, short-circuit proof, reverse polarity protection dark ON light ON	◆	◆	◆	◆
Switching voltage	max. 250 V AC/DC max. 30 V DC	◆	◆	◆	◆
Switching current	max. 100 mA max. 2 A	◆	◆	◆	◆
Switching frequency	≤ 500 Hz 20 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K) -30 ... 55 °C (243 ... 328 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	fixed cable 2 m, 5-core connector M12 x 1, 4-pin	◆	◆	◆	◆
Material		◆	◆	◆	◆
Housing	plastic	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Mass	155 g 25 g	◆	◆	◆	◆

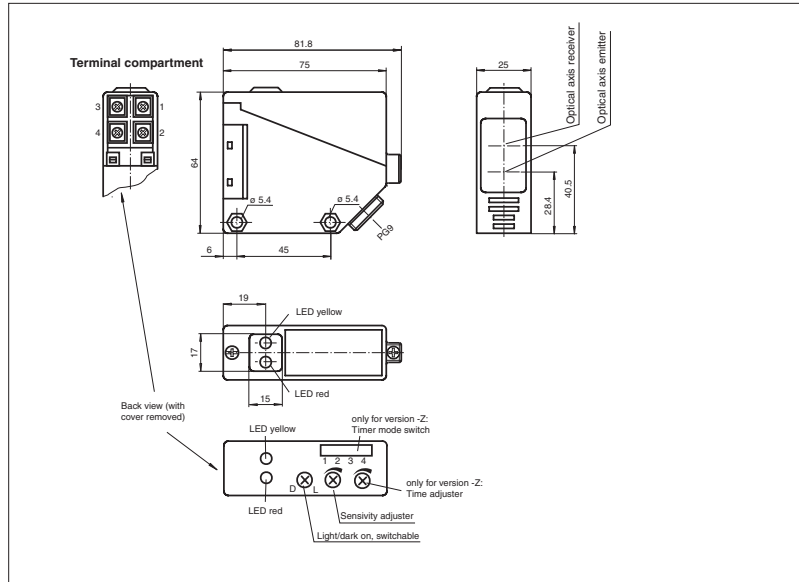
**Electrical connection**



Date of edition 2008-03-20



- Infrared light
- Light/dark ON, switchable
- Protection degree IP67
- Timer function  
RLK39-8-...-Z...



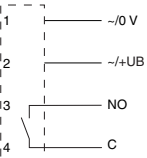
4.3

Photoelectric sensors, diffused mode sensors, energetic

		RLK39-8-80/0/31/40a/116	RLK39-8-80/0-Z/31/40a/116	RLK39-8-20/0/31/40a/116	RLK39-8-20/0-Z/31/40a/116
Sensing range adjustment		◆	◆	◆	◆
Timer		◆	◆	◆	◆
Detection range	0 ... 2000 mm	◆	◆	◆	◆
	0 ... 800 mm	◆	◆	◆	◆
Light source	IREL	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆
Operating voltage	12 ... 240 V DC	◆	◆	◆	◆
	24 ... 240 V AC (50 ... 60 Hz)	◆	◆	◆	◆
No-load supply current	≤ 35 mA	◆	◆	◆	◆
Power consumption	≤ 3 VA	◆	◆	◆	◆
Signal output	1 relay output	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Switching voltage	≤ 240 V AC	◆	◆	◆	◆
Switching current	≤ 3 A	◆	◆	◆	◆
Switching frequency	≤ 25 Hz	◆	◆	◆	◆
Timer function	On-/off-delay or pulse extension on choice	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>	◆	◆	◆	◆
Material					
Housing	PBT	◆	◆	◆	◆
Optical face	PMTA	◆	◆	◆	◆
Mass	110 g	◆	◆	◆	◆

Electrical connection

Option 31/40a/116

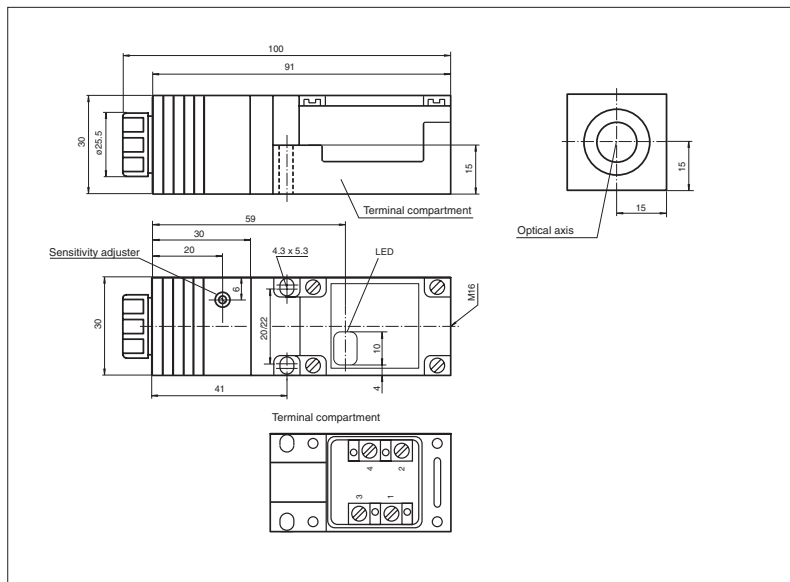


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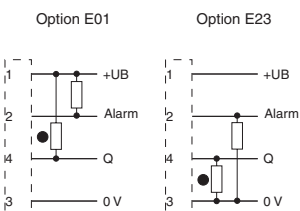


- Light/dark ON parameterisable
- Protected against mutual interference
- Position of the sensor head adjustable
- For glass fibre light guide



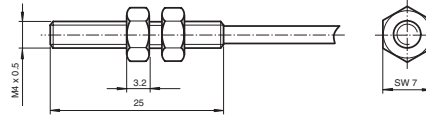
		OJ500-M1K-E01	OJ500-M1K-E23
Sensing range adjustment		◆	◆
Detection range	without fibre optics : 0 ... 500 mm , with fibre optic see selection table for fibre optics	◆	◆
Light source	LED	◆	◆
Light type	infrared, modulated light	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 35 mA	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	light/dark switching	◆	◆
Switching voltage	max. 30 V DC	◆	◆
Switching current	≤ 200 mA	◆	◆
Switching frequency	≤ 1.5 kHz / 200 Hz switchable	◆	◆
Timer function	pulse extension 20 ms, switchable	◆	◆
Output of the pre-fault indication	1 npn, active when falling short of the stability control 1 pnp, active when falling short of the stability control	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	terminal compartment M16, core cross-section ≤ 2,5 mm <sup>2</sup>	◆	◆
Material			
Housing	PBT	◆	◆
Optical face	Scratch resistant mineral glass lens	◆	◆
Mass	100 g	◆	◆

Electrical connection



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- Miniature design in M4 housing
- Housing material high-grade steel
- Fastening nuts designed so that they cannot be over-tightened
- Signal converters SU10... or SU11... are suitable to operate

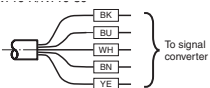


4.3

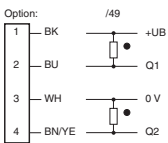
Photoelectric sensors, diffused mode sensors, energetic

		KT10-8-80	SU10/40a/49/116	SU11/32/40a/82b/115	SU11/32/40a/82b/92	SU11/40a/49/115	SU11/40a/49/92
Detection range	0 ... 80 mm	◆					
Light source	IRE D	◆					
Light type	infrared, modulated light	◆					
Operating voltage	10 ... 30 V DC		◆	◆	◆	◆	◆
No-load supply current	40 mA		◆	◆	◆	◆	◆
Signal output	1 npn, 1 pnp synchronised-switching, short-circuit proof, protected against reverse polarity		◆			◆	◆
	1 npn, short-circuit proof, open collector			◆	◆	◆	◆
Switching type	light/dark switching		◆	◆	◆	◆	◆
Switching voltage	30 V DC		◆	◆	◆	◆	◆
Switching current	200 mA		◆	◆	◆	◆	◆
Switching frequency	70 Hz		◆	◆	◆	◆	◆
Output of the pre-fault indication	1 npn, inactive when falling short of the stability control		◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP40	◆	◆	◆	◆	◆	◆
	IP65	◆		◆	◆	◆	◆
Connection	fixed cable 1500 mm	◆					
	fixed cable 2500 mm			◆		◆	
	M12 connector, 4-pin screw terminals		◆				◆
Material							
Housing	aluminium			◆	◆	◆	◆
	PVC		◆				
	V2A	◆					
Optical face	glass	◆					
Mass	20 g	◆					
	50 g		◆				
	60 g			◆	◆	◆	◆

Electrical connection

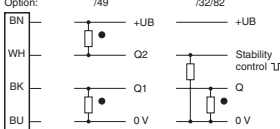


Signal converter SU10 ...

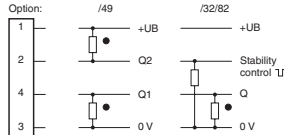


Signal converter SU11 ...

Cable connection (option 115)



Connector (option 92)



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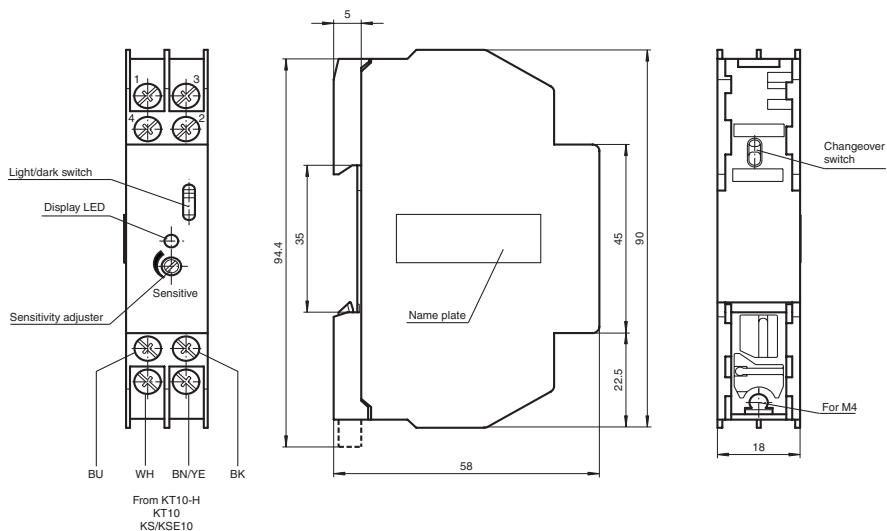
Date of edition 2008-03-20



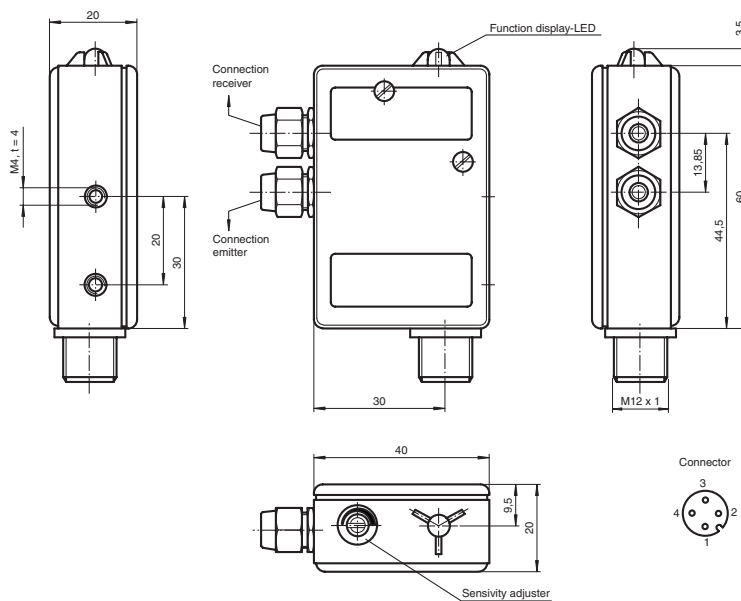
**Amplifier  
SU10/40a/49/116**



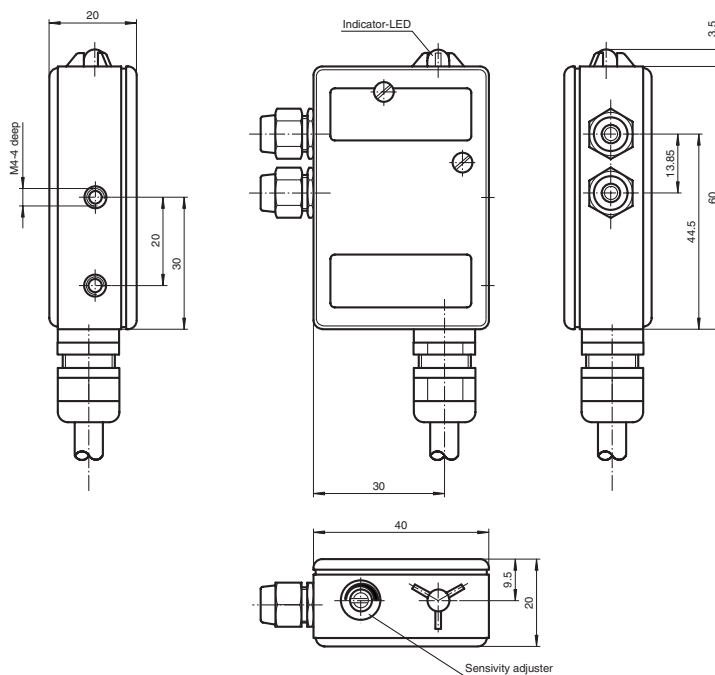
Amplifier for mounting on a standard top hat rail.



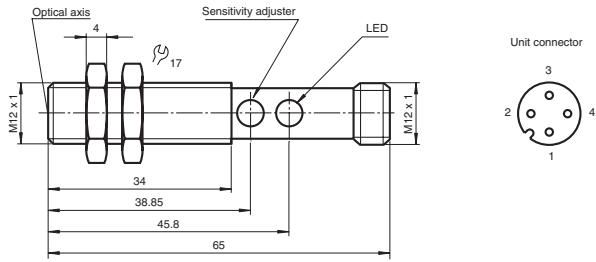
**Amplifier  
SU11.../92**



**Amplifier  
SU11.../115**



Date of issue 31.03.2008



- M12 threaded housing made of brass, nickel plated
- Visible red light
- Light/dark ON, programmable
- Protection degree IP67

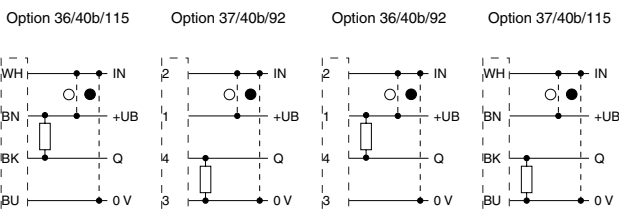


4.3

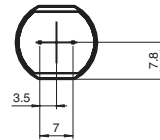
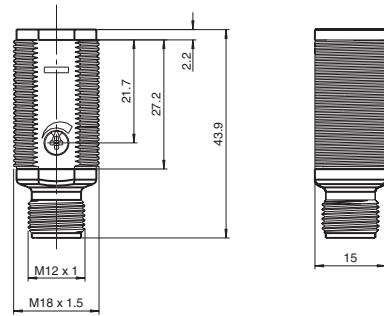
Photoelectric sensors, diffused mode sensors, energetic

Sensing range adjustment		GLV12-8-200/36/40b/115	GLV12-8-200/36/40b/92	GLV12-8-200/37/40b/115	GLV12-8-200/37/40b/92
Detection range	0 ... 200 mm	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆	◆
Control input	Light ON: +UB Dark ON: 0 V	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆
Switching current	max. 300 mA	◆	◆	◆	◆
Switching frequency	≤ 700 Hz	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	fixed cable 2 m connector M12 x 1, 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Mass	15 g 45 g	◆	◆	◆	◆

Electrical connection



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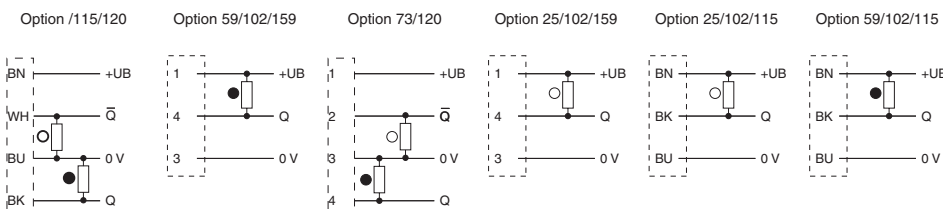
- Short design in M18 plastic housing
- 4 LEDs indicator for 360° all-round visibility
- Optimal price/power ratio

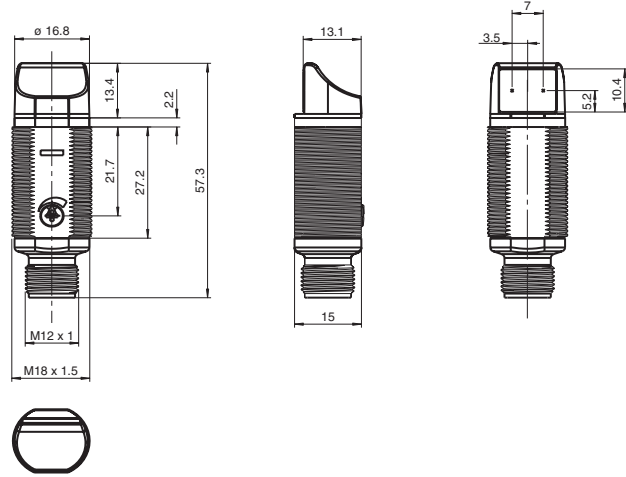


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		GLV18-8-20/0115/120	GLV18-8-20/025/102/115	GLV18-8-20/025/102/159	GLV18-8-20/059/102/115	GLV18-8-20/059/102/159	GLV18-8-20/073/120	GLV18-8-45/0115/120	GLV18-8-45/025/102/115	GLV18-8-45/025/102/159	GLV18-8-45/059/102/115	GLV18-8-45/059/102/159	GLV18-8-45/073/120
Sensitivity adjustment		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing range adjustment		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Detection range	50 ... 200 mm adjustable 50 ... 450 mm adjustable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red 640 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated insulation voltage $\dot{U}$ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, open collector 2 pnp, antivalent, short-circuit proof, open collectors	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON light/dark switching light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m Plastic connector M12 x 1 ; 3-pin Plastic connector M12 x 1, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material													
Housing	PC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	< 10 g < 100 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**





- Short design in M18 plastic housing
- Optical face lateral
- 4 LEDs indicator for 360° all-round visibility
- Optimal price/power ratio

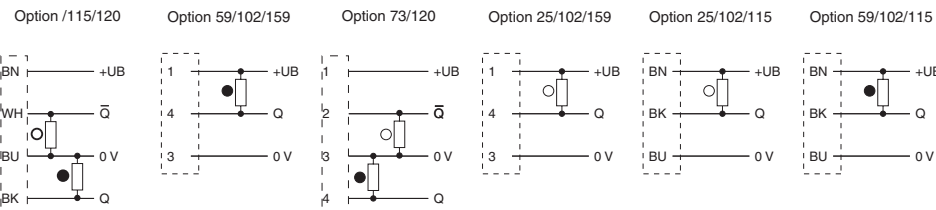


4.3

Photoelectric sensors, diffused mode sensors, energetic

Sensitivity adjustment		GLV18-8-20-0-S/11 5/1 20	GLV18-8-20-0-S/25/10 2/1 15	GLV18-8-20-0-S/25/10 2/1 59	GLV18-8-20-0-S/59/10 2/1 15	GLV18-8-20-0-S/59/10 2/1 59	GLV18-8-20-0-S/73/120	GLV18-8-40-0-S/11 5/1 20	GLV18-8-40-0-S/25/10 2/1 15	GLV18-8-40-0-S/25/10 2/1 59	GLV18-8-40-0-S/59/10 2/1 15	GLV18-8-40-0-S/59/10 2/1 59	GLV18-8-40-0-S/73/120
Sensing range adjustment		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Detection range	50 ... 200 mm adjustable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	50 ... 400 mm adjustable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED, red 640 nm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated insulation voltage $\bar{U}$ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, open collector	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	2 pnp, antivalent, short-circuit proof, open collectors	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	light/dark switching	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	light ON	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Plastic connector M12 x 1; 3-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Plastic connector M12 x 1; 4-pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material													
Housing	PC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	< 10 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	< 100 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection



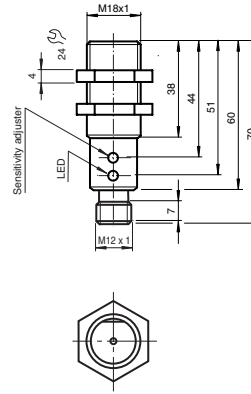
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

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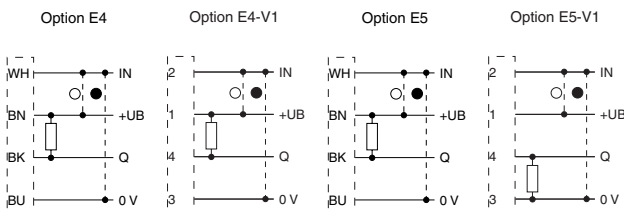


- Dual colour indication LED
- High switching frequency
- Light/dark ON, programmable
- Strong metallic housing in cylindrical shape M18 x 1
- Protection degree IP67



		OB T200-18GM60-E4	OB T200-18GM60-E4-V1	OB T200-18GM60-E5	OB T200-18GM60-E5-V1	OB T500-18GM60-E4	OB T500-18GM60-E4-V1	OB T500-18GM60-E5	OB T500-18GM60-E5-V1
Sensing range adjustment		◆	◆	◆	◆	◆	◆	◆	◆
Detection range	0 ... 200 mm	◆	◆	◆	◆	◆	◆	◆	◆
	0 ... 500 mm								
Light source	IRE D , 880 nm	◆	◆	◆	◆	◆	◆	◆	◆
Light type	Infrared	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
	1 PNP output, short-circuit proof, protected from reverse polarity, open collector								
Switching type	Light/dark on selectable electrically switchable	◆	◆	◆	◆	◆	◆	◆	◆
Switching voltage	max. 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆
	connector M12 x 1, 4-pin								
Material									
Housing	brass, nickel-plated	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	PC	◆	◆	◆	◆	◆	◆	◆	◆
Mass	110 g	◆	◆	◆	◆	◆	◆	◆	◆
	45 g								

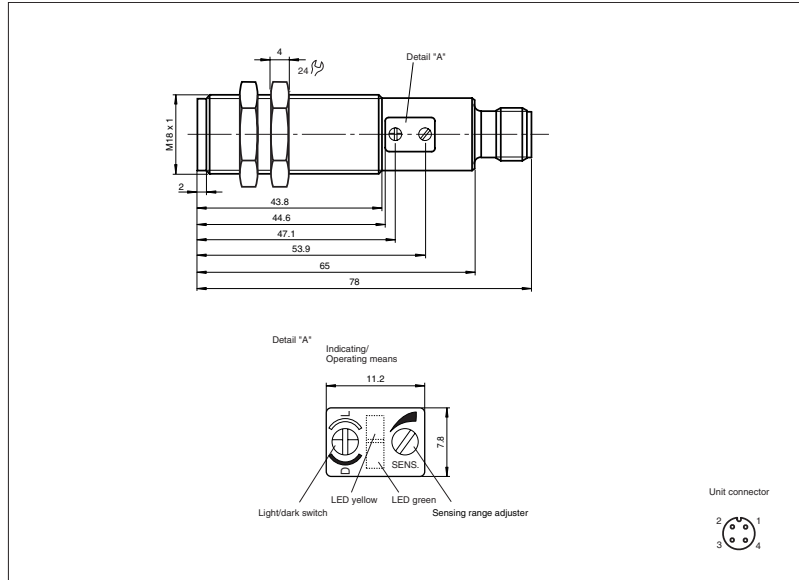
**Electrical connection**



Date of edition 2008-03-20



- Clearly arranged control panel with very light LED display
- Flashing power on LED in case of short-circuit
- Multiple device installation possible, no mutual interference
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class II
- M18 threaded housing made of brass, nickel plated



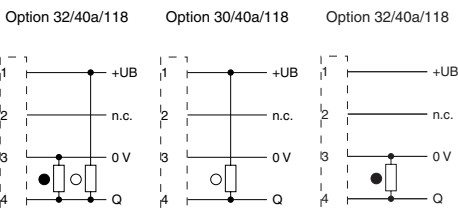
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4.3

Photoelectric sensors, diffused mode sensors, energetic

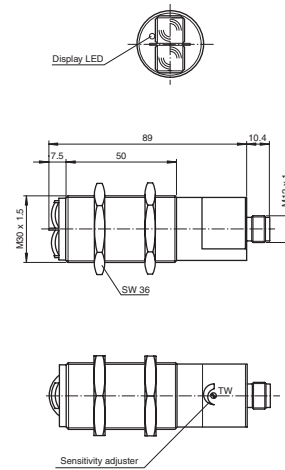
		VT18-8-400-M/30/40a/118	VT18-8-400-M/32/40a/118	VT18-8-400-M/40a/118/128	VT18-8-400-M-LAS/30/40a/118	VT18-8-400-M-LAS/32/40a/118	VT18-8-400-M-LAS/40a/118/128
Sensing range adjustment		◆	◆	◆	◆	◆	◆
Detection range	0 ... 400 mm, adjustable	◆	◆	◆	◆	◆	◆
Light source	laser diode Red light 650 nm LED, Red light 660 nm	◆	◆	◆	◆	◆	◆
Laser class	Laser class 1, IEC 60825-1	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆
No-load supply current	< 30 mA	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆	◆	◆
Switching voltage	30 V DC	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 55 °C (248 ... 328 K) -25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆	◆	◆
Connection	M 12 connector, 4-pin (Vario-Quick fast connection technology)	◆	◆	◆	◆	◆	◆
Material							
Housing	brass, nickel-plated	◆	◆	◆	◆	◆	◆
Optical face	plastic	◆	◆	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆	◆	◆

Electrical connection





- M30 plastic housing
- Light/dark switching



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Sensing range adjustment			
Detection range	100 ... 2500 mm		
Light source	IREL		
Light type	infrared, modulated light		
Operating voltage	24 V DC ± 20 %		
No-load supply current	30 mA		
Signal output	2 pnp, antivalent, short-circuit proof, protected against reverse polarity		
Switching type	light/dark switching		
Switching voltage	max. 30 V DC		
Switching current	max. 200 mA		
Switching frequency	35 Hz		
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Protection degree	IP67		
Connection	Plastic connector M 12 x 1, 4-pin		
Material			
Housing	ABS		
Optical face	Plastic lenses		
Mass	approx. 70 g		

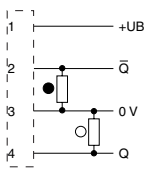
GLV30-8-2500/47/73c

4.3

Photoelectric sensors, diffused mode sensors, energetic

Electrical connection

Option 47/73c

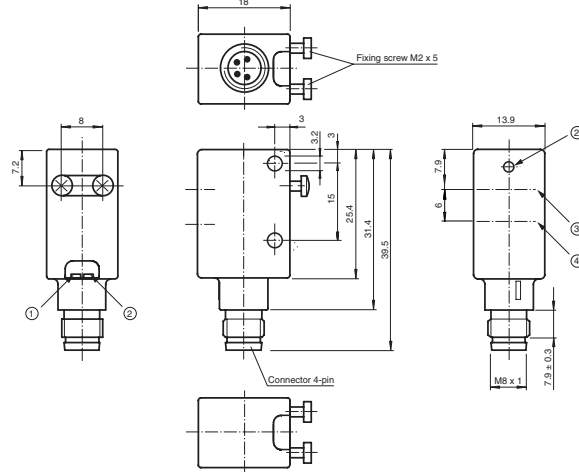




Unit connector M8



1	operating display green
2	indication of the switching state yellow
3	emitter axis
4	receiver axis



- Miniature design
- Precise background suppression
- Very small black-white difference
- Small, sharp light spot
- Not sensitive to ambient light, even with switched energy saving lamps
- Protected against mutual interference



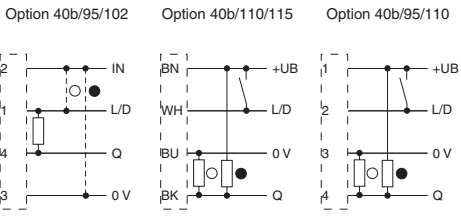
4.4

Photoelectric sensors, diffused mode sensors with background suppression

		ML4.2-8-H-20-R/40b/110/115	ML4.2-8-H-20-R/40b/95/110	ML4.2-8-H-20-RT/40b/110/115	ML4.2-8-H-20-RT/40b/95/110	ML4.2-8-H-40-R/40b/110/115	ML4.2-8-H-40-R/40b/95/110	ML4.2-8-H-40-RT/40b/110/115	ML4.2-8-H-40-RT/40b/95/102	ML4.2-8-H-60-R/40b/95/110	ML4.2-8-H-60-RT/40b/95/110	ML4.2-8-H-80-R/40b/110/115	ML4.2-8-H-80-R/40b/95/110	ML4.2-8-H-80-RT/40b/110/115	ML4.2-8-H-80-RT/40b/95/110
Background suppression		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Detection range	10 ... 40 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	10 ... 60 mm														
	10 ... 80 mm														
Detection range max.	7 ... 20 mm	◆	◆	◆											
	10 ... 100 mm														
	10 ... 50 mm														
	10 ... 80 mm														
Light source	5 ... 25 mm	◆	◆	◆											
	IRED, 880 nm	◆	◆	◆											
	LED, red 660 nm				◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	approx.														
		1 mm	1 mm	1 mm	1 mm					10 mm	10 mm	10 mm	10 mm	15 mm	15 mm
Background suppression	starts from	25 mm	25 mm	25 mm	25 mm	50 mm	50 mm	50 mm	50 mm	80 mm	80 mm	80 mm	80 mm	100 mm	100 mm
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	red, modulated light														
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	< 25 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	NPN, open collector short-circuit proof protected against reverse polarity														
Switching type	Light/dark on selectable electrically switchable	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	M8 connector, 4-pin														
Material															
Housing	ABS GV5	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	glass pane	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 10 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Electrical connection





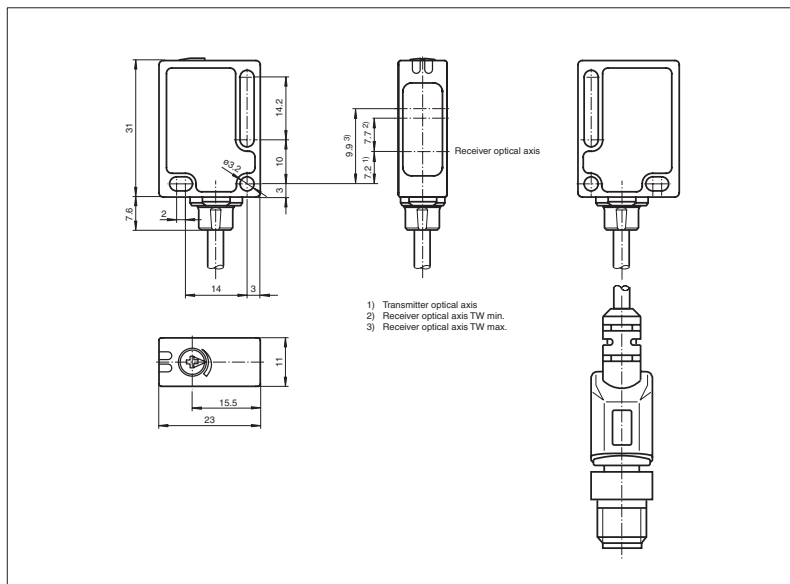




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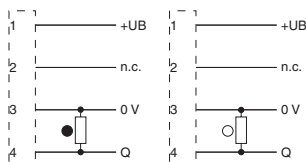
- **Miniature design**
- **Minimal black-white difference**
- **Flexible mounting possibilities due to slotted hole**
- **Not sensitive to ambient light, even with switched energy saving lamps**
- **Protection class II**



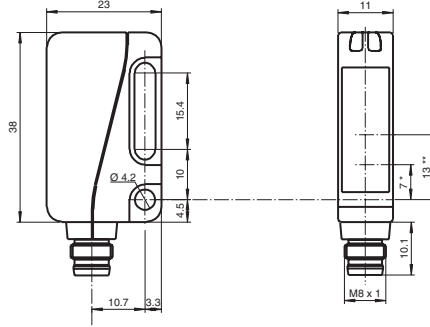
		ML8-8-H-140-RT/25/65a/103/115b	ML8-8-H-140-RT/59/65a/103/115b	ML8-8-H-350-IR/2.5/65a/103/115b	ML8-8-H-350-IR/5.9/65a/103/115b
Background suppression		◆	◆	◆	◆
Sensing range adjustment		◆	◆	◆	◆
Detection range	4 ... 350 mm	◆	◆	◆	◆
Detection range min.	5 ... 140 mm	◆	◆	◆	◆
	4 ... 25 mm	◆	◆	◆	◆
	5 ... 25 mm	◆	◆	◆	◆
Detection range max.	10 ... 350 mm	◆	◆	◆	◆
	13 ... 140 mm	◆	◆	◆	◆
Light source	IR LED	◆	◆	◆	◆
	LED red	◆	◆	◆	◆
Black/White difference (6%/90%)	< 15 %	◆	◆	◆	◆
	< 25 %	◆	◆	◆	◆
Adjustment range	25 ... 140 mm	◆	◆	◆	◆
	25 ... 350 mm	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆
	red, modulated light	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆
No-load supply current	< 20 mA	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 50 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆
	light ON	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	200 Hz	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP 65	◆	◆	◆	◆
Connection	fixed cable 300 mm with M12 connector, 4-pin	◆	◆	◆	◆
Material					
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆
Mass	approx. 10 g	◆	◆	◆	◆

**Electrical connection**

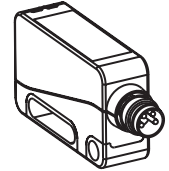
Option /59/103      Option /25/103



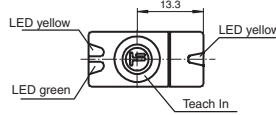
Date of edition 2008-03-20



\* optical axis transmitter  
\*\* optical axis receiver



- Ultra bright LEDs for power on and switching state
- Flashing power on LED in case of short-circuit
- TEACH-IN
- Not sensitive to ambient light, even with switched energy saving lamps
- Protected against mutual interference
- Protection class II

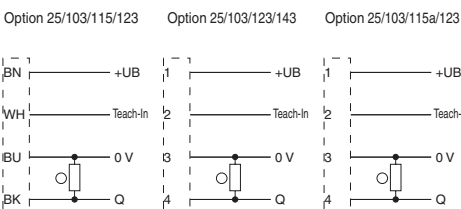


4.4

Photoelectric sensors, diffused mode sensors with background suppression

		ML9-8-H-50/25/65b/103/15/123	ML9-8-H-50/25/65b/103/15a/123	ML9-8-H-50/25/65b/103/123/143
Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Teach-In		◆	◆	◆
Detection range	5 ... 50 mm	◆	◆	◆
Detection range min.	10 ... 15 mm	◆	◆	◆
Detection range max.	5 ... 50 mm	◆	◆	◆
Light source	LED, red	◆	◆	◆
Black/White difference (6%/90%)	< 10 %	◆	◆	◆
Adjustment range	15 ... 50 mm	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆
No-load supply current	< 20 mA at 24 V	◆	◆	◆
Protection class	II, rated voltage ≤ 50 V AC with degree of pollution 1-2 according to IEC 60664-1, function insulation acc. to DIN EN 50178	◆	◆	◆
Function input	Ext. Teach-In input (ET)	◆	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆
Switching type	light ON	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆
Protection degree	IP 67	◆	◆	◆
Connection	fixed cable 2 m	◆	◆	◆
	fixed cable 200 mm with M8 connector, 4-pin		◆	
	plastic connector M8, 4-pin			◆
Material				
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆
Optical face	glass	◆	◆	◆
Mass	approx. 15 g		◆	◆
	approx. 25 g			◆
	approx. 50 g	◆		

Electrical connection



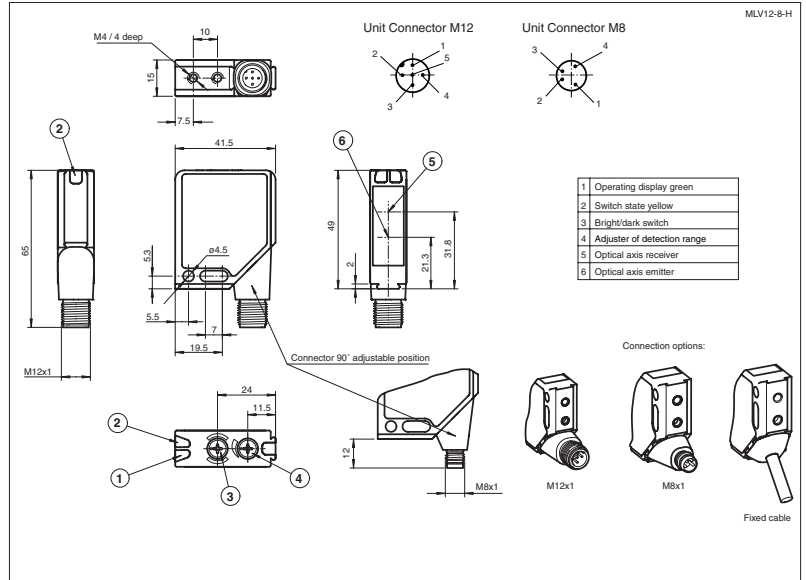
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

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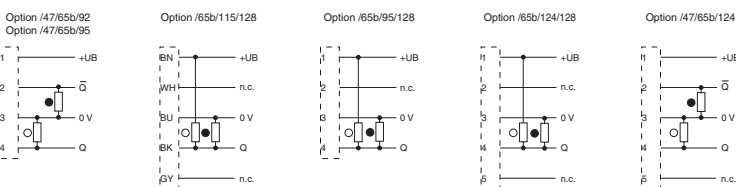


- **Reliable detection of all surfaces, independent of colour and structure**
- **Minimal black-white difference**
- **Ultra bright LEDs for power on and switching state**
- **Flashing power on LED in case of short-circuit**
- **Not sensitive to ambient light, even with switched energy saving lamps**
- **Multiple device installation possible, no mutual interference**



	MLV12-8-H-100-RT/65b/124/128	MLV12-8-H-250-IR/4/7/65b/92	MLV12-8-H-250-IR/65b/124/128	MLV12-8-H-250-RT/4/7/65b/124	MLV12-8-H-250-RT/4/7/65b/92	MLV12-8-H-250-RT/4/7/65b/95	MLV12-8-H-250-RT/65b/115/128	MLV12-8-H-250-RT/65b/124/128	MLV12-8-H-250-RT/65b/95/128
Background suppression	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing range adjustment	◆	◆	◆	◆	◆	◆	◆	◆	◆
Detection range	20 ... 250 mm, adjustable	◆	◆	◆	◆	◆	◆	◆	◆
Detection range min.	40 ... 100 mm, adjustable	◆	◆	◆	◆	◆	◆	◆	◆
Detection range max.	20 ... 40 mm	◆	◆	◆	◆	◆	◆	◆	◆
Detection range max.	20 ... 100 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light source	20 ... 250 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light source	IRED, 880 nm	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	LED, 660 nm	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	10% at 100 mm	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	10% at 250 mm	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	6% at 250 mm	◆	◆	◆	◆	◆	◆	◆	◆
Adjustment range	40 ... 100 mm	◆	◆	◆	◆	◆	◆	◆	◆
Adjustment range	50 ... 250 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 40 mA	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 55 mA	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity, 0.2 A / 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	2 pnp outputs, antivalent, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 0.2 A	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2500 mm	◆	◆	◆	◆	◆	◆	◆	◆
Connection	Metal connector M12 x 1, 4-pin, 90° convertible	◆	◆	◆	◆	◆	◆	◆	◆
Connection	Metal connector M12, 5-pin, 90° convertible	◆	◆	◆	◆	◆	◆	◆	◆
Connection	Metal connector M8, 4-pin, may be rotated 90°	◆	◆	◆	◆	◆	◆	◆	◆
Material		◆	◆	◆	◆	◆	◆	◆	◆
Housing	Frame: die-cast zinc, nickel-plated, Laterals: plastic PC, glass-fiber reinforced	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆	◆	◆	◆	◆

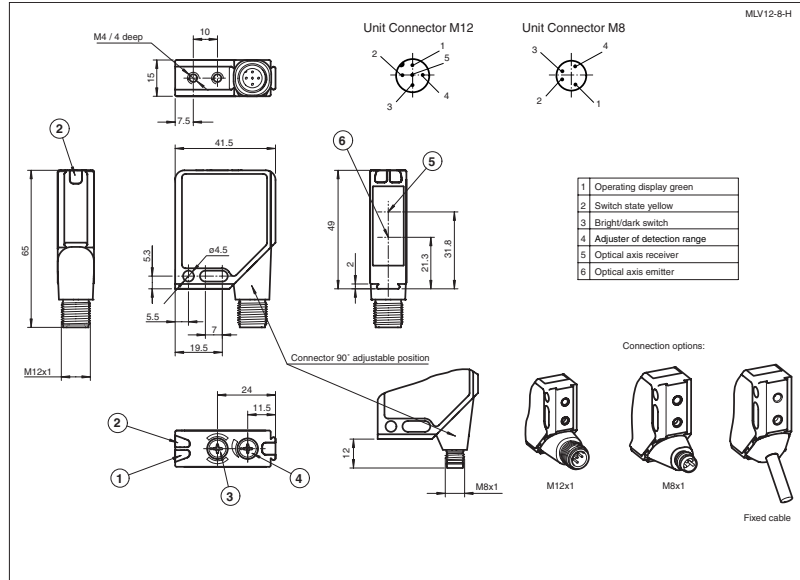
**Electrical connection**



Date of edition 2008-03-20



- **Reliable detection of all surfaces, independent of colour and structure**
- **Minimal black-white difference**
- **Ultra bright LEDs for power on and switching state**
- **Flashing power on LED in case of short-circuit**
- **Not sensitive to ambient light, even with switched energy saving lamps**
- **Multiple device installation possible, no mutual interference**



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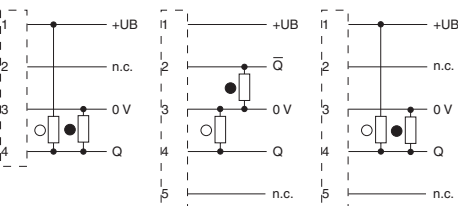
4.4

Photoelectric sensors, diffused mode sensors with background suppression

Background analysis		MLV12-8-HW-RT/65b/124	MLV12-8-HW-RT/65b/124/128	MLV12-8-HW-RT/65b/95/128
Sensing range adjustment		◆	◆	◆
Detection range	50 ... 150 mm, adjustable	◆	◆	◆
Light source	LED, 680 nm	◆	◆	◆
Adjustment range	50 ... 150 mm	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	≤ 55 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity, 0.2 A / 30 V DC 2 pnp outputs, antivalent, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆
Switching current	max. 0.2 A	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆
Protection degree	IP 67	◆	◆	◆
Connection	Metal connector M 12, 5-pin, 90° convertible Metal connector M 8, 4-pin, may be rotated 90°	◆	◆	◆
Material				
Housing	Frame: die-cast zinc, nickel-plated Laterals: plastic PC, glass-fiber reinforced	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆
Mass	60 g	◆	◆	◆

Electrical connection

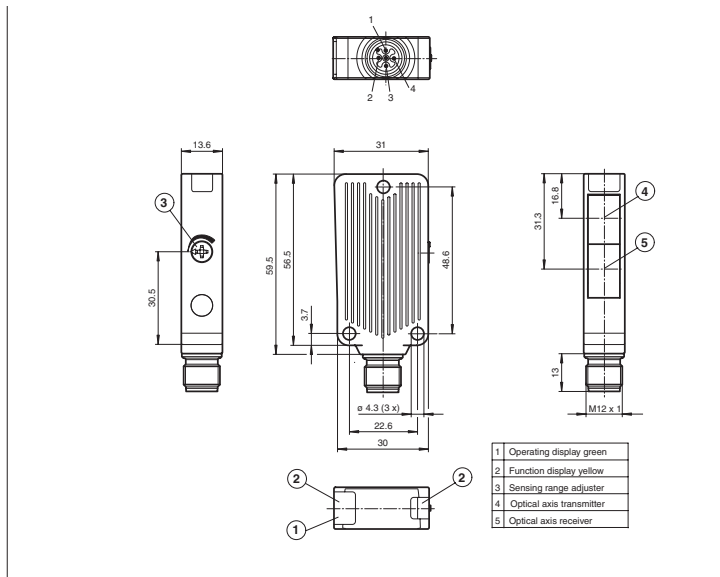
Option /65b/95/128    Option /47/65b/124    Option /65b/124/128



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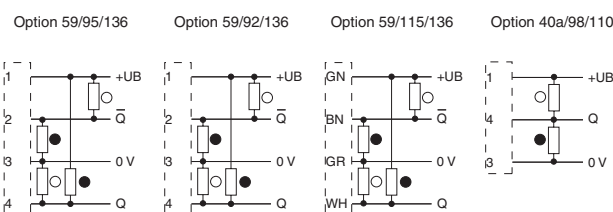


- **Reliable detection of all surfaces, independent of colour and structure**
- **Minimal black-white difference**
- **Precision background suppression, adjustable**
- **Extremely high switching frequency**
- **Clearly visible function indicators**
- **Short circuit and low voltage indicator**



	MLV 41-8-H-350-IR/59/15b/136	MLV 41-8-H-350-IR/59/15/136	MLV 41-8-H-350-IR/59/2/136	MLV 41-8-H-350-IR/59/5/136	MLV 41-8-H-350-RT/40a/98/110	MLV 41-8-H-350-RT/59/15b/136	MLV 41-8-H-350-RT/59/15/136	MLV 41-8-H-350-RT/59/2/136	MLV 41-8-H-350-RT/59/5/136
Background suppression	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensing range adjustment	◆	◆	◆	◆	◆	◆	◆	◆	◆
Detection range	50 ... 350 mm, adjustable	◆	◆	◆	◆	◆	◆	◆	◆
Detection range min.	10 ... 50 mm	◆	◆	◆	◆	◆	◆	◆	◆
Detection range max.	20 ... 50 mm	◆	◆	◆	◆	◆	◆	◆	◆
Detection range max.	30 ... 350 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light source	IRE D, 880 nm	◆	◆	◆	◆	◆	◆	◆	◆
	LED, 660 nm	◆	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	< 10 % at 350 mm	◆	◆	◆	◆	◆	◆	◆	◆
	< 15 % at 350 mm	◆	◆	◆	◆	◆	◆	◆	◆
Background suppression	+ 10 % of the upper limit of the detection range	◆	◆	◆	◆	◆	◆	◆	◆
Adjustment range	50 ... 350 mm	◆	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆
	Power from Class 2 Power Source	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	max. 25 mA	◆	◆	◆	◆	◆	◆	◆	◆
Protection class	II, rated voltage ≤ 50 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆	◆	◆	◆	◆	◆
	function insulation acc. to DIN EN 50178	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	1 push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆
	2 Push-pull outputs, complementary, short-circuit proof, reverse polarity-protected	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆	◆	◆
Switching frequency	1000 Hz	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2500 mm	◆	◆	◆	◆	◆	◆	◆	◆
	fixed cable 300 mm with M 12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆
	Metal connector M12, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆
	Metal connector M8, 3-pin	◆	◆	◆	◆	◆	◆	◆	◆
	Metal connector M8, 4-pin	◆	◆	◆	◆	◆	◆	◆	◆
Material									
Housing	aluminium, Delta-Seal coated	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	glass pane	◆	◆	◆	◆	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆	◆	◆	◆	◆
	50 g	◆	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**



Date of edition 2008-03-20

Subject to reasonable modifications due to technical advances.

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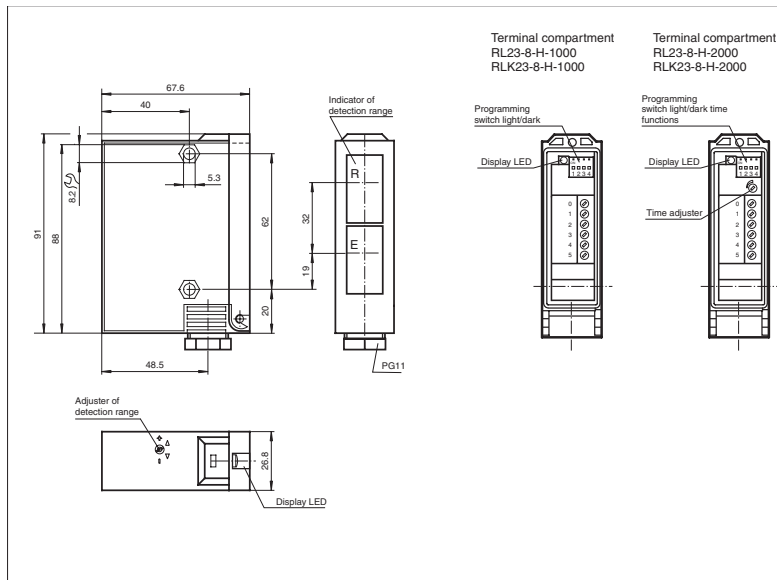
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- Adjustable background suppression
  - Sturdy plastic housing
  - Optical surface made of scratch-resistant glass
  - Infrared light
- RLK23-8-H-1000-IR/31/116  
RLK23-8-H-2000-IR/31/116

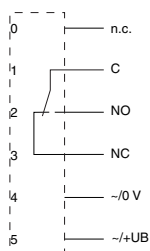


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		RLK23-8-H-500-RT/31/116	RLK23-8-H-1000-IR/31/116	RLK23-8-H-2000-IR/31/116
Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Detection range	50 ... 1000 mm	◆	◆	◆
	50 ... 2000 mm			◆
	50 ... 500 mm			◆
Detection range min.	50 ... 150 mm	◆	◆	◆
Detection range max.	50 ... 1000 mm	◆	◆	◆
	50 ... 3000 mm			◆
	50 ... 500 mm	◆	◆	◆
Light source	IRE D	◆	◆	◆
	LED	◆	◆	◆
Black/White difference (6%/90%)	< 10 %	◆	◆	◆
	< 20 %			◆
	< 5 %			◆
Light type	infrared, modulated light	◆	◆	◆
	red, modulated light	◆	◆	◆
Operating voltage	12 ... 240 V AC, 10 ... 30 V DC	◆	◆	◆
Power consumption	3 VA	◆	◆	◆
Signal output	1 relay, 1 alternator	◆	◆	◆
	1 relay output, 1 alternator	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆
	Light/dark ON, switchable	◆	◆	◆
Switching current	max. 2 A	◆	◆	◆
Switching frequency	10 Hz	◆	◆	◆
Timer function	GAN, GAB, IAB, programmable, adjustment range 0.1 ... 10 s	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	terminal compartment	◆	◆	◆
Material				
Housing	Terluran GV15	◆	◆	◆
Optical face	glass	◆	◆	◆
Mass	180 g	◆	◆	◆

**Electrical connection**

Option /31/116

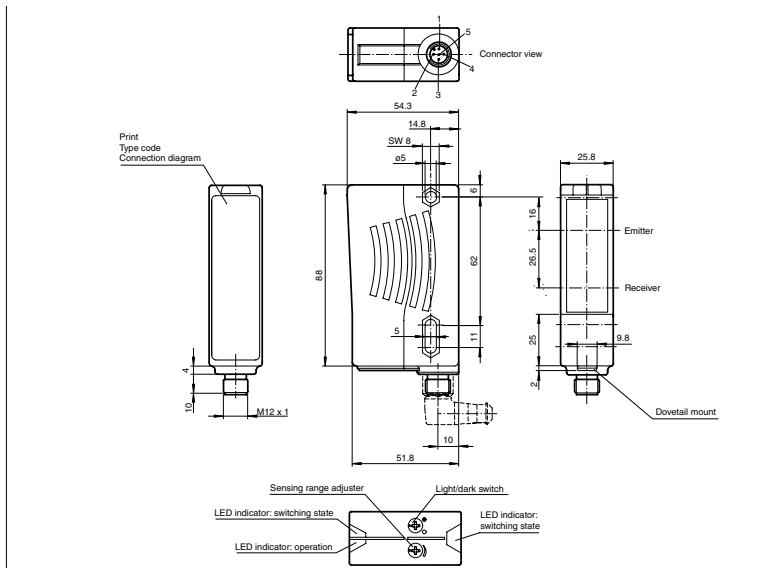


Date of edition 2008-03-20





- Visible red light, pulsed LASER light
- Small light beam diameter for detection of small parts
- Ultra bright LEDs for power on and switching state
- Not sensitive to ambient light, even with energy saving lamps
- Waterproof, protection class IP67
- Protection class II

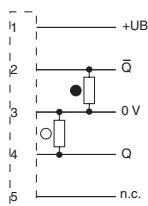


Laser Class I

	RL28-8-H-1500-LAS/105/110	RL28-8-H-1500-LAS/47/105	RL28-8-H-1500-LAS/47/115b
Background suppression	◆	◆	◆
Sensing range adjustment	◆	◆	◆
Detection range	◆	◆	◆
Detection range min.	◆	◆	◆
Detection range max.	◆	◆	◆
Light source	◆	◆	◆
Black/White difference (6%/90%)	◆	◆	◆
Background suppression	◆	◆	◆
Laser class	◆	◆	◆
Light type	◆	◆	◆
Operating voltage	◆	◆	◆
No-load supply current	◆	◆	◆
Protection class	◆	◆	◆
Signal output	◆	◆	◆
Switching type	◆	◆	◆
Switching current	◆	◆	◆
Switching frequency	◆	◆	◆
Ambient temperature	◆	◆	◆
Protection degree	◆	◆	◆
Connection	◆	◆	◆
Material			
Housing	◆	◆	◆
Optical face	◆	◆	◆
Mass	◆	◆	◆

Electrical connection

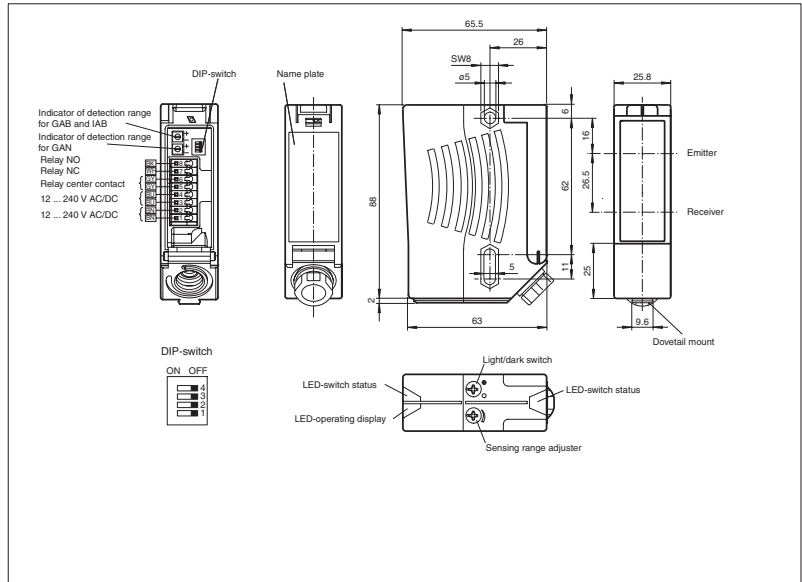
Option /47/105



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- Ultra bright LEDs for power on and switching state
- Programmable time function GAN, GAB, IAB and GAN-IAB as double function
- Not sensitive to ambient light, even with energy saving lamps
- Waterproof, protection class IP67
- Protection class II
- Good adaptability due to red transmission LED



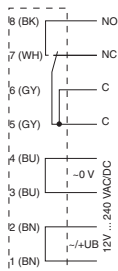
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4.4

Photoelectric sensors, diffused mode sensors with background suppression

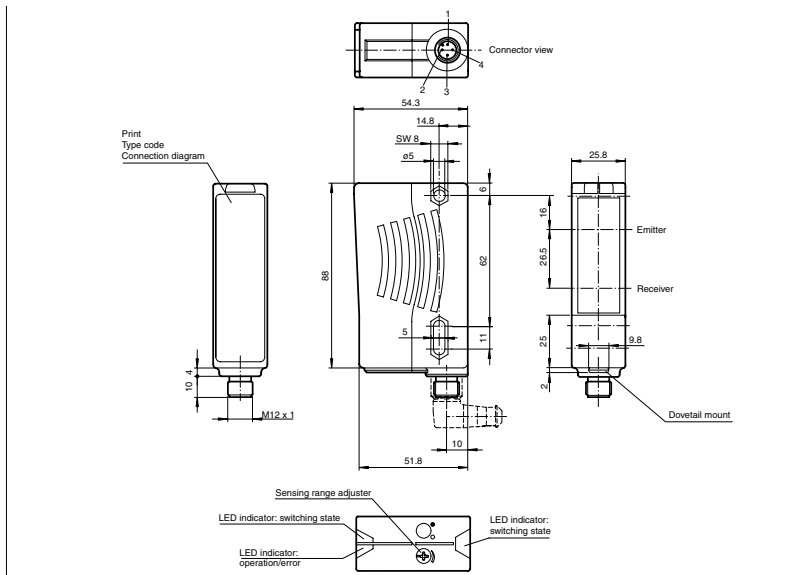
		RLK28-8-H-40-0-RT-Z/31/116	RLK28-8-H-70-0-RT-Z/31/116	RLK28-8-H-200-0-IR-Z/31/116
Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Timer		◆	◆	◆
Detection range	20 ... 2000 mm	◆	◆	◆
	20 ... 400 mm	◆	◆	◆
	20 ... 700 mm	◆	◆	◆
Detection range min.	20 ... 150 mm	◆	◆	◆
	20 ... 200 mm	◆	◆	◆
Light source	IRE D, 880 nm	◆	◆	◆
	LED, 660 nm	◆	◆	◆
Black/White difference (6%/90%)	< 10 %	◆	◆	◆
	< 20 %	◆	◆	◆
	< 40 %	◆	◆	◆
Background suppression	max. + 10 % of the upper limit of the detection range	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆
	red, modulated light	◆	◆	◆
Operating voltage	12 ... 240 V AC/DC	◆	◆	◆
Power consumption	≤ 3.5 VA	◆	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	Relay, 1 alternator	◆	◆	◆
Switching type	light/dark ON, switchable (Switchable, The light/dark switch is only activated if the other one is in position 'dark ON')	◆	◆	◆
Switching current	max. 2 A	◆	◆	◆
Switching frequency	250 Hz	◆	◆	◆
Timer function	GAN, GAB, IAB, GAN-IAB, GAN-GAB, programmable, adjustment interval 0.1 ... 10 s	◆	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	terminal compartment with 8 spring-loaded terminals for wire cross section 0.5 ... 1.5 mm <sup>2</sup> , insulation stripping 7,5 ... 8,5 mm, cable gland M16 x 1,5	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆
Mass	112 g	◆	◆	◆

Electrical connection





- Sensor with AS interface according to Spec. 2.11
- Ultra bright LEDs for power on and switching state
- Good alignability due to red transmission LED
- Not sensitive to ambient light, even with switched energy saving lamps
- Waterproof, protection class IP67
- Protection class II

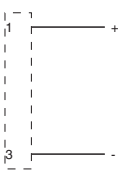


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		RL28-8-H-400-RT-B3B/73c	RL28-8-H-700-RT-B3B/73c
Background suppression		◆	◆
Sensing range adjustment		◆	◆
Detection range	20 ... 400 mm	◆	◆
	20 ... 700 mm		◆
Detection range min.	20 ... 150 mm	◆	
	20 ... 200 mm		◆
Detection range max.	20 ... 400 mm	◆	
	20 ... 700 mm		◆
Light source	LED, 660 nm	◆	◆
Black/White difference (6%/90%)	< 10 %	◆	
	< 20 %		◆
Background suppression	max. + 10 % of the upper limit of the detection range	◆	◆
Light type	red, modulated light	◆	◆
Operating voltage	26.5 ... 31.6 V via AS-Interface network, min. 18.5 V	◆	◆
No-load supply current	≤ 40 mA	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆
Test input	Data bit D2: 0: emitter on 1: emitter off	◆	◆
Signal output	AS-Interface	◆	◆
Switching type	Light/dark ON, switchable via AS-i bus system	◆	◆
Switching frequency	250 Hz	◆	◆
Timer function	Impulsed off-delay IAB, 50 ms, switchable via AS-Interface	◆	◆
Ambient temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆
Protection degree	IP 67	◆	◆
Connection	Plastic connector M12 x 1, 4-pin	◆	◆
Material			
Housing	Plastic ABS	◆	◆
Optical face	plastic	◆	◆
Mass	70 g	◆	◆

**Electrical connection**

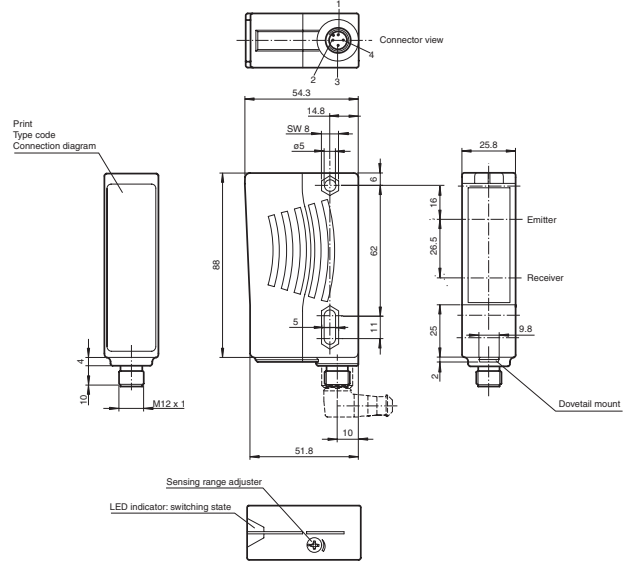
Option AS-Interface



Date of edition 2008-03-20



- Very clearly visible LED
- Good alignability due to red transmission LED
- Minimal black-white difference
- Powerful push-pull output
- Optimal price/power ratio
- Protection class II



The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

4.4

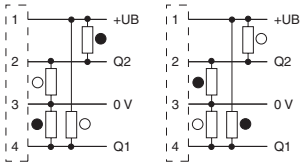
Photoelectric sensors, diffused mode sensors with background suppression

Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Detection range	30 ... 1200 mm , adjustable	◆	◆	◆
Detection range min.	20 ... 200 mm	◆	◆	◆
Detection range max.	30 ... 1200 mm	◆	◆	◆
Light source	LED 660 nm	◆	◆	◆
Black/White difference (6%/90%)	< 35 % at 1200 mm sensor range	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	≤ 40 mA	◆	◆	◆
Protection class	2 , rated voltage ≤300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆
Switching type	dark ON		◆	◆
	light ON	◆		◆
Switching current	max. 100 mA	◆	◆	◆
Switching frequency	125 Hz	◆	◆	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆	◆	◆
Protection degree	IP 65	◆	◆	◆
Connection	Plastic connector M12 x 1, 4-pin with 0.2 m fixed cable and M 12 connector, 4-pin	◆	◆	◆
Material				
Housing	Plastic ABS	◆	◆	◆
Optical face	plastic		◆	◆
Mass	70 g	◆	◆	◆

Electrical connection

Option /73c/136

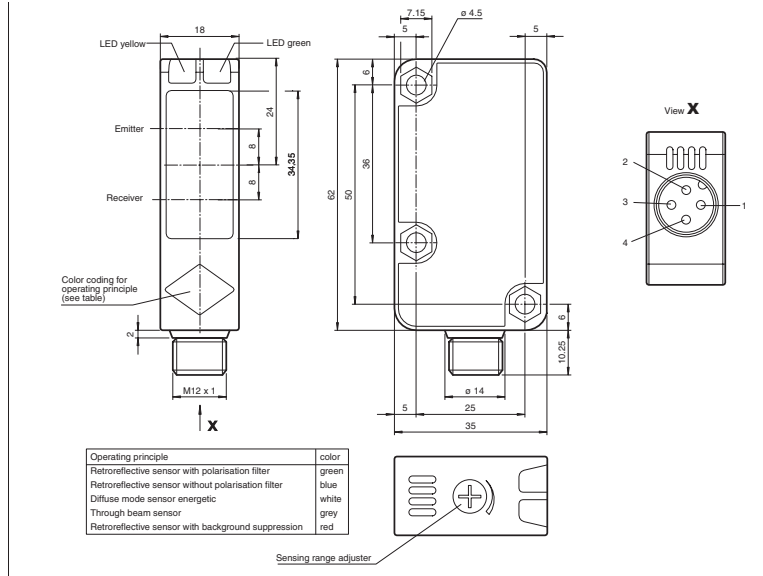
Option /59/73c/136



Date of edition 2008-03-20



- Background interference suppression
- Very clearly visible LED
- Powerful push-pull output
- Red transmission light
- Compact and stable housing
- Protection class II

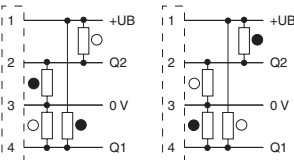


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Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Detection range	10 ... 300 mm	◆	◆	◆
Light source	LED, 630 nm	◆	◆	◆
Background blanking	≥ 450 mm	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	≤ 25 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 230 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection	◆	◆	◆
Switching type	dark ON light ON	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆
Switching frequency	≤ 500 Hz	◆	◆	◆
Ambient temperature	-30 ... 55 °C (243 ... 328 K)	◆	◆	◆
Protection degree	IP 67	◆	◆	◆
Connection	fixed cable with plug connector M12 x 1, 4 pin connector M12 x 1, 4-pin	◆	◆	◆
Housing	plastic	◆	◆	◆
Optical face	PMMA	◆	◆	◆
Mass	25 g 50 g	◆	◆	◆

**Electrical connection**

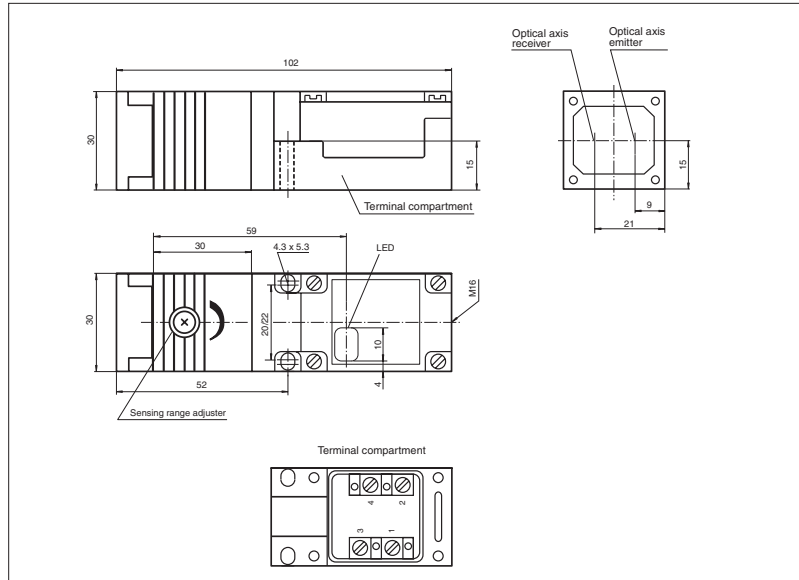
Option /59/73c/136      Option /25/73c/136



Date of edition 2008-03-20



- Light/dark ON parameterisable
- Pre-fault indication and output (dynamic and static)
- Protected against mutual interference
- Removable terminal compartment
- Position of the sensor head adjustable



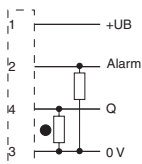
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4.4

Background suppression		◆
Sensing range adjustment		◆
Detection range	0 ... 100 mm	◆
Detection range min.	0 ... 30 mm	◆
Detection range max.	0 ... 100 mm	◆
Light source	LED	◆
Light type	infrared, modulated light	◆
Operating voltage	10 ... 30 V DC	◆
No-load supply current	≤ 35 mA	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆
Switching type	light/dark switching	◆
Switching current	≤ 200 mA	◆
Switching frequency	≤ 1.5 kHz / 200 Hz switchable	◆
Timer function	pulse extension 20 ms, switchable	◆
Output of the pre-fault indication	1 pnp, active when falling short of the stability control	◆
Ambient temperature	-25 ... 60 °C (248 ... 333 K)	◆
Protection degree	IP67	◆
Connection	terminal compartment M16, core cross-section ≤ 2,5 mm <sup>2</sup>	◆
Material		
Housing	PBT	◆
Optical face	Scratch resistant mineral glass lens	◆
Mass	100 g	◆

Electrical connection

Option E23

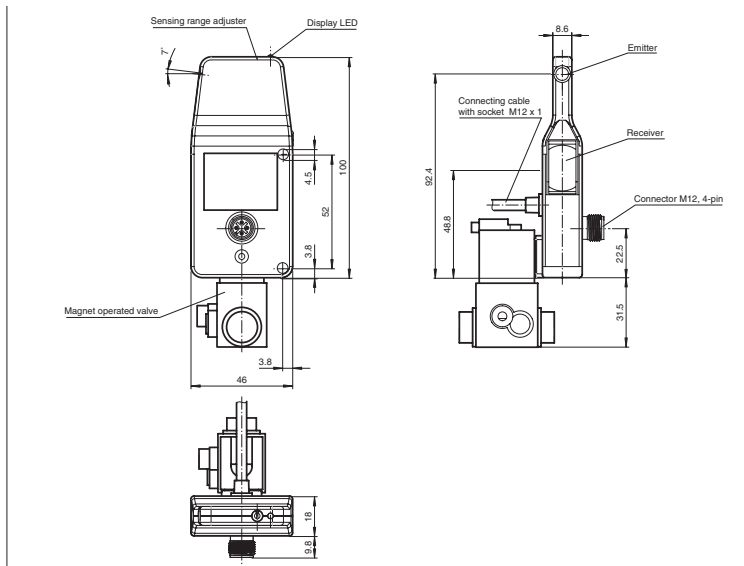




The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

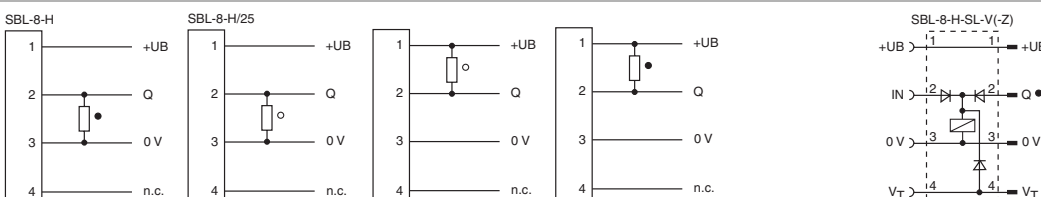


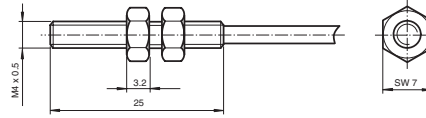
- For installation between the rollers on a roller conveyor
- Minimal black-white difference
- Protection degree IP65
- Cascadable  
SBL-8-H-SL-V  
SBL-8-H-SL-V-Z  
SBL-8-H-SL-V-Z-3110



		SBL-8-H	SBL-8-H/25	SBL-8-H/25/30	SBL-8-H/30	SBL-8-H-SL-V	SBL-8-H-SL-V-Z	SBL-8-H-SL-V-Z-3110
Background suppression		◆	◆	◆	◆	◆	◆	◆
Sensing range adjustment		◆	◆	◆	◆	◆	◆	◆
Timer		◆	◆	◆	◆	◆	◆	◆
Detection range	40 ... 900 mm	◆	◆	◆	◆	◆	◆	◆
Detection range min.	40 ... 340 mm	◆	◆	◆	◆	◆	◆	◆
Detection range max.	40 ... 900 mm	◆	◆	◆	◆	◆	◆	◆
Light source	IRE D	◆	◆	◆	◆	◆	◆	◆
Black/White difference (6%/90%)	< 10 %	◆	◆	◆	◆	◆	◆	◆
Adjustment range	340 ... 900 mm	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆
Cascadability	max. 25 sensors per line max. 50 sensors per line	◆	◆	◆	◆	◆	◆	◆
Operating voltage	24 V DC 24 VDC -20% +10%	◆	◆	◆	◆	◆	◆	◆
No-load supply current	max. 125 mA max. 30 mA max. 80 mA	◆	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆
Switching type	1 pnp, short-circuit proof, protected against reverse polarity dark ON light ON	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆
Switching frequency	100 Hz	◆	◆	◆	◆	◆	◆	◆
Pneumatic output	2/3 way valve	◆	◆	◆	◆	◆	◆	◆
Kind of valve	currentless closed	◆	◆	◆	◆	◆	◆	◆
Operating pressure	0 ... 7 bar 2 ... 8 bar	◆	◆	◆	◆	◆	◆	◆
Medium	air	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 50 °C (253 ... 323 K)	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆	◆
Connection	Connector M12 x 1 Connector M12 x 1 ; Connecting cable with Socket, straight M12 x 1	◆	◆	◆	◆	◆	◆	◆
Material								
Housing	plastic	◆	◆	◆	◆	◆	◆	◆
Optical face	Plastic lens	◆	◆	◆	◆	◆	◆	◆
Mass	approx. 200 g approx. 50 g	◆	◆	◆	◆	◆	◆	◆

**Electrical connection**





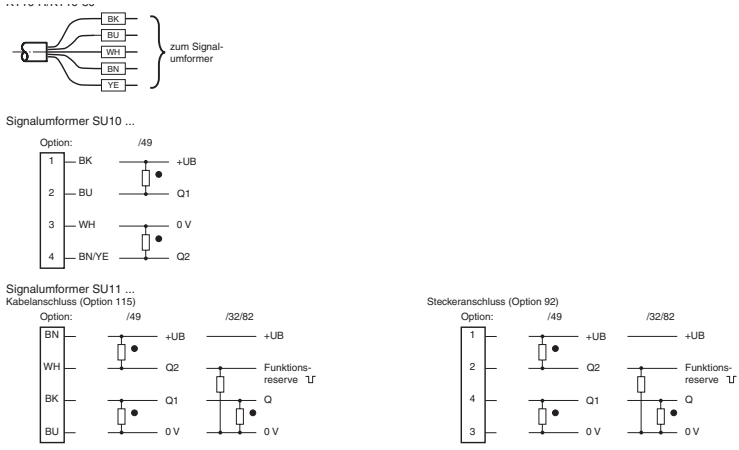
- Miniature design in M4 housing
- Housing material high-grade steel
- Fastening nuts designed so that they cannot be over-tightened
- Signal converters SU10... or SU11... are suitable to operate



4.4

	KT10-8-H-8	SU10/4 0a/49/116	SU11/3 2A 0a/82b/115	SU11/3 2A 0a/82b/92	SU11/4 0a/49/115	SU11/4 0a/49/92
Background suppression	◆					
Sensitivity adjuster		◆	◆	◆	◆	◆
Detection range		0.5 ... 8 mm				
Light source	◆	IRE D				
Black/White difference (6%/90%)	◆	≤ 10 %				
Background suppression	◆	starts from 10 mm				
Light type	◆	infrared, modulated light				
Operating voltage		10 ... 30 V DC	◆	◆	◆	◆
No-load supply current		40 mA	◆	◆	◆	◆
Signal output		1 npn, 1 pnp synchronised-switching, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆
		1 pnp, short-circuit proof, open collector		◆	◆	◆
Switching type		light/dark switching	◆	◆	◆	◆
Switching current		200 mA	◆	◆	◆	◆
Switching frequency		70 Hz	◆	◆	◆	◆
Output of the pre-fault indication		1 pnp, inactive when falling short of the stability control	◆	◆	◆	◆
Ambient temperature	◆	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree		IP 40	◆			
		IP 65	◆	◆	◆	◆
Connection	◆	fixed cable 1500 mm				
		fixed cable 2500 mm		◆	◆	
		M 12 connector, 4-pin				◆
		screw terminals				◆
Material		aluminium		◆	◆	◆
		PVC	◆			
		V2A	◆			
Optical face	◆	glass	◆			
Mass	◆	20 g	◆			
		50 g		◆	◆	◆
		60 g			◆	◆

Electrical connection

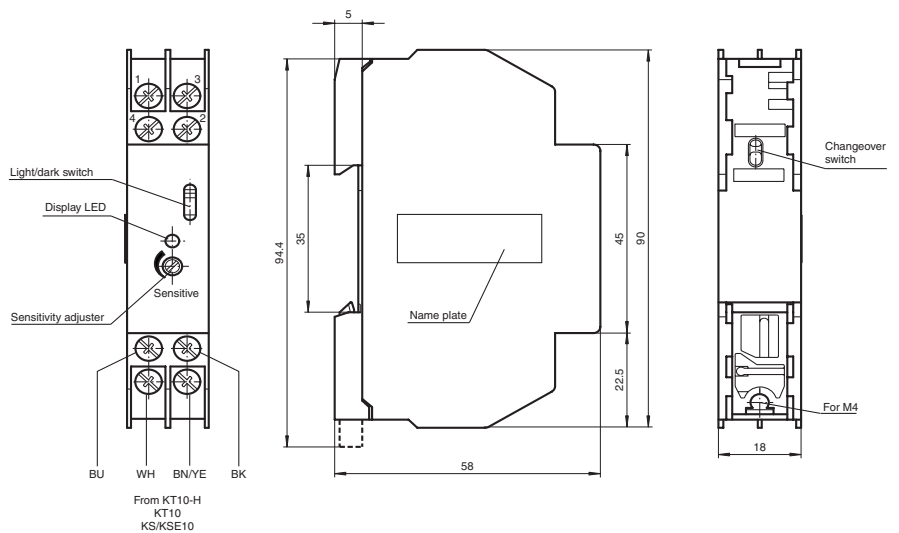


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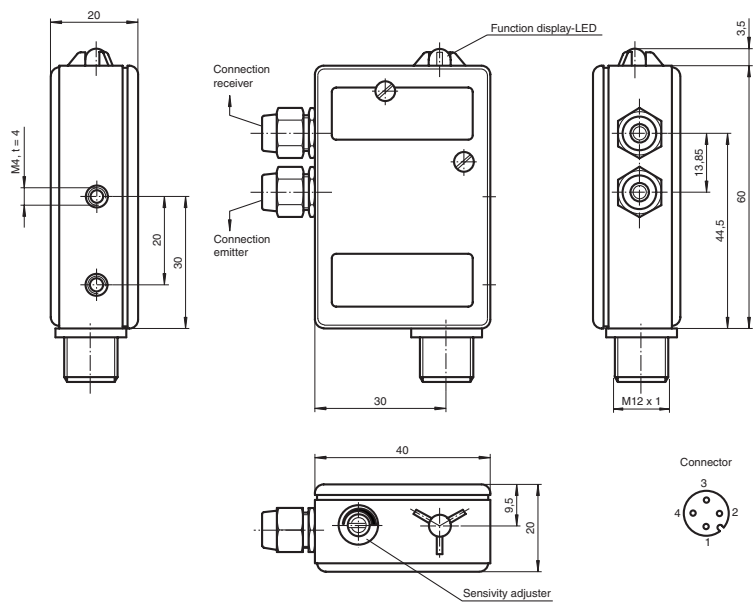
**Amplifier  
SU10/40a/49/116**



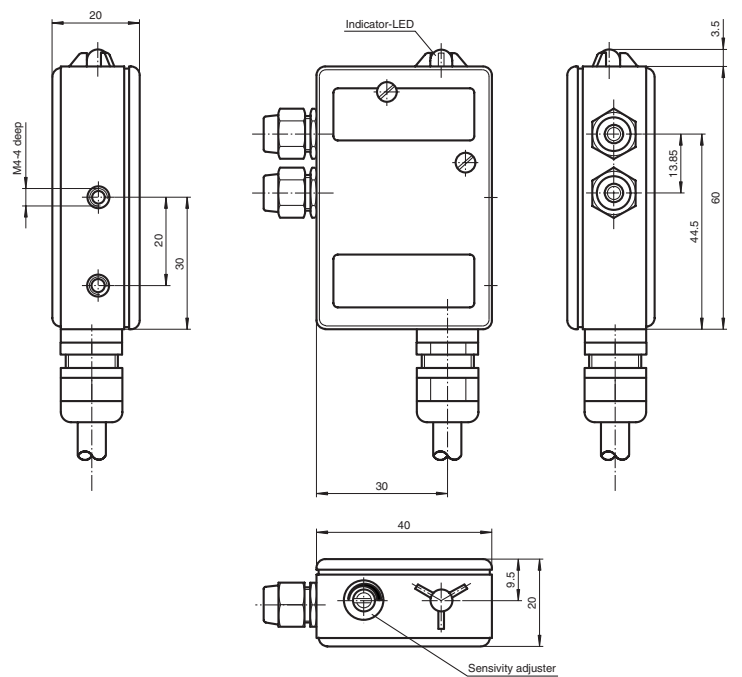
Amplifier for mounting on a standard top hat rail.



**Amplifier  
SU11.../92**

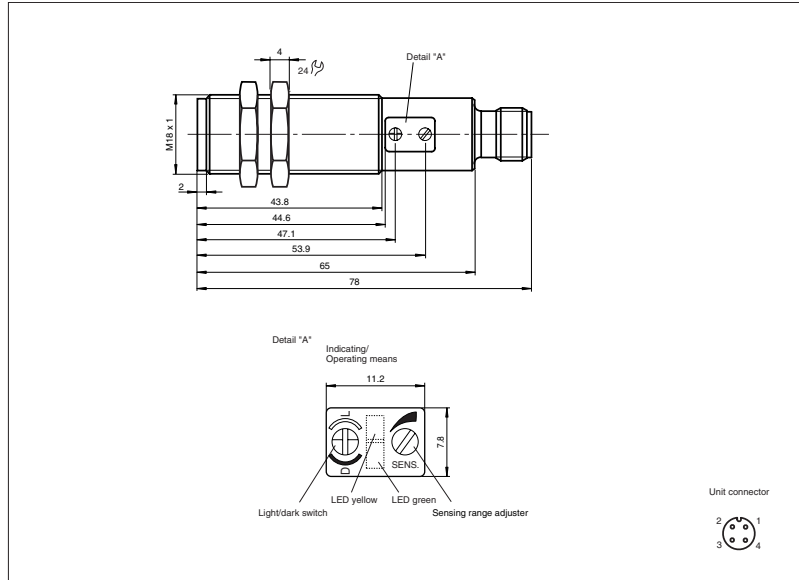


**Amplifier  
SU11.../115**





- Adjustable background suppression
- Clearly arranged control panel with very light LED display
- Flashing power on LED in case of short-circuit
- Multiple device installation possible, no mutual interference
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class II

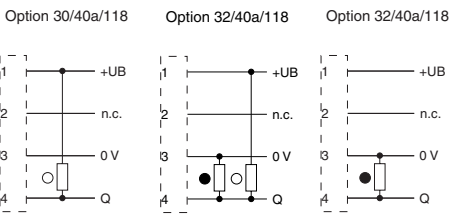


4.4

Photoelectric sensors, diffused mode sensors with background suppression

Background suppression		◆	◆	◆
Sensing range adjustment		◆	◆	◆
Detection range	20 ... 120 mm , adjustable	◆	◆	◆
Detection range min.	20 ... 40 mm	◆	◆	◆
Detection range max.	20 ... 120 mm	◆	◆	◆
Light source	LED, Red light 660 nm	◆	◆	◆
Black/White difference (6 %/90 %)	< 10 % at a distance of 120 mm	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	< 35 mA	◆	◆	◆
Protection class	II , rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	Push-pull output short-circuit proof overvoltage protected 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	M12 connector, 4-pin (Vario-Quick fast connection technology)	◆	◆	◆
Material				
Housing	brass , nickel-plated	◆	◆	◆
Optical face	plastic	◆	◆	◆
Mass	60 g	◆	◆	◆

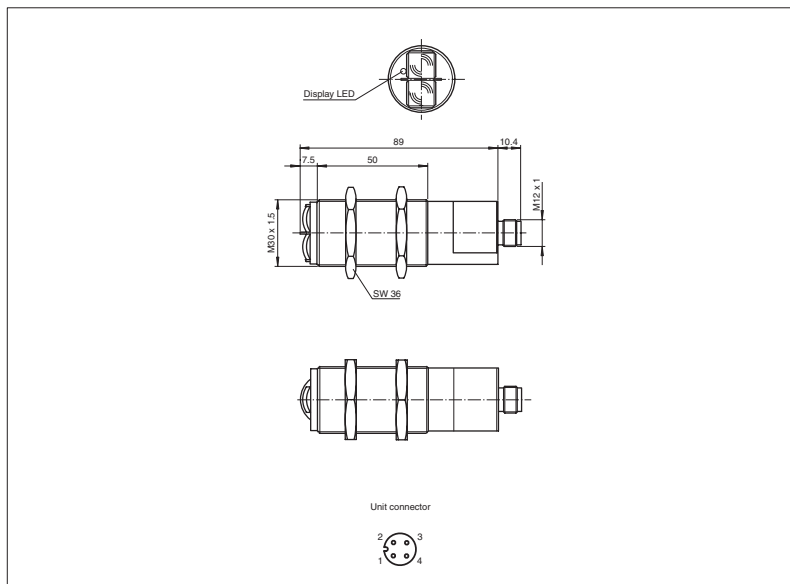
Electrical connection



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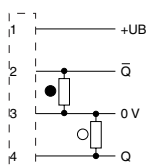
- **M30 plastic housing**
- **Dark-On switching**  
GLV30-8-H-2371
- **Light/dark switching**  
GLV30-8-H-150-IR/47/73c



Background suppression		GLV30-8-H-150-IR/47/73c	GLV30-8-H-2371
Detection range	20 ... 150 mm	◆	◆
Detection range min.	0 ... 145 mm	◆	◆
Detection range max.	0 ... 170 mm	◆	◆
Light source	IRE D	◆	◆
Black/White difference (6%/90%)	< 10 mm	◆	◆
Background suppression	starts from 180 mm	◆	◆
Light type	infrared, modulated light	◆	◆
Operating voltage	24 V DC ± 20 %	◆	◆
No-load supply current	30 mA	◆	◆
Signal output	1 pnp, short-circuit proof, protected from reverse polarity, open collector	◆	◆
	2 pnp, antivalent, short-circuit proof, protected against reverse polarity	◆	◆
Switching type	dark ON	◆	◆
	light/dark switching	◆	◆
Switching current	max. 200 mA	◆	◆
Switching frequency	35 Hz	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	Plastic connector M12 x 1, 4-pin	◆	◆
Material			
Housing	ABS	◆	◆
Optical face	Plastic lens	◆	◆
Mass	approx. 70 g	◆	◆

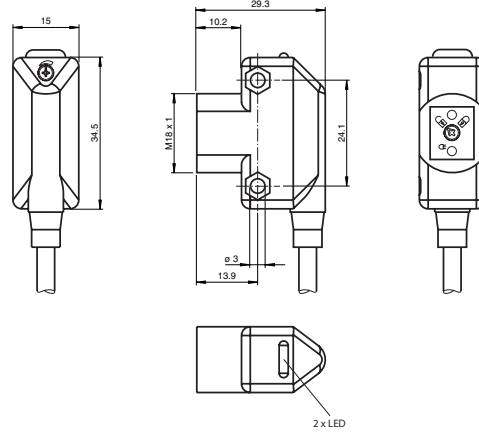
**Electrical connection**

Option 47/73c



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Date of edition 2008-03-20



- Compact design
- Ultra bright LEDs for power on, stability control and switching state
- Sturdy, waterproof plastic housing
- Front side mounting with M18-thread or side mounting holes
- Sensing range depends on the fibre optics being used
- Modern dual push-pull outputs

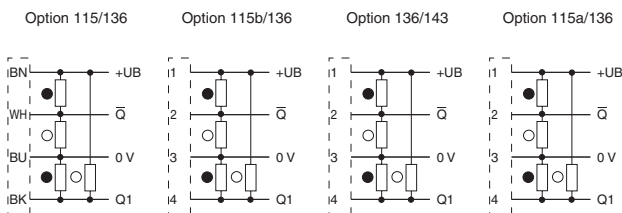


4.5

Photoelectric sensors, fiber optic sensors

		ML17-LL-K/115/136	ML17-LL-K/115a/136	ML17-LL-K/115b/136	ML17-LL-K/136/143	ML17-LL-K/73/136
Sensitivity adjustment		◆	◆	◆	◆	◆
Effective detection range	depends on the fibre optics being used	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆
Light source	Red light, 670 nm	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆
No-load supply current	< 25 mA	◆	◆	◆	◆	◆
Protection class	IP67	◆	◆	◆	◆	◆
Signal output	2 Push-pull outputs, short-circuit proof, reverse polarity protection, overvoltage protected	◆	◆	◆	◆	◆
Switching type	Light/dark on selectable electrically switchable	◆	◆	◆	◆	◆
Switching current	max. 100 mA, every output	◆	◆	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 55 °C (253 ... 328 K)	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆
Connection	fixed cable 2 m	◆				
	plastic connector M12, 4-pin					◆
	plastic connector M8, 4-pin				◆	
	150 mm PVC cable with M12 connector, 4-pin			◆		
	150 mm PVC cable with M8 connector, 4-pin		◆			
Housing	ABS	◆	◆	◆	◆	◆
Optical face	Acrylic	◆	◆	◆	◆	◆
Mass	40 g	◆	◆	◆	◆	◆

Electrical connection

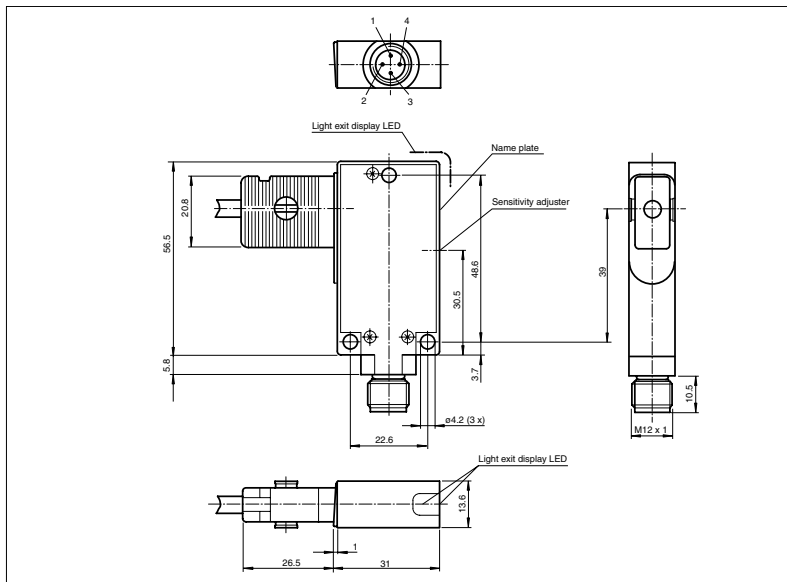


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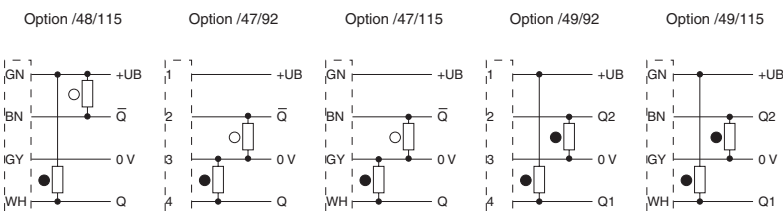
- Sturdy aluminium housing
- Fibre optic adapter with quick tightening shutter
- Less space required
- Extensive fibre optic product selection as accessories



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Sensitivity adjustment		MLV 40-LL-IR/47/115	MLV 40-LL-IR/47/92	MLV 40-LL-IR/48/115	MLV 40-LL-IR/49/115	MLV 40-LL-IR/49/92	MLV 40-LL-RT/48/115	MLV 40-LL-RT/49/115
Detection range	depends on the fibre optics being used see selection table for fibre optics	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light red, modulated light	◆	◆	◆	◆	◆	◆	◆
Light source	IRE D LED, Red light	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆
No-load supply current	40 mA	◆	◆	◆	◆	◆	◆	◆
Signal output	1 pnp and 1 npn short-circuit proof, protected against reverse polarity 2 npn antivalent, short-circuit proof, protected against reverse polarity 2 pnp, antivalent, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆
Switching frequency	100 Hz	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆	◆
Connection	fixed cable 2 m M12 connector, 4-pin	◆	◆	◆	◆	◆	◆	◆
Material								
Housing	aluminium	◆	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆	◆	◆	◆

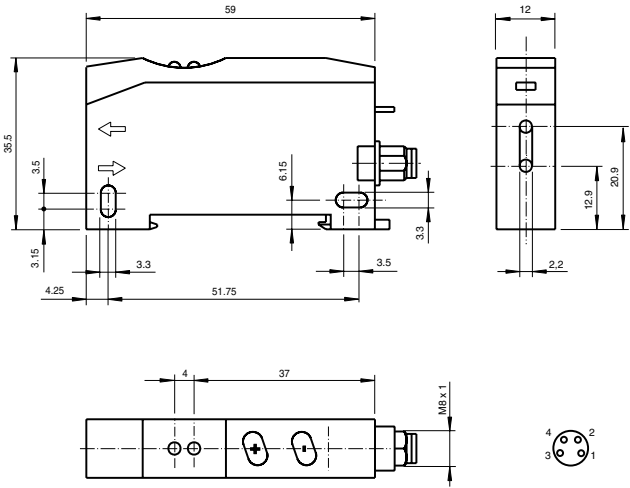
**Electrical connection**



Date of edition 2008-03-20



- Protected against mutual interference
- DIN rail mounting
- Extensive fibre optic product selection as accessories
- Self diagnosis function
- Ergonomic design simplifies the installation and operation
- Very powerful red transmission LED
- Open collectors output TTL compatible

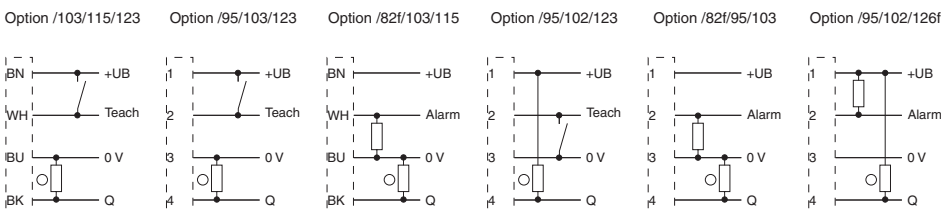


4.5

Photoelectric sensors, fiber optic sensors

Effective detection range	depends on the fibre optics being used see selection table for fibre optics	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Light source	LED, red	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 40 mA	◆	◆	◆	◆	◆	◆
Control input	Teach-In input	◆	◆	◆	◆	◆	◆
Signal output	1 npn, short-circuit proof, open collector 1 pnp, short-circuit proof, open collector	◆	◆	◆	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 1.5 kHz	◆	◆	◆	◆	◆	◆
Timer function	parameterisable	◆	◆	◆	◆	◆	◆
Output of the pre-fault indication	npn, dynamic pnp, dynamic	◆	◆	◆	◆	◆	◆
Ambient temperature	- 10 ... 55 °C (263 ... 328 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 65	◆	◆	◆	◆	◆	◆
Connection	4-pin, M8 x 1 connector	◆	◆	◆	◆	◆	◆
	2 m cable, 4 x 0,14 mm <sup>2</sup> , PVC	◆	◆	◆	◆	◆	◆
Material							
Housing	PBT	◆	◆	◆	◆	◆	◆
Mass	30 g	◆	◆	◆	◆	◆	◆
	70 g	◆	◆	◆	◆	◆	◆

Electrical connection



The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

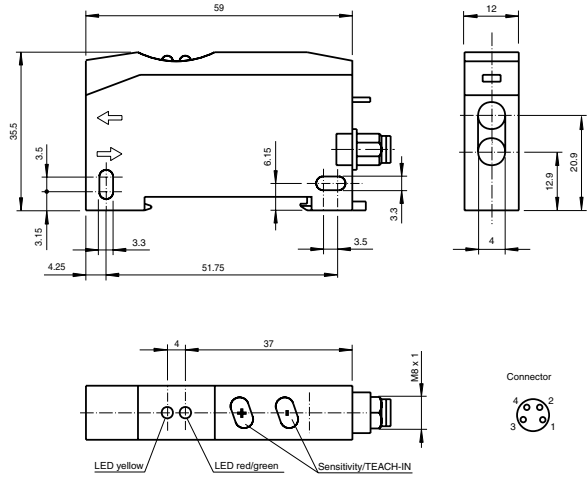
Date of edition 2008-04-04



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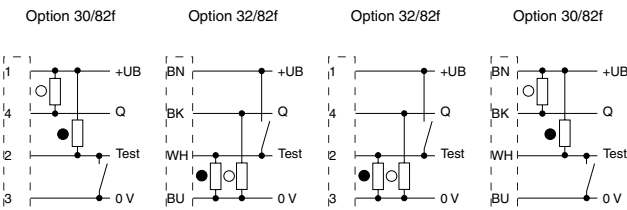


- Parameterisation via optical communication link (e.g. optional time increments)
- Pre-fault indication and output (dynamic and static)
- Visible red light
- Protected against mutual interference
- DIN rail mounting
- Extensive fibre optic product selection as accessories

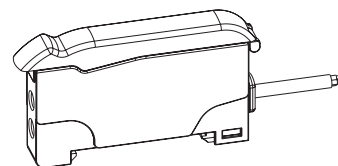
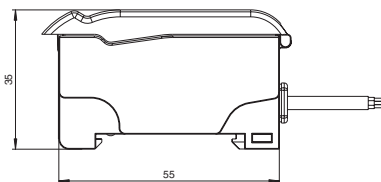


		SU15-G30/82f/115	SU15-G30/82f/95	SU15-G32/82f/115	SU15-G32/82f/95
Effective detection range	depends on the fibre optics being used see selection table for fibre optics	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 26 mA	◆	◆	◆	◆
Control input	parameterisable	◆	◆	◆	◆
Signal output	1 switch output, npn, NC or NO 1 multi-function input/complementary switch output/pre-fault output (nnp), parameterisable	◆	◆	◆	◆
	1 switch output, pnp, NC or NO 1 multi-function input/complementary switch output/pre-fault output (pnp), parameterisable			◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆
Switching frequency	≤ 1.5 kHz	◆	◆	◆	◆
Timer function	parameterisable	◆	◆	◆	◆
Output of the pre-fault indication	nnp, dynamic/static configurable pnp, dynamic/static configurable	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP 65	◆	◆	◆	◆
Connection	4-pin, M8 x 1 connector	◆	◆	◆	◆
Material	2 m cable, 4 x 0,14 mm <sup>2</sup> , PVC	◆	◆	◆	◆
Housing	PBT	◆	◆	◆	◆
Mass	30 g	◆	◆	◆	◆

**Electrical connection**



Date of edition 2008-04-04



- Sleek design
  - Visible red light with brighter beam spot for easy alignment
  - Easy installation on DIN rail
  - 3 response times selectable
  - High switching frequency
  - Self diagnosis function
- SU18-16/40a/102/115/126a  
SU18-16/40a/110/115/126a

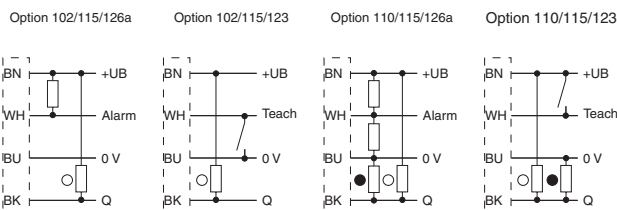


4.5

Photoelectric sensors, fiber optic sensors

		SU18-40a/102/115/123	SU18-40a/110/115/123	SU18-16/40a/102/115/126a	SU18-16/40a/110/115/126a	SU18-40a/102/115/126a	SU18-40a/110/115/126a
Sensitivity adjustment				◆	◆		
Light/dark switch		◆	◆	◆	◆	◆	◆
Effective detection range	depends on the fibre optics being used	◆	◆	◆	◆	◆	◆
Light type	red, modulated light	◆	◆	◆	◆	◆	◆
Light source	LED, 660 nm	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆	◆	◆
Function input	external Teach-In	◆	◆				
Signal output	1 push-pull output npn/pnp, short-circuit proof			◆	◆	◆	◆
	1 npn, short-circuit proof, open collector	◆	◆			◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA, resistive load	◆	◆	◆	◆	◆	◆
Switching frequency	Standard mode: 3 kHz, High speed mode: 6 kHz, High resolution: 250 Hz	◆	◆	◆	◆	◆	◆
	Standard mode: 3 kHz, High speed mode: 6 kHz, High resolution: 500 Hz	◆	◆			◆	◆
Output of the pre-fault indication	1 push-pull output npn/pnp, short-circuit proof					◆	◆
	1 npn, short-circuit proof, open collector			◆	◆		
Ambient temperature	-10 ... 55 °C (263 ... 328 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 50	◆	◆	◆	◆	◆	◆
Connection	2 m cable, 4 x 0,14 mm <sup>2</sup> , PVC	◆	◆	◆	◆	◆	◆
Material							
Housing	PC	◆	◆	◆	◆	◆	◆
Mass	45 g	◆	◆	◆	◆	◆	◆

Electrical connection

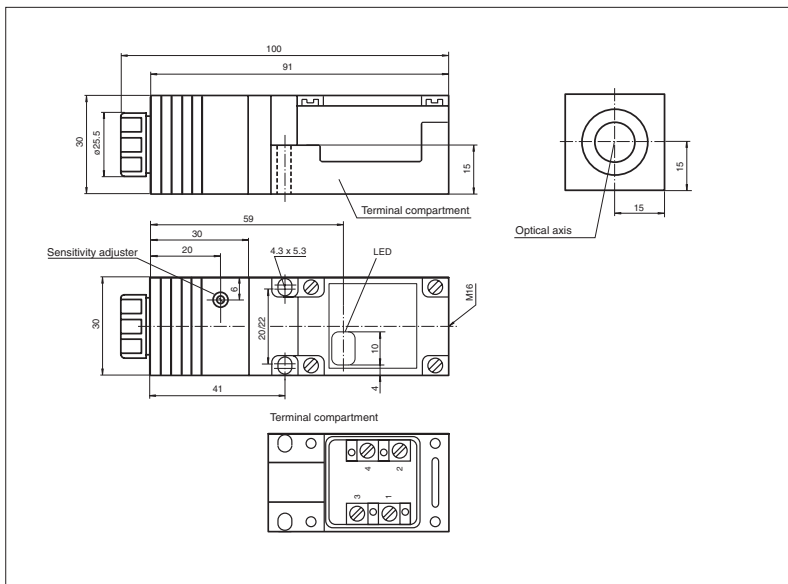


The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Date of edition 2008-03-20

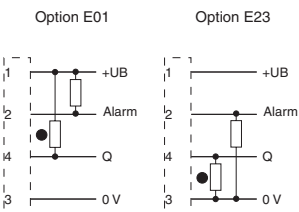


- Light/dark ON parameterisable
- Protected against mutual interference
- Position of the sensor head adjustable
- For glass fibre light guide



		OJ500-M1K-E01	OJ500-M1K-E23
Sensing range adjustment		◆	◆
Light/dark switch		◆	◆
Detection range	without fibre optics : 0 ... 500 mm , with fibre optic see selection table for fibre optics	◆	◆
Light type	infrared, modulated light	◆	◆
Light source	LED	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 35 mA	◆	◆
Signal output	1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	light/dark switching	◆	◆
Switching current	≤ 200 mA	◆	◆
Switching frequency	≤ 1.5 kHz / 200 Hz switchable	◆	◆
Timer function	pulse extension 20 ms, switchable	◆	◆
Output of the pre-fault indication	1 npn, active when falling short of the stability control 1 pnp, active when falling short of the stability control	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP 67	◆	◆
Connection	terminal compartment M16, core cross-section ≤ 2,5 mm <sup>2</sup>	◆	◆
Material			
Housing	PBT	◆	◆
Optical face	Scratch resistant mineral glass lens	◆	◆
Mass	100 g	◆	◆

**Electrical connection**

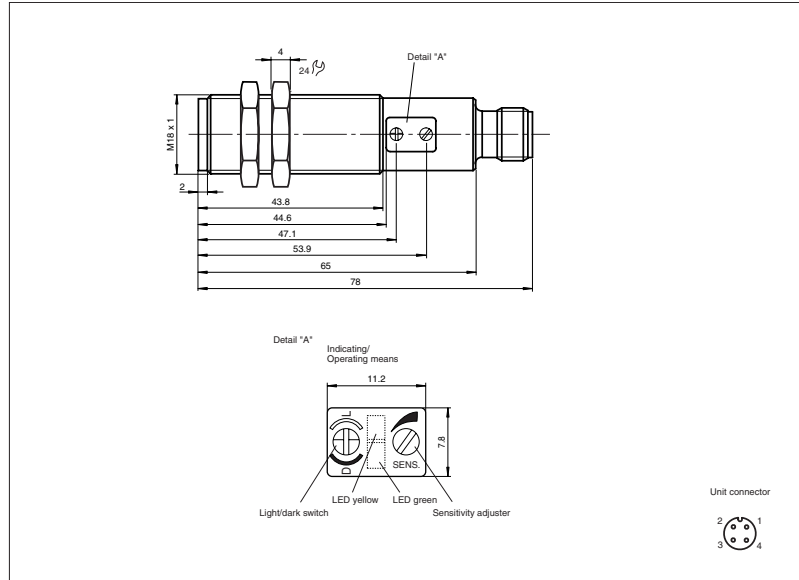


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- Clearly arranged control panel with very light LED display
- Flashing power on LED in case of short-circuit
- Light/dark switch as potentiometer
- Multiple device installation possible, no mutual interference
- Not sensitive to ambient light, even with switched energy saving lamps
- Protection class 2
- Extensive fibre optic product selection as accessories

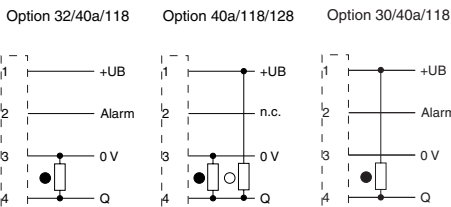


4.5

Photoelectric sensors, fiber optic sensors

		VL18LL-M/30/40a/118	VL18LL-M/32/40a/118	VL18LL-M/40a/118/128
Sensitivity adjustment		◆	◆	◆
Light/dark switch		◆	◆	◆
Detection range	depends on the fibre optics being used see selection table for fibre optics	◆	◆	◆
Light type	red, modulated light	◆	◆	◆
Light source	LED, Red light, 650 nm	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆
No-load supply current	< 35 mA	◆	◆	◆
Protection class	II, rated voltage ≤ 300 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, overvoltage protected 1 NPN output, short-circuit proof, protected from reverse polarity, open collector 1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆
Switching type	light/dark ON, switchable	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆
Switching frequency	500 Hz	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP 67	◆	◆	◆
Connection	M12 connector, 4-pin	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Optical face	plastic	◆	◆	◆
Mass	60 g	◆	◆	◆

Electrical connection

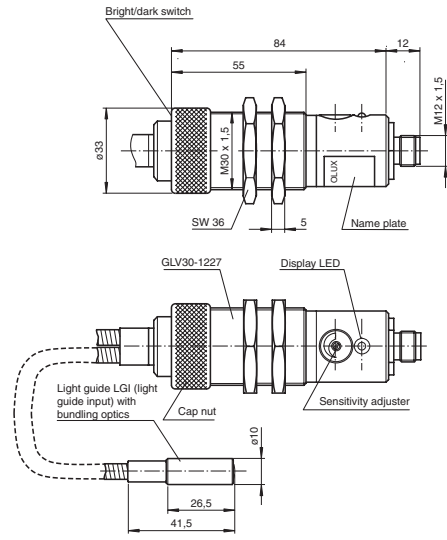


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- M30 nickel plated brass threaded housing
- Light/dark switching
- For glass fibre light guide
- Extensive fibre optic product selection as accessories

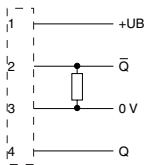


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Sensing range adjustment		◆	GLV30-LL-1227/40a/53/92
Light/dark switch		◆	
Detection range	without fibre optics : 0 ... 1700 mm , with fibre optic see selection table for fibre optics	◆	
Light type	infrared, modulated light	◆	
Light source	IRED	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	40 mA	◆	
Signal output	1 pnp, not short-circuit proof	◆	
Switching type	light/dark switching	◆	
Switching current	max. 500 mA	◆	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Protection degree	IP65	◆	
Connection	Metal connector M12 x 1, 4-pin	◆	
Material			
Housing	brass, nickel-plated	◆	
Optical face	glass	◆	
Mass	370 g	◆	

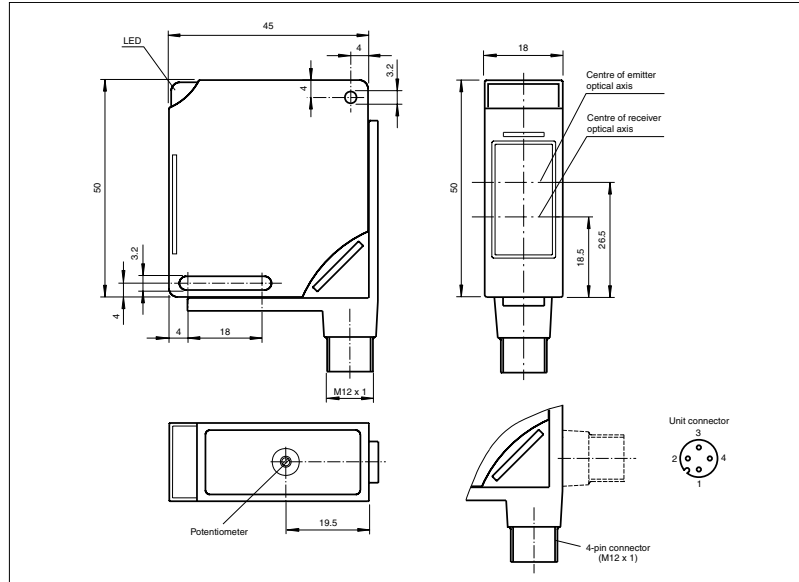
**Electrical connection**

Option 40a/53/92





- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Detection of partially transparent objects
- Visible red light
- Light/dark ON, programmable
- Adjustable sensitivity
- Protection degree IP67



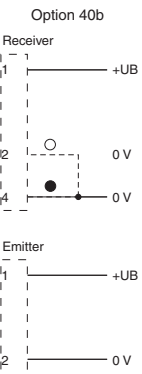
4.6

Photoelectric sensors for hazardous areas

Sensitivity adjustment		◆
Light/dark switch		◆
Marking	Zone 1:  II 2G EEx ia IIC T6	◆
Effective detection range	0 ... 10 m	◆
Light type	red, modulated light	◆
Light source	LED, 660 nm	◆
Operating voltage	6 ... 16 V DC (R <sub>i</sub> approx. 0 Ohm)	◆
Signal output	1 NAMUR output NC/NO programmable	◆
Switching type	Light/dark ON, programmable	◆
Switching frequency	≥ 100 Hz	◆
Current consumption	Emitter: ≥ 2.2 mA, Receiver:	◆
Reference target detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA	◆
Reference target not detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA	◆
EC-Type Examination Certificate	PTB 99 ATE X 2036 X	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP 67	◆
Connection	V1 connector (M12 x 1), 4-pin, rotatable through 90°	◆
Material		
Housing	PBT	◆
Optical face	scratch resistant plastic pane	◆
Mass	60 g (device)	◆

M 11/MV11-Ex/40b/112

**Electrical connection**

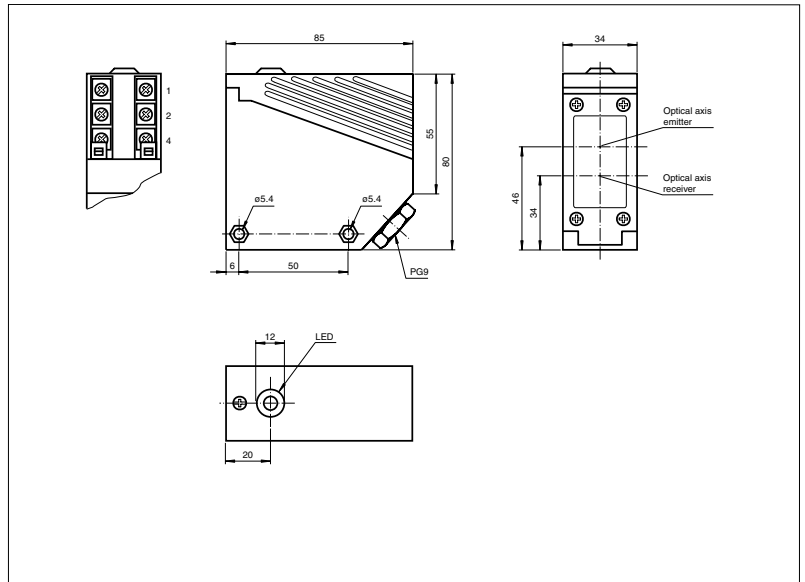


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Date of edition 2008-03-20



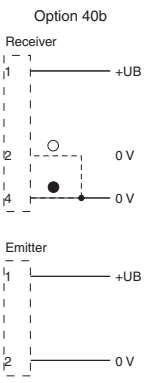
- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Visible red light
- Light/dark ON, programmable
- Adjustable sensitivity
- Resistant against noise



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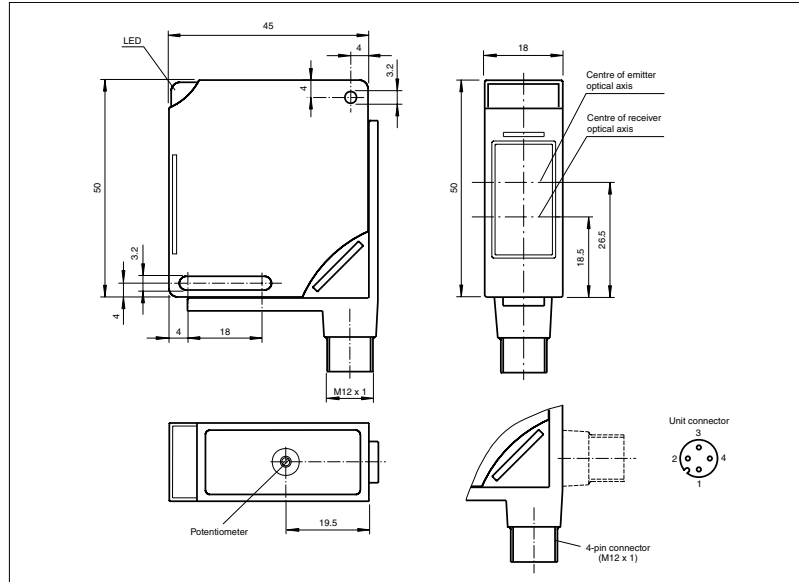
Sensitivity adjustment		◆	L36/LV36-Ex/40b/116
Light/dark switch		◆	
Marking	Zone 1:  II 2G EEx ia IIC T6	◆	
Effective detection range	0 ... 30 m	◆	
Light type	red, modulated light	◆	
Light source	LED, 660 nm	◆	
Operating voltage	6 ... 16 V DC (R <sub>i</sub> approx. 0 Ohm)	◆	
Signal output	1 NAMUR output NC/NO programmable	◆	
Switching type	Light/dark ON, programmable	◆	
Switching frequency	≥ 100 Hz	◆	
Current consumption	Emitter: ≥ 2.2 mA, Receiver:	◆	
Reference target detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA	◆	
Reference target not detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA	◆	
EC-Type Examination Certificate	PTB 01 ATEX 2184 X	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Protection degree	IP54	◆	
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>	◆	
Material			
Housing	PMMA	◆	
Optical face	PMMA	◆	
Mass	200 g (device)	◆	

**Electrical connection**





- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Glare protected with polarisation filter
- Visible red light
- Adjustable sensitivity
- Light/dark ON, programmable
- Protection degree IP67



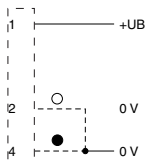
4.6

Photoelectric sensors for hazardous areas

Sensitivity adjustment			
Marking	Zone 1:  II 2G EEx ia IIC T6		◆ MLV11-54-Ex/40b/112
Effective detection range	0 ... 3 m		◆
Reflector distance	300 ... 3000 mm		◆
Reference target	H85 reflector		◆
Light type	red, modulated light		◆
Light source	LED, 660 nm		◆
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)		◆
Signal output	1 NAMUR output NC/NO programmable		◆
Switching type	Light/dark ON, programmable		◆
Switching frequency	≥ 100 Hz		◆
Current consumption			◆
Reference target detected	connection 1, 2: ≥ 2.2 mA		◆
Reference target not detected	connection 1, 4: ≤ 1 mA		◆
EC-Type Examination Certificate	PTB 99 ATEX 2036 X		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		◆
Protection degree	IP67		◆
Connection	V1 connector (M12 x 1), 4-pin, rotatable through 90°		◆
Material			◆
Housing	PBT		◆
Optical face	scratch resistant plastic pane		◆
Mass	60 g		◆

Electrical connection

Option 40b



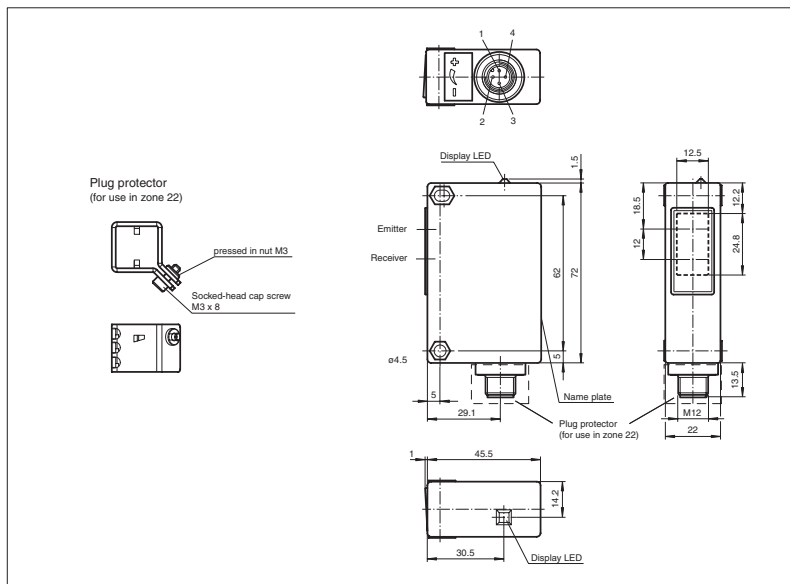
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Date of edition 2008-03-20





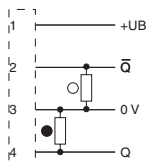
- ATEX-approval for zone 2 and zone 22
- Sleek design, special for storage and conveyor systems
- Excellent optical performance data
- Scratch-resistant and solvent resistant optical covering made of glass



Marking	zone 2:  II 3G EEx nA II T4; zone 22:  II 3D IP65 T 75°C	◆	◆
Effective detection range	0 ... 10 m	◆	◆
Reflector distance	0 ... 4 m	◆	◆
Reference target	H60 reflector	◆	◆
Light type	red, modulated light	◆	◆
Light source	LED	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	40 mA	◆	◆
Signal output	2 pnp, antivalent, short-circuit proof, protected against reverse polarity	◆	◆
Switching type	light/dark switching	◆	◆
Switching current	max. 50 mA	◆	◆
Switching frequency	250 Hz	◆	◆
EC-Type Examination Certificate	TÜV 01 ATEX 1765 X	◆	◆
Ambient temperature	-20 ... 50 °C (253 ... 323 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	Plastic connector M12 x 1, 4-pin	◆	◆
Material			
Housing	Terluran GV15	◆	◆
Optical face	glass	◆	◆
Mass	60 g	◆	◆

**Electrical connection**

Option /47/73c

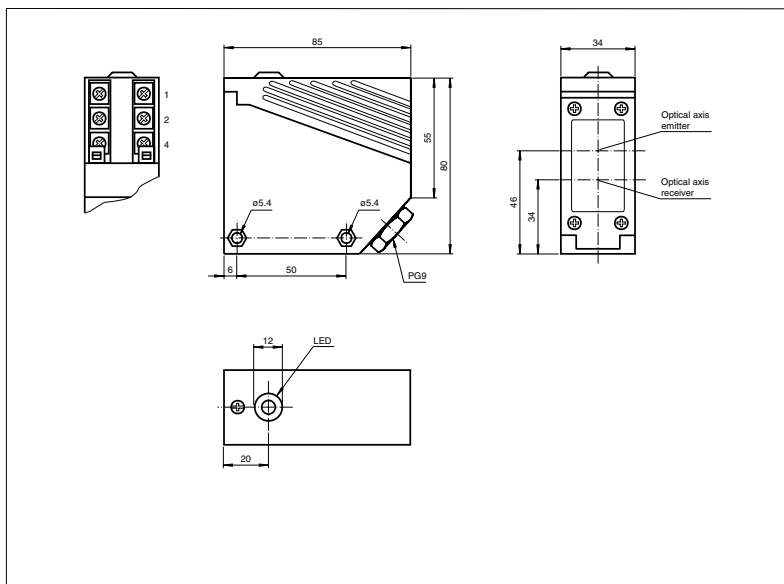


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Date of edition 2008-03-20



- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Glare protected with polarisation filter
- Resistant against noise
- Light/dark ON, programmable
- Adjustable sensitivity
- Scratch resistant mineral glass lens



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4.6

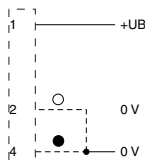
Photoelectric sensors for hazardous areas

Sensitivity adjustment			
Marking	Zone 1:  II 2G EEx ia IIC T6		◆
Effective detection range	0 ... 8 m		◆
Reflector distance	800 ... 8000 mm		◆
Reference target	H85 reflector		◆
Light type	Red light 660 nm		◆
Light source	LED, 660 nm		◆
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)		◆
Signal output	1 NAMUR output NC/NO programmable		◆
Switching type	Light/dark ON, programmable		◆
Switching frequency	≥ 100 Hz		◆
Current consumption			◆
Reference target detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA		◆
Reference target not detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA		◆
EC-Type Examination Certificate	PTB 01 ATEX 2184 X		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		◆
Protection degree	IP54		◆
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>		◆
Material			◆
Housing	PMMA		◆
Optical face	Scratch resistant mineral glass lens		◆
Mass	200 g		◆

RL 36-55-Ex/40b/116

**Electrical connection**

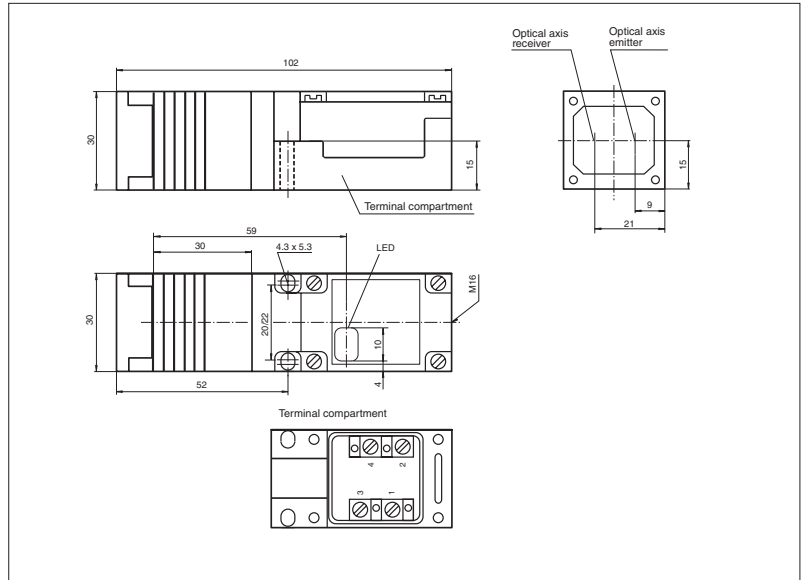
Option 40b



Date of edition 2008-03-20



- ATEX approval for zone 20 (Dust) and zone 1 (Gas)
- Intrinsically safe, EEx ia IIC T6
- Light/dark ON, programmable
- Glare protected with polarisation filter
- Position of the sensor head adjustable
- Scratch resistant mineral glass lens
- Protection degree IP67

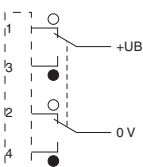


The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Marking	Zone 1:  II 2G EEx ia IIC T6 Zone 20/21:  II 1D Ex iaD 20 T 85 °C	◆	OCS2000-M1K-N2
Effective detection range	0 ... 2 m	◆	
Reflector distance	100 ... 2000 mm	◆	
Reference target	Retro-reflector C 110-2	◆	
Light type	red, modulated light	◆	
Light source	LED, 660 nm	◆	
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)	◆	
Signal output	1 NAMUR output NC/NO programmable	◆	
Switching type	Light/dark ON, programmable	◆	
Switching frequency	≥ 100 Hz	◆	
Current consumption			
Reference target detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA	◆	
Reference target not detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA	◆	
EC-Type Examination Certificate	PTB 01 A TEX 2203 X, ZELM 03 A TEX 0196 X	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Protection degree	IP67 according to EN 60529, Class II insulation	◆	
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>	◆	
Material			
Housing	PBT	◆	
Optical face	Scratch resistant mineral glass lens	◆	
Mass	100 g	◆	

**Electrical connection**

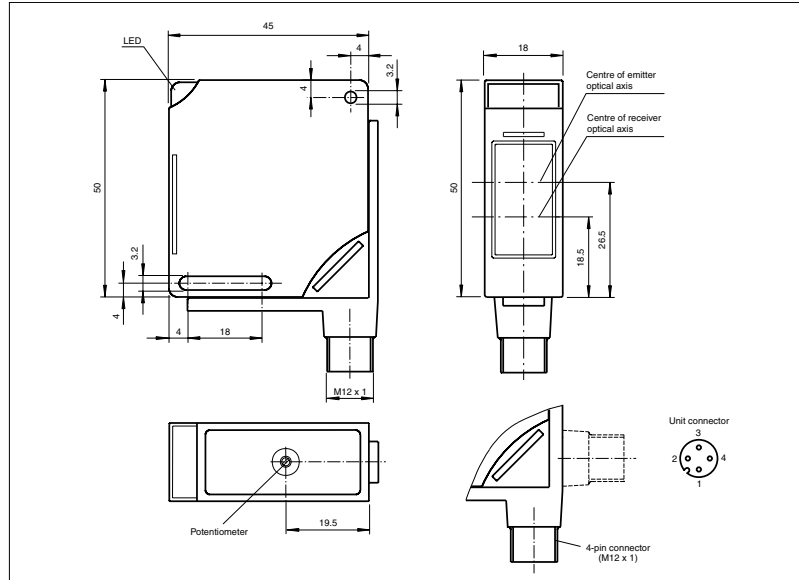
Option 40b



Date of edition 2008-03-20



- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Diffuse reflective sensor for standard applications
- Adjustable sensitivity
- Light/dark ON, programmable
- Protection degree IP67



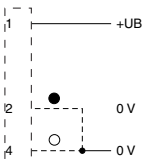
4.6

Photoelectric sensors for hazardous areas

Sensing range adjustment			
Marking	Zone 1:  II 2G EEx ia IIC T6		◆
Detection range	0 ... 500 mm		◆
Adjustment range	180 ... 500 mm		◆
Reference target	standard white 200 mm x 200 mm		◆
Light type	infrared, modulated light		◆
Light source	IRED, 860 nm		◆
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)		◆
Signal output	1 NAMUR output NC/NO programmable		◆
Switching type	Light/dark ON, programmable		◆
Switching frequency	≥ 100 Hz		◆
Current consumption			◆
Reference target detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA		◆
Reference target not detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA		◆
EC-Type Examination Certificate	PTB 99 ATEX 2036 X		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		◆
Protection degree	IP67		◆
Connection	V1 connector (M 12 x 1), 4-pin, rotatable through 90°		◆
Material			◆
Housing	PBT		◆
Optical face	scratch resistant plastic pane		◆
Mass	60 g		◆

Electrical connection

Option 40b

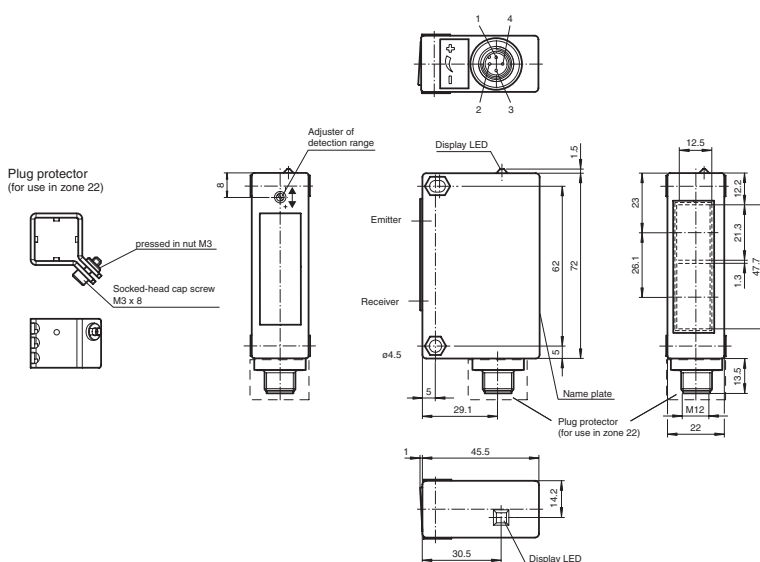


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Date of edition 2008-03-20



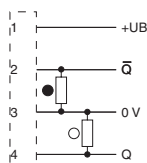
- ATEX-approval for zone 2 and zone 22
- Sleek design, special for storage and conveyor systems
- Adjustable background suppression
- Excellent optical performance data
- Scratch-resistant and solvent resistant optical covering made of glass



Background suppression		◆	◆
Sensing range adjustment		◆	◆
Marking	zone 2: $\text{Ex}$ II 3G EEx nA IIT4; zone 22: $\text{Ex}$ II 3D IP65 T 75°C	◆	◆
Detection range	30 ... 400 mm, adjustable	◆	◆
	30 ... 800 mm	◆	◆
Reference target	standard white 200 mm x 200 mm	◆	◆
Black/White difference (6%/90%)	< 15 %	◆	◆
Light type	infrared, modulated light	◆	◆
Light source	IRED	◆	◆
	IRED, 860 nm	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	40 mA	◆	◆
Signal output	2 pnp, antivalent, short-circuit proof, protected against reverse polarity	◆	◆
Switching type	light/dark switching	◆	◆
Switching current	max. 50 mA	◆	◆
Switching frequency	250 Hz	◆	◆
EC-Type Examination Certificate	TÜV 01 ATEX 1765 X	◆	◆
Ambient temperature	-20 ... 50 °C (253 ... 323 K)	◆	◆
Protection degree	IP 65	◆	◆
Connection	Plastic connector M12 x 1, 4-pin	◆	◆
Material			
Housing	Terluran GV 15	◆	◆
Optical face	glass	◆	◆
Mass	60 g	◆	◆

**Electrical connection**

Option /47/73c

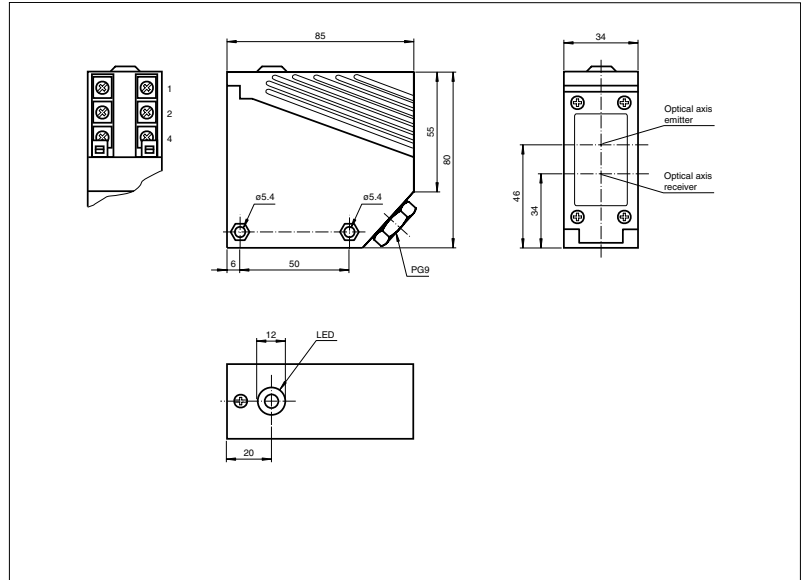


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Date of edition 2008-03-20



- ATEX-approval for zone 1
- Intrinsically safe, EEx ia IIC T6
- Light/dark ON, programmable
- Resistant against noise
- Adjustable sensitivity



4.6

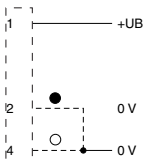
Photoelectric sensors for hazardous areas

Sensing range adjustment			
Marking	Zone 1:  II 2G EEx ia IIC T6		◆
Detection range	0 ... 2000 mm		◆
Adjustment range	350 ... 2000 mm		◆
Reference target	standard white 200 mm x 200 mm		◆
Light type	infrared, modulated light		◆
Light source	IRE D, 860 nm		◆
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)		◆
Signal output	1 NAMUR output NC/NO programmable		◆
Switching type	Light/dark ON, programmable		◆
Switching frequency	≥ 100 Hz		◆
Current consumption			◆
Reference target detected	connection 1, 2: ≤ 1 mA connection 1, 4: ≥ 2.2 mA		◆
Reference target not detected	connection 1, 2: ≥ 2.2 mA connection 1, 4: ≤ 1 mA		◆
EC-Type Examination Certificate	PTB 01 ATEX 2184 X		◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)		◆
Protection degree	IP54		◆
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>		◆
Material			◆
Housing	PMMA		◆
Optical face	PMMA		◆
Mass	200 g		◆

RL36-8-2000-Ex/40b/116

Electrical connection

Option 40b

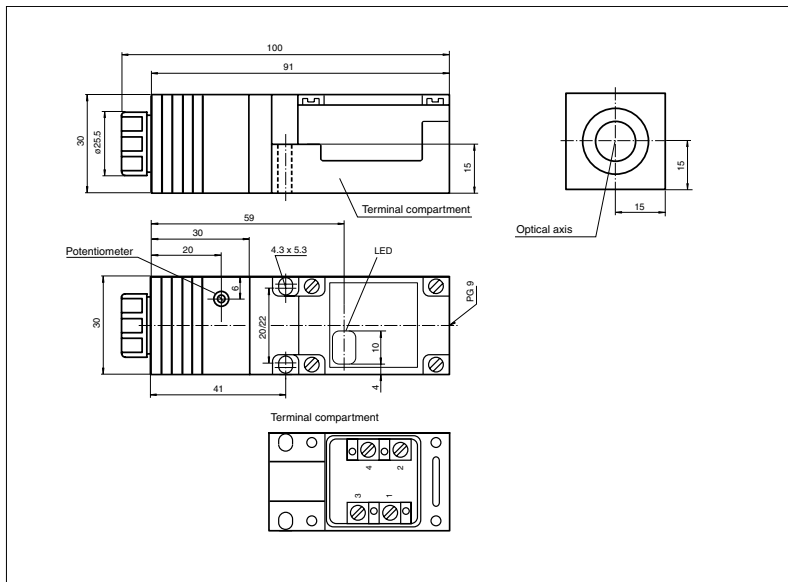


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Date of edition 2008-03-20



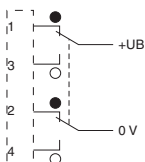
- ATEX approval for zone 20 (Dust) and zone 1 (Gas)
- Intrinsically safe, EEx ia IIC T6
- Adjustable sensitivity
- Light/dark ON, programmable
- Position of the sensor head adjustable
- Scratch resistant mineral glass lens
- Protection degree IP67
- commonly used with glass fibre light guide, adapter type 18



Sensing range adjustment		◆	OCT300-M1K-N2
Light/dark switch		◆	
Marking	Zone 1:  II 2G EEx ia IIC T6 Zone 20/21:  II 1D Ex iaD 20 T 85°C	◆	
Detection range	0 ... 300 mm	◆	
Adjustment range	70 ... 300 mm	◆	
Reference target	standard white 200 mm x 200 mm	◆	
Light type	infrared, modulated light	◆	
Light source	IRED, 880 nm	◆	
Operating voltage	6 ... 20 V DC (R <sub>i</sub> approx. 0 Ohm)	◆	
Signal output	1 NAMUR output NC/NO programmable	◆	
Switching type	Light/dark ON, programmable	◆	
Switching frequency	≤ 100 Hz	◆	
Current consumption		◆	
Reference target detected	connection 1, 2: ≤ 1 mA connection 3, 4: ≥ 2.7 mA	◆	
Reference target not detected	connection 1, 2: ≥ 2.7 mA connection 3, 4: ≤ 1 mA	◆	
EC-Type Examination Certificate	PTB 01 A TEX 2203 X, ZELM 03 A TEX 0196 X	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Protection degree	IP67	◆	
Connection	terminal compartment PG9, ≤ 2.5 mm <sup>2</sup>	◆	
Material		◆	
Housing	PBT	◆	
Optical face	Scratch resistant mineral glass lens	◆	
Mass	100 g	◆	

**Electrical connection**

Option 40b

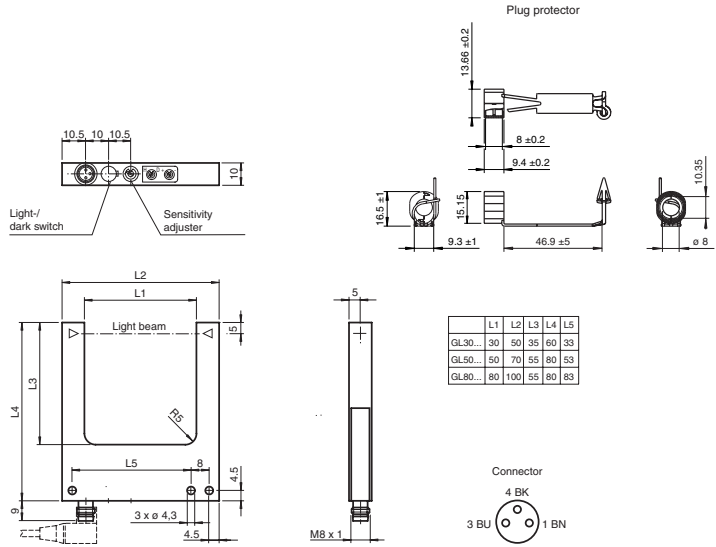


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Date of edition 2008-03-20



- ATEX approval
- Optimised for the detection of small parts
- High switching frequency
- Sensitivity adjuster and light/dark switch as standard features of this series
- Infrared light
- Protection degree IP67
- diecast zinc housing, powder coated



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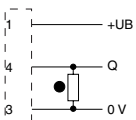
4.6

Photoelectric sensors for hazardous areas

		GL30-IR-EX 2/3 2/4 0a/98a	GL50-IR-EX 2/3 2/4 0a/98a	GL80-IR-EX 2/3 2/4 0a/98a
Category	3G	◆	◆	◆
Sensitivity adjustment		◆	◆	◆
Light/dark switch		◆	◆	◆
Marking	II 3G Ex op is nA IIC T6 Gc X	◆	◆	◆
Fork width	30 mm 50 mm 80 mm	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆
Light source	IREDD	◆	◆	◆
Obstacle size	0.3 mm	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆
Signal output	1 pnp, short-circuit proof, open collector	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆
Switching frequency	2 kHz	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆
Protection degree	IP 67	◆	◆	◆
Connection	M8 connector, 3-pin	◆	◆	◆
Material				
Housing	diecast zinc, powder coated	◆	◆	◆
Optical face	glass	◆	◆	◆
Mass	125 g 60 g 90 g	◆	◆	◆

**Electrical connection**

Option 32/40a/98a



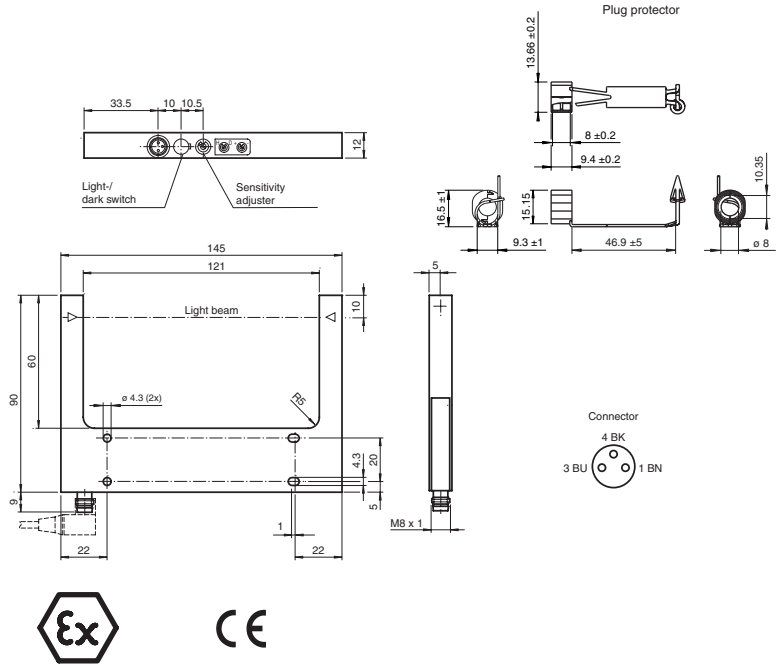
Date of edition 2008-03-20



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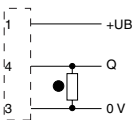
- ATEX approval
- Optimised for the detection of small parts
- High switching frequency
- Sensitivity adjuster and light/dark switch as standard features of this series
- Infrared light
- Protection degree IP67
- diecast zinc housing, powder coated



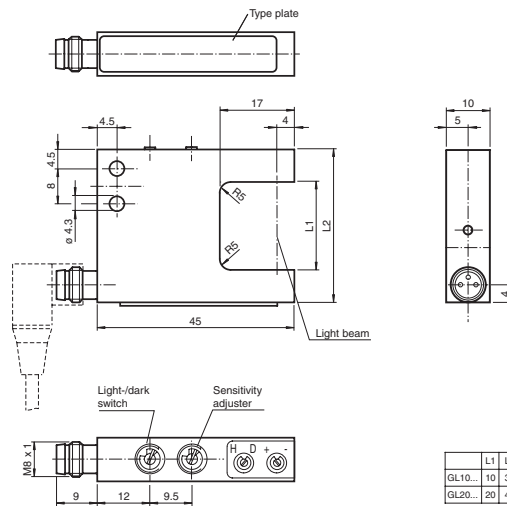
Category	3G	◆	GL 121-IR-EX2/32/40a/98a
Sensitivity adjustment		◆	
Light/dark switch		◆	
Marking	Ex II 3G Ex op is nA IIC T6 Gc X	◆	
Fork width	121 mm	◆	
Light type	infrared, modulated light	◆	
Light source	IREL	◆	
Obstacle size	0.3 mm	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	≤ 15 mA	◆	
Signal output	1 pnp, short-circuit proof, open collector	◆	
Switching type	light/dark switching	◆	
Switching current	max. 100 mA	◆	
Switching frequency	2 kHz	◆	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Protection degree	IP67	◆	
Connection	M8 connector, 3-pin	◆	
Material		◆	
Housing	diecast zinc, powder coated	◆	
Optical face	glass	◆	
Mass	2.95 g	◆	

**Electrical connection**

Option 32/40a/98a



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- Optimised for the detection of small parts
- High switching frequency
- Multiple device installation possible, no mutual interference
- Sensitivity adjuster and light/dark switch as standard features of this series
- Protection degree IP67
- cULus approval
- Sturdy aluminium housing
- Infrared light



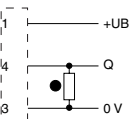
4.7

Photoelectric sensors, slot type sensors / frame type sensors

		GL 10-RT/32/40a/98a	GL 10-IR/32/40a/98a	GL 20-RT/32/40a/98a	GL 20-IR/32/40a/98a
Sensitivity adjustment		◆	◆	◆	◆
Light/dark switch		◆	◆	◆	◆
Fork width	10 mm	◆	◆		
	20 mm			◆	◆
Obstacle size	0.3 mm	◆	◆	◆	◆
Light type	infrared, modulated light		◆		◆
	red, modulated light	◆		◆	
Light source	ILED		◆		◆
	LED	◆		◆	
Approvals	CE, cULus	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Signal output	1 pnp, short-circuit proof, open collector	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	2 kHz	◆	◆	◆	◆
	3 kHz			◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	M8 connector, 3-pin	◆	◆	◆	◆
Material					
Housing	anodised aluminium		◆		◆
	aluminium, black anodised	◆		◆	
Optical face	glass	◆	◆	◆	◆
Mass	20 g	◆	◆	◆	◆
	25 g			◆	◆

**Electrical connection**

Option 32/40a/98a

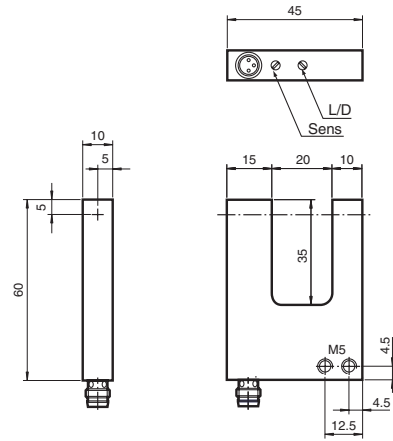


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- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity



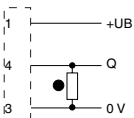
Laser Class II

GL20-LAS/32/40a/98a

Sensitivity adjustment		◆
Light/dark switch		◆
Fork width	20 mm	◆
Obstacle size	0.05 mm	◆
Light type	Laser red	◆
Light source	laser diode , 650 nm	◆
Laser class	2	◆
Approvals	CE	◆
Operating voltage	10 ... 30 V DC	◆
No-load supply current	45 mA	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆
Switching type	light/dark switching	◆
Switching current	max. 200 mA	◆
Switching frequency	10000 Hz	◆
Ambient temperature	-10 ... 60 °C ( 263 ... 333 K)	◆
Protection degree	IP65	◆
Connection	M8 connector, 3-pin	◆
Material		
Housing	aluminium, black anodised	◆
Optical face	glass	◆
Installation	may be mounted in rows	◆
Mass	30 g	◆

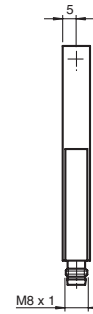
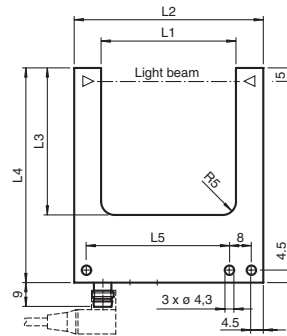
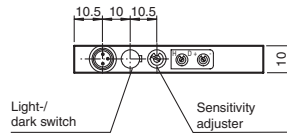
**Electrical connection**

Option 32/40a/98a



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	L1	L2	L3	L4	L5
GL30...	30	50	35	60	33
GL50...	50	70	55	80	53
GL80...	80	100	55	80	83

- Optimised for the detection of small parts
- High switching frequency
- Multiple device installation possible, no mutual interference
- Sensitivity adjuster and light/dark switch as standard features of this series
- Protection degree IP67
- cULus approval
- Diecast zinc housing, powder coated
- Visible red light



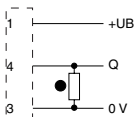
4.7

Photoelectric sensors, slot type sensors / frame type sensors

		GL30-IR/32/40a/98a	GL30-RT/32/40a/98a	GL50-RT/32/40a/98a	GL50-IR/32/40a/98a	GL80-RT/32/40a/98a	GL80-IR/32/40a/98a
Sensitivity adjustment		◆	◆	◆	◆	◆	◆
Light/dark switch		◆	◆	◆	◆	◆	◆
Fork width	30 mm	◆	◆				
	50 mm			◆			
	80 mm					◆	◆
Obstacle size	0.3 mm	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆			◆		
	red, modulated light		◆	◆		◆	◆
Light source	IRED	◆			◆		◆
	LED		◆	◆		◆	◆
Approvals	CE, cULus	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆	◆	◆
Signal output	1 pnp, short-circuit proof, open collector	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆			◆		
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Switching frequency	2 kHz	◆			◆		
	3 kHz		◆	◆		◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Connection	M8 connector, 3-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	diecast zinc, powder coated	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆
Mass	125 g					◆	◆
	60 g	◆	◆				
	90 g			◆	◆		

Electrical connection

Option 32/40a/98a

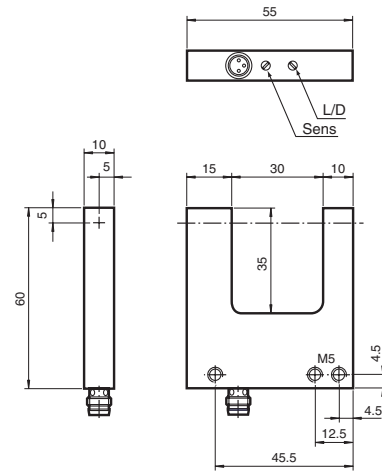


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- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity

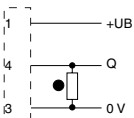


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Sensitivity adjustment		◆	GL30-LAS/32/40a/98a
Light/dark switch		◆	
Fork width	30 mm	◆	
Obstacle size	0.05 mm	◆	
Light type	Laser red	◆	
Light source	laser diode, 650 nm	◆	
Laser class	2	◆	
Approvals	CE	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	45 mA	◆	
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	
Switching type	light/dark switching	◆	
Switching current	max. 200 mA	◆	
Switching frequency	10000 Hz	◆	
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	
Protection degree	IP65	◆	
Connection	M8 connector, 3-pin	◆	
Material			
Housing	aluminium, black anodised	◆	
Optical face	glass	◆	
Installation	may be mounted in rows	◆	
Mass	30 g	◆	

**Electrical connection**

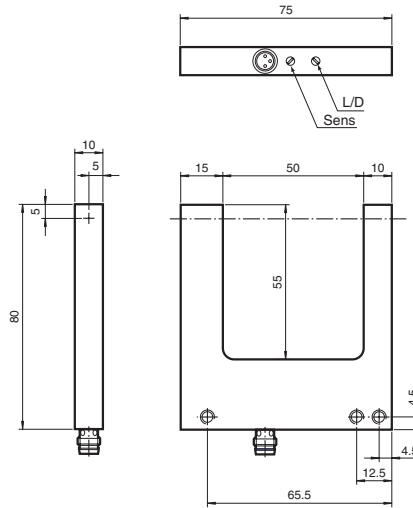
Option 32/40a/98a



Date of edition 2008-03-20



- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity



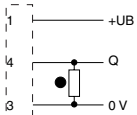
4.7

Photoelectric sensors, slot type sensors / frame type sensors

Sensitivity adjustment		◆	GL50-LAS/32/40a/98a
Light/dark switch		◆	
Fork width	50 mm	◆	
Obstacle size	0.05 mm	◆	
Light type	Laser red	◆	
Light source	laser diode, 650 nm	◆	
Laser class	2	◆	
Approvals	CE	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	45 mA	◆	
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	
Switching type	light/dark switching	◆	
Switching current	max. 200 mA	◆	
Switching frequency	10000 Hz	◆	
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	
Protection degree	IP 65	◆	
Connection	M8 connector, 3-pin	◆	
Material			
Housing	aluminium, black anodised	◆	
Optical face	glass	◆	
Installation	may be mounted in rows	◆	
Mass	30 g	◆	

**Electrical connection**

Option 32/40a/98a

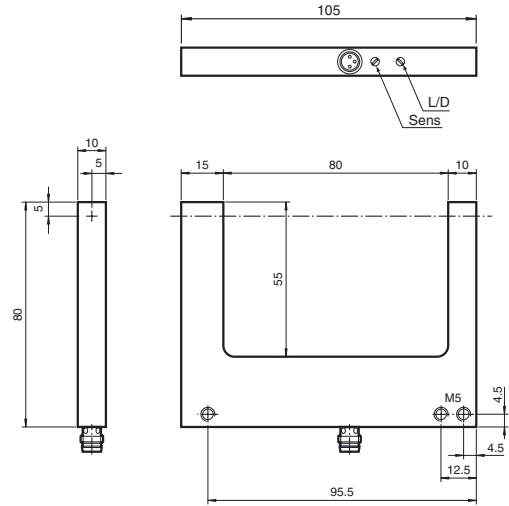


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Date of edition 2008-03-20



- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity



GL80-LAS/32/40a/98a

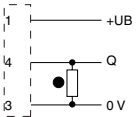
Sensitivity adjustment	◆	
Light/dark switch	◆	
Fork width	80 mm	◆
Obstacle size	0.05 mm	◆
Light type	Laser red	◆
Light source	laser diode , 650 nm	◆
Laser class	2	◆
Approvals	CE	◆
Operating voltage	10 ... 30 V DC	◆
No-load supply current	45 mA	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆
Switching type	light/dark switching	◆
Switching current	max. 200 mA	◆
Switching frequency	10000 Hz	◆
Ambient temperature	-10 ... 60 °C ( 263 ... 333 K)	◆
Protection degree	IP65	◆
Connection	M8 connector, 3-pin	◆
Material		
Housing	aluminium, black anodised	◆
Optical face	glass	◆
Installation	may be mounted in rows	◆
Mass	30 g	◆

4.7

Photoelectric sensors, slot type sensors / frame type sensors

**Electrical connection**

Option 32/40a/98a

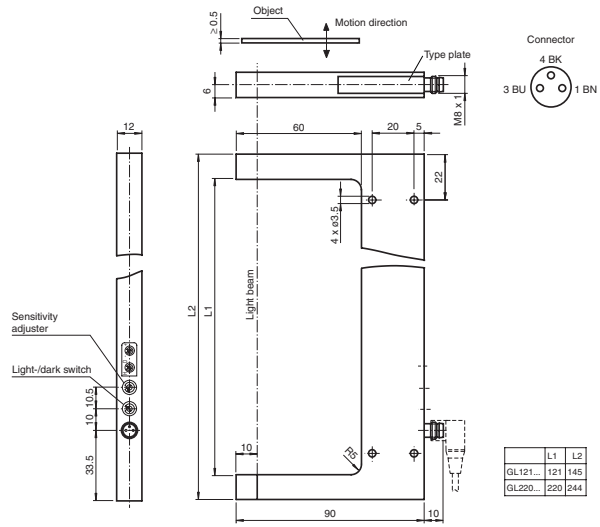


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Date of edition 2008-03-20



- Optimised for the detection of small parts
  - High switching frequency
  - Multiple device installation possible, no mutual interference
  - Sensitivity adjuster and light/dark switch as standard features of this series
  - Protection degree IP67
  - cULus approval
  - Visible red light
- GL121-RT/32/40a/98a



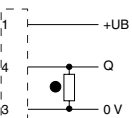
4.7

Photoelectric sensors, slot type sensors / frame type sensors

		GL121-RT/32/40a/98a	GL121-IR/32/40a/98a	GL220-RT/32/40a/98a	GL220-IR/32/40a/98a
Sensitivity adjustment		◆	◆	◆	◆
Light/dark switch		◆	◆	◆	◆
Fork width	121 mm	◆	◆	◆	◆
	220 mm			◆	◆
Obstacle size	0.3 mm	◆	◆		
	0.5 mm			◆	◆
Light type	infrared, modulated light		◆		
	red, modulated light	◆		◆	◆
Light source	IREC		◆		
	LED	◆		◆	◆
Approvals	CE, cULus	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, class 2	◆	◆	◆	◆
No-load supply current	≤ 15 mA	◆	◆	◆	◆
Signal output	1 pnp, short-circuit proof, open collector	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆
Switching frequency	2 kHz	◆	◆	◆	◆
	3 kHz			◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	M8 connector, 3-pin	◆	◆	◆	◆
Material					
Housing	aluminium				◆
	aluminium, black anodised			◆	
	diecast zinc, powder coated	◆	◆		
Optical face	glass	◆	◆	◆	◆
Mass	240 g	◆	◆	◆	◆
	295 g	◆	◆		

Electrical connection

Option 32/40a/98a



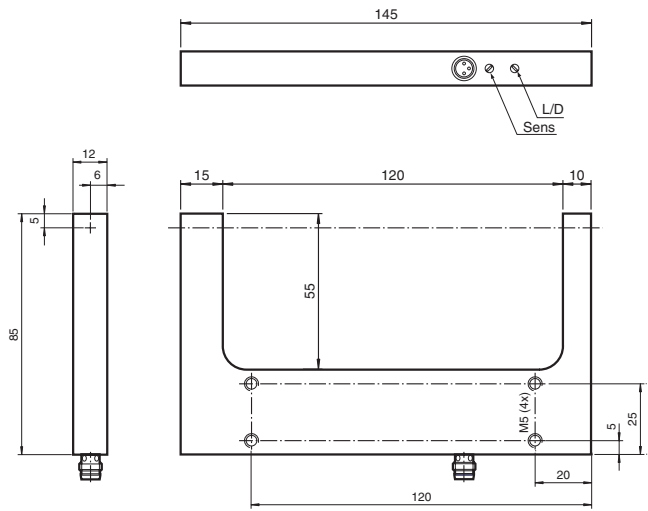
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- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity

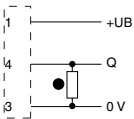


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Sensitivity adjustment		◆	GL120-LAS/32/40a/98a
Light/dark switch		◆	
Fork width	120 mm	◆	
Obstacle size	0.05 mm	◆	
Light type	Laser red	◆	
Light source	laser diode, 650 nm	◆	
Laser class	2	◆	
Approvals	CE	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	45 mA	◆	
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	
Switching type	light/dark switching	◆	
Switching current	max. 200 mA	◆	
Switching frequency	10000 Hz	◆	
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	
Protection degree	IP65	◆	
Connection	M8 connector, 3-pin	◆	
Material			
Housing	aluminium, black anodised	◆	
Optical face	glass	◆	
Installation	may be mounted in rows	◆	
Mass	30 g	◆	

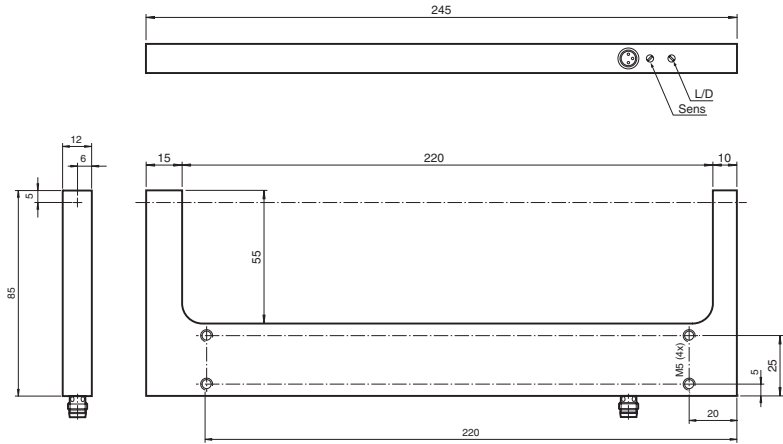
**Electrical connection**

Option 32/40a/98a





- High switching frequency
- High resolution
- Sturdy aluminium housing
- Light/dark switching
- Alignable housing
- Adjustable sensitivity



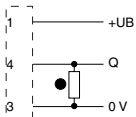
4.7

Photoelectric sensors, slot type sensors / frame type sensors

Sensitivity adjustment		◆	GL220-LAS/32/40a/98a
Light/dark switch		◆	
Fork width	220 mm	◆	
Obstacle size	0.05 mm	◆	
Light type	Laser red	◆	
Light source	laser diode, 650 nm	◆	
Laser class	2	◆	
Approvals	CE	◆	
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	45 mA	◆	
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	
Switching type	light/dark switching	◆	
Switching current	max. 200 mA	◆	
Switching frequency	10000 Hz	◆	
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	
Protection degree	IP 65	◆	
Connection	M8 connector, 3-pin	◆	
Material			
Housing	aluminium, black anodised	◆	
Optical face	glass	◆	
Installation	may be mounted in rows	◆	
Mass	30 g	◆	

Electrical connection

Option 32/40a/98a

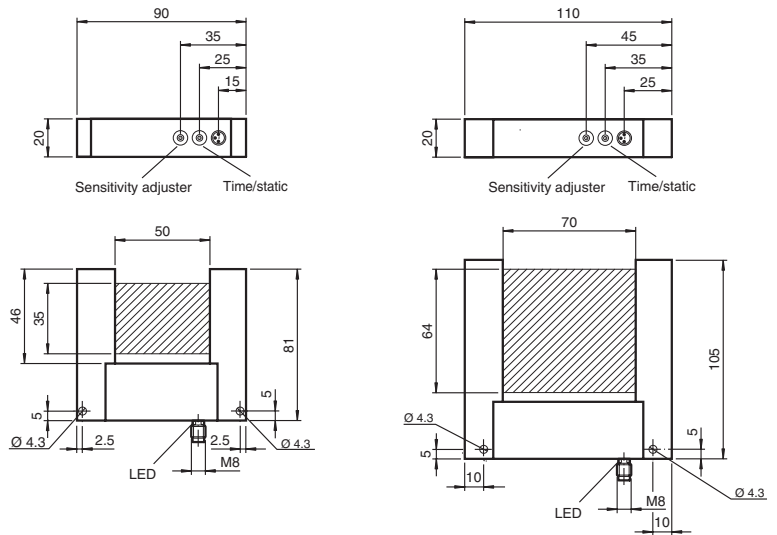


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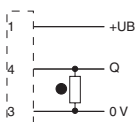
- High switching frequency
- High resolution
- Time function
- Adjustable sensitivity
- Sturdy aluminium housing



		RAL50-IR/32/98	RAL70-IR/32/98
Sensitivity adjustment		◆	◆
Fork width	50 mm	◆	◆
	70 mm		◆
Light type	infrared, modulated light	◆	◆
Light source	IREL	◆	◆
Resolution	0.5 mm	◆	◆
	0.8 mm		◆
active zone	35 mm x 50 mm	◆	◆
	70 mm x 64 mm		◆
Operating voltage	24 V DC ± 20 %	◆	◆
No-load supply current	40 mA	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	dark ON	◆	◆
Switching current	200 mA	◆	◆
Pulse extension	0.1 ... 150 ms	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	M8 connector, 3-pin	◆	◆
Material			
Housing	aluminium, black anodised	◆	◆
Optical face	glass	◆	◆
Mass	200 g	◆	◆
	300 g		◆

Electrical connection

Option 32/98

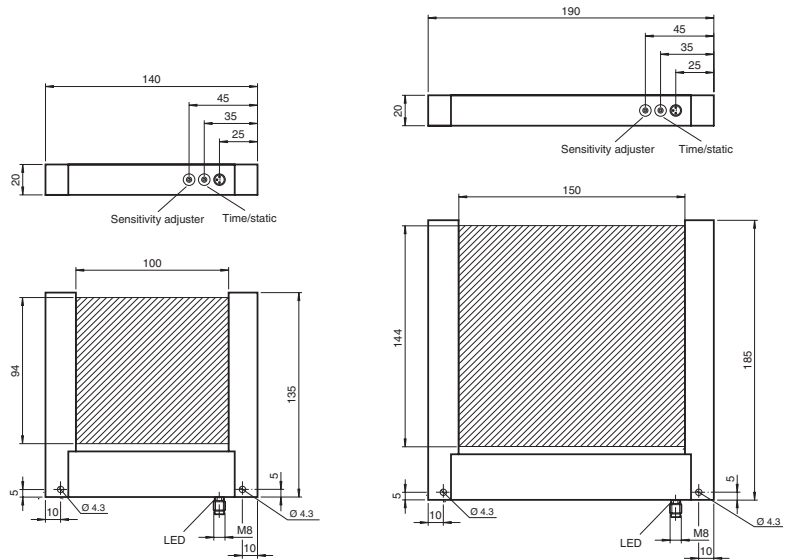


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- High switching frequency
- High resolution
- Time function
- Adjustable sensitivity
- Sturdy aluminium housing



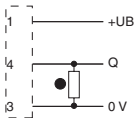
4.7

Photoelectric sensors, slot type sensors / frame type sensors

		RAL100-IR/32/98	RAL150-IR/32/98
Sensitivity adjustment		◆	◆
Fork width	100 mm	◆	
Fork width	150 mm		◆
Light type	infrared, modulated light	◆	◆
Light source	IREd	◆	◆
Resolution	1.5 mm	◆	◆
active zone	3 mm		◆
	100 mm x 94 mm	◆	
	150 mm x 144 mm		◆
Operating voltage	24 V DC ± 20 %	◆	◆
No-load supply current	40 mA	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆
Switching type	dark ON	◆	◆
Switching current	200 mA	◆	◆
Pulse extension	0.1 ... 150 ms	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	M8 connector, 3-pin	◆	◆
Material			
Housing	aluminium, black anodised	◆	◆
Optical face	glass	◆	◆
Mass	400 g	◆	
	500 g		◆

**Electrical connection**

Option 32/98

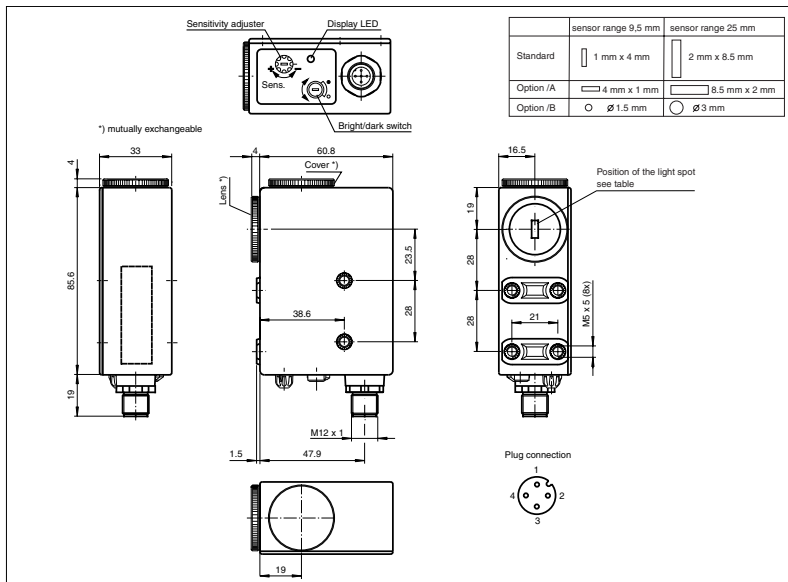


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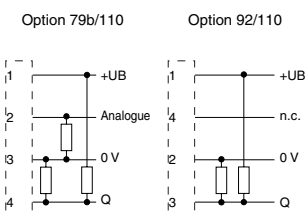


- Optical system exchangeable by 90°
- Push-pull output
- 30 µs response time, suitable for extremely rapid scanning processes
- Sturdy plastic housing
- Protection degree IP67



Sensor range	9.5 mm +/-3 mm	◆	DK10-9,5/79 B/92/110
Light type	green, modulated light	◆	
Light source	LED	◆	DK10-9,5/92/110
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	≤ 55 mA	◆	
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	DK10-9,5/9S 20/92/110
Switching type	light/dark ON, switchable	◆	
Switching current	max. 200 mA	◆	
Response time	30 µs	◆	
Measurement output	Analogue output 0.3 ... 10 mA, (RL ≤ 600 Ohm)	◆	DK10-9,5/A/79B/92/110
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Protection degree	IP67	◆	
Connection	M12 connector, 4-pin	◆	DK10-9,5/A/92/110
Material			
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	
Optical face	glass	◆	
Mass	200 g	◆	

Electrical connection

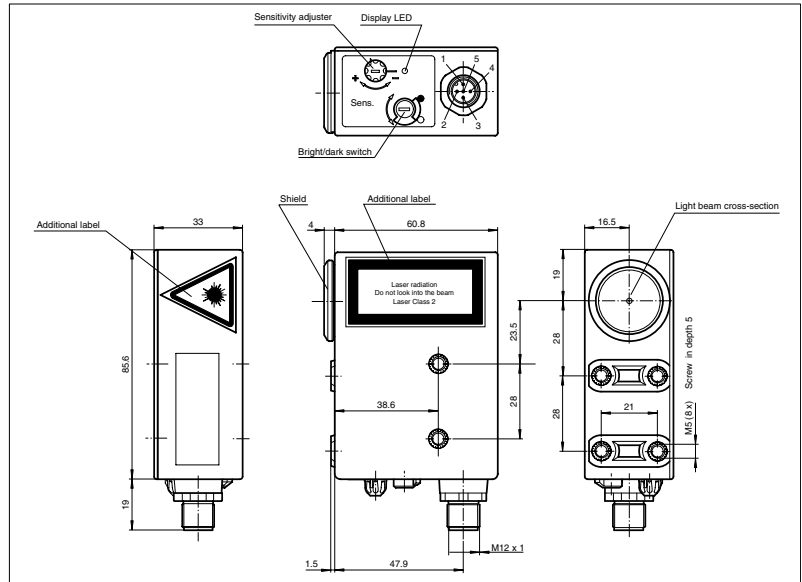


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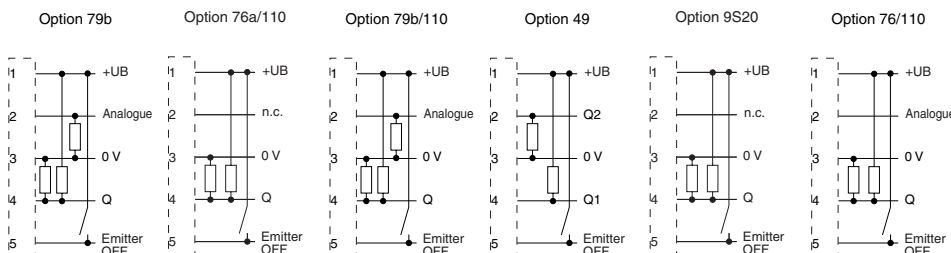


- Laser class 2, eyesafe
- 30 μs response time, suitable for extremely rapid scanning processes
- Sturdy, waterproof plastic housing
- Laser print mark contrast sensor for recording very small print marks



		DK10-LA S/95/49	DK10-LA S/95/79b	DK10-LA S/76a/110/124	DK10-LA S/76a/79b/110/124	DK10-LA S/9S 20	DK10-LA S/9S 50/76a/110/124	DK10-LA S-54/76/110/124
Effective detection range	0 ... 10 m							
Reflector distance	0 ... 10 m							
Sensor range	300 mm							
	800 mm							
Detection range	3 ... 300 mm	◆	◆	◆	◆	◆	◆	◆
	3 ... 800 mm							
Light type	red, modulated light	◆	◆	◆	◆	◆	◆	◆
Light source	laser diode, 650 nm	◆	◆	◆	◆	◆	◆	◆
Laser class	2	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 55 mA	◆	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof	◆	◆	◆	◆	◆	◆	◆
	1 pnp and 1 npn short-circuit proof, open collector, synchronized-switching							
Switching type	Light/dark ON, switchable	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆
Response time	30 μs	◆	◆	◆	◆	◆	◆	◆
Measurement output	Analogue output 0.3 ... 10 mA, (RL ≤ 600 Ohm)	◆	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation with +Ub	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆	◆	◆	◆
Connection	connector M12 x 1, 5-pin	◆	◆	◆	◆	◆	◆	◆
Material								
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆	◆
Mass	200 g	◆	◆	◆	◆	◆	◆	◆

Electrical connection



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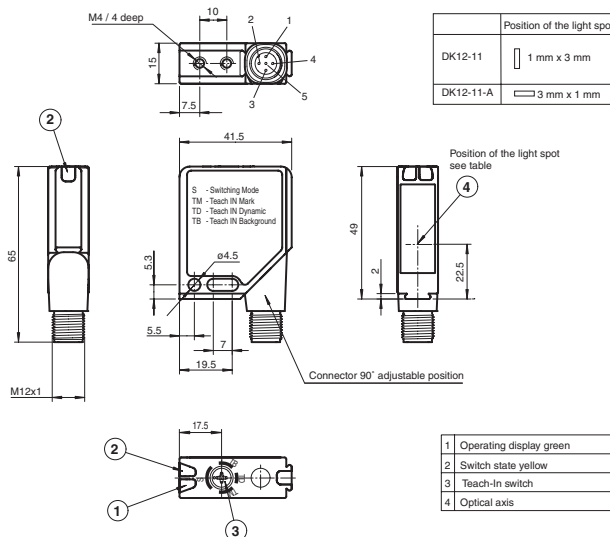
4.8

Photoelectric sensors, print mark scanners

Date of edition 2008-03-20



- Diffuse mode sensor for recording any print mark
- TEACH-IN, static and dynamic
- 50 µs response time, suitable for extremely rapid scanning processes
- 3 emitter colours: green, red and blue



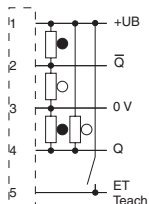
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	DK12-11/124/136	DK12-11/9s20/124/136	DK12-11-A/124/136
Static TEACH-IN	◆	◆	◆
Dynamic TEACH-IN	◆	◆	◆
Sensor range	11 mm ± 2 mm	◆	◆
Light type	Visible green/red/blue, modulated light	◆	◆
Light source	3 LEDs (R,G,B)	◆	◆
Teach-In	static and dynamic Teach-In	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 80 mA	◆	◆
Protection class	II, rated voltage ≤ 250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆	◆
Signal output	2 Push-pull outputs, complementary, short-circuit proof, reverse polarity-protected	◆	◆
Switching type	light/dark switching	◆	◆
Switching current	max. 100 mA	◆	◆
Response time	50 µs	◆	◆
Function input	Ext. Teach-In input (ET)	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	Metal connector M12, 5-pin, 90° convertible	◆	◆
Material			
Housing	Frame: die-cast zinc, nickel-plated Laterals: plastic PC, glass-fiber reinforced	◆	◆
Optical face	Plastic pane	◆	◆
Mass	60 g	◆	◆

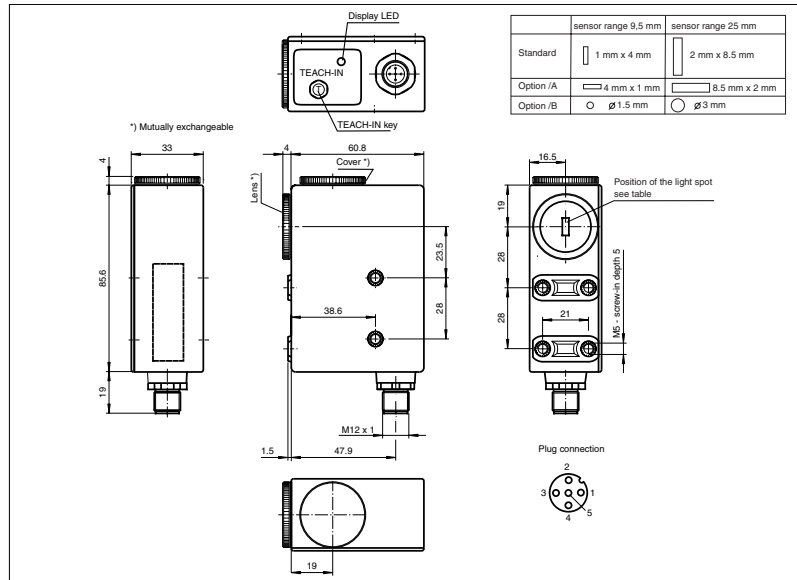
**Electrical connection**

Option 124/136





- **Static TEACH-IN: automatic switching threshold adaptation**
- **30 μs response time, suitable for extremely rapid scanning processes**
- **Powerful push-pull output**
- **Optical system exchangeable by 90°**
- **Sturdy, waterproof plastic housing**

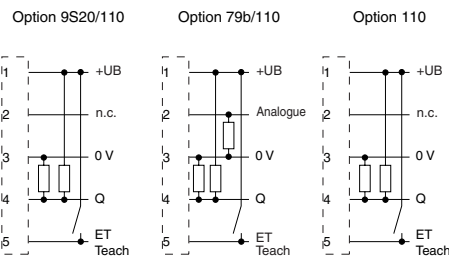


4.8

Photoelectric sensors, print mark scanners

		DK20/35 A/9/S2.0	DK20/35 B	DK20/35 B/79B	DK20/A/35B	DK20-25/110/124	DK20-25/A/110/124	DK20-25/B/110/124	DK20-9,5/110/124	DK20-9,5/79B/110/124	DK20-9,5/9S20/110/124	DK20-9,5/A/110/124	DK20-9,5/A/79B/110/124	DK20-9,5/B/110/124	DK20-9,5/B/79B/110/124
Static TEACH-IN		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Sensor range	25 mm +/- 6 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	50 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	9.5 mm +/- 3 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	red, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Visible green/red/blue, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	LED	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Teach-In	static Teach-In	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 70 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark ON switchable, results from the order of the Teach-In	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Response time	30 μs	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Measurement output	Analogue output 0.3 ... 10 mA, (RL ≤ 600 Ohm)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function input	Teach-In input	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	M12 connector, 5 pin	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material															
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	200 g	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Electrical connection



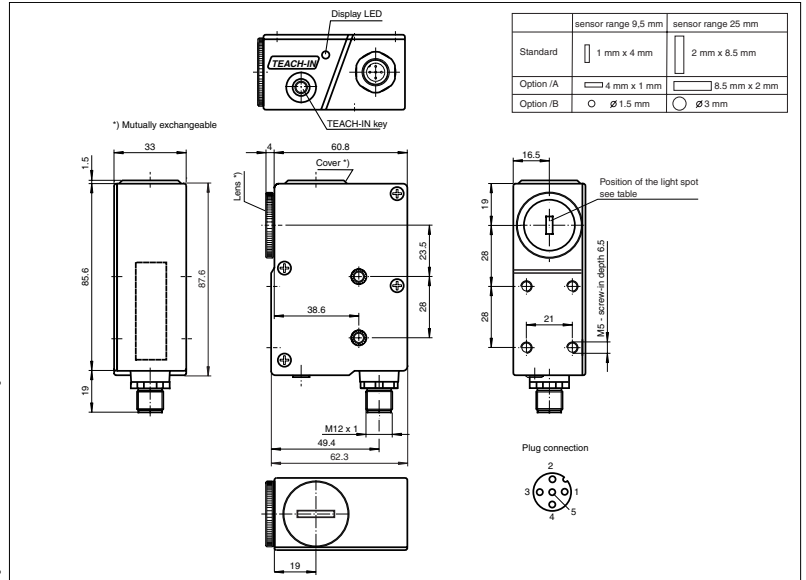
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Date of edition 2008-03-20





- **Static TEACH-IN: automatic switching threshold adaptation**
- **30 μs response time, suitable for extremely rapid scanning processes**
- **3 emitter colours: green, red and blue**
- **Powerful push-pull output**
- **Optical system exchangeable by 90°**
- **Stainless steel version, especially suitable for applications in the food industry**

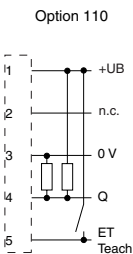


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Date of edition 2008-03-20

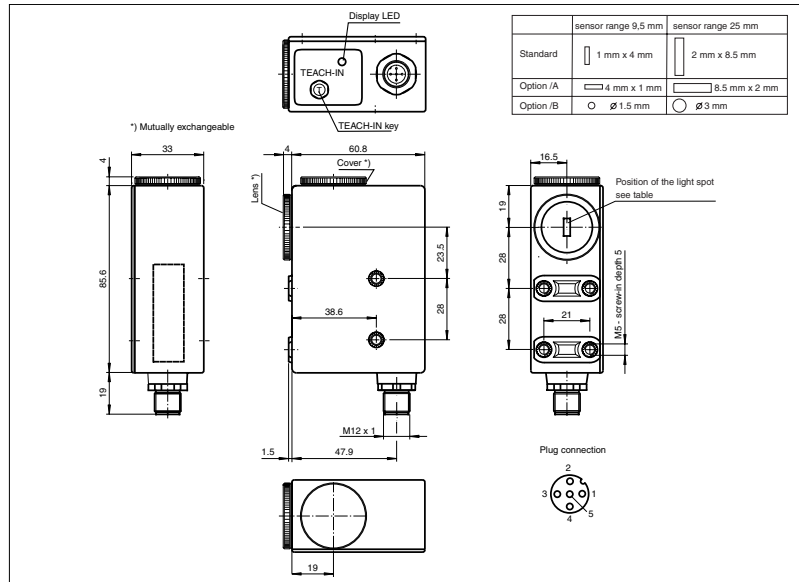
		DKE 20-9,5/110/124	DKE 20-9,5/9s2/110/124
Static TEACH-IN		◆	◆
Sensor range	9.5 mm +/-3 mm	◆	◆
Light type	Visible green/red/blue, modulated light	◆	◆
Light source	LED	◆	◆
Teach-In	static Teach-In	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 70 mA	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆
Switching type	light/dark ON switchable, results from the order of the Teach-In	◆	◆
Switching current	max. 200 mA	◆	◆
Response time	30 μs	◆	◆
Function input	Teach-In input	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	Metal connector M12 x 1, 5-pin	◆	◆
Material			
Housing	Stainless steel	◆	◆
Optical face	glass	◆	◆
Mass	530 g	◆	◆

**Electrical connection**





- **Dynamic TEACH-IN:** automatic switching threshold adaptation with one key pressure
- **30 μs response time,** suitable for extremely rapid scanning processes
- **3 emitter colours:** green, red and blue
- **Powerful push-pull output**
- **Optical system exchangeable by 90°**
- **Sturdy, waterproof plastic housing**

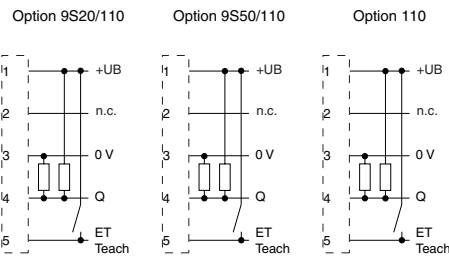


4.8

Photoelectric sensors, print mark scanners

		D K21-25/110/124	D K21-25/B/110/124	D K21-9.5/110/124	D K21-9.5/9S 20/110/124	D K21-9.5/9S 50/110/124	D K21-9.5/A/110/124
Dynamic TEACH-IN		◆	◆	◆	◆	◆	◆
Sensor range	25 mm +/- 6 mm 9.5 mm +/- 3 mm	◆	◆	◆	◆	◆	◆
Light type	Visible green/red/blue, modulated light	◆	◆	◆	◆	◆	◆
Light source	LED	◆	◆	◆	◆	◆	◆
Teach-In	Dynamic Teach-In	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 60 mA	◆	◆	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆	◆	◆
Response time	30 μs	◆	◆	◆	◆	◆	◆
Function input	Teach-In input	◆	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆	◆	◆
Connection	M 12 connector, 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆	◆
Mass	200 g	◆	◆	◆	◆	◆	◆

Electrical connection

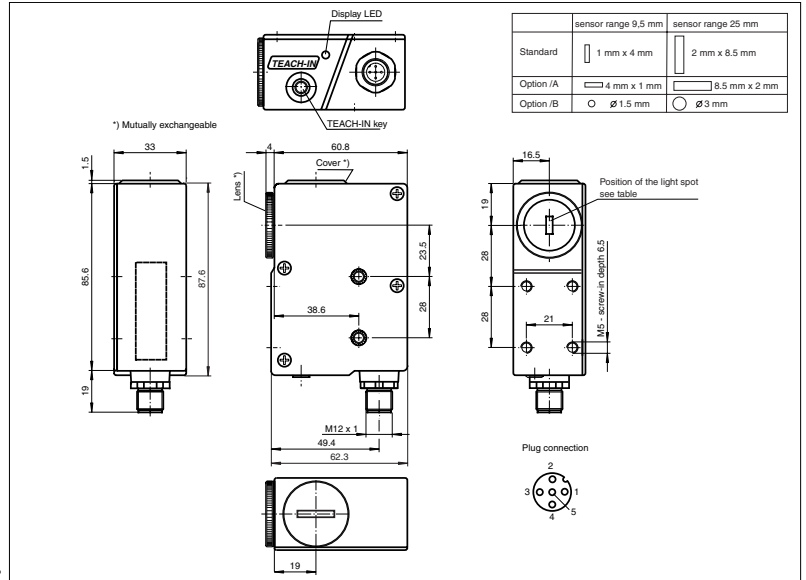


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Date of edition 2008-03-20



- **Dynamic TEACH-IN:** automatic switching threshold adaptation with one key pressure
- **30 μs response time,** suitable for extremely rapid scanning processes
- **3 emitter colours:** green, red and blue
- **Powerful push-pull output**
- **Optical system exchangeable by 90°**
- **Stainless steel version,** especially suitable for applications in the food industry

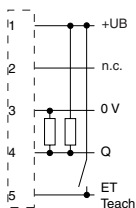


Dynamic TEACH-IN		◆
Sensor range	9.5 mm +/-3 mm	◆
Light type	Visible green/red/blue, modulated light	◆
Light source	LED	◆
Teach-In	Dynamic Teach-In	◆
Operating voltage	10 ... 30 V DC	◆
No-load supply current	≤ 60 mA	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆
Switching current	max. 200 mA	◆
Response time	30 μs	◆
Function input	Teach-In input	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆
Protection degree	IP67	◆
Connection	M12 connector, 5 pin	◆
Material		
Housing	Stainless steel	◆
Optical face	glass	◆
Mass	530 g	◆

DKE 21-9,5/1 10/124

**Electrical connection**

Option 110

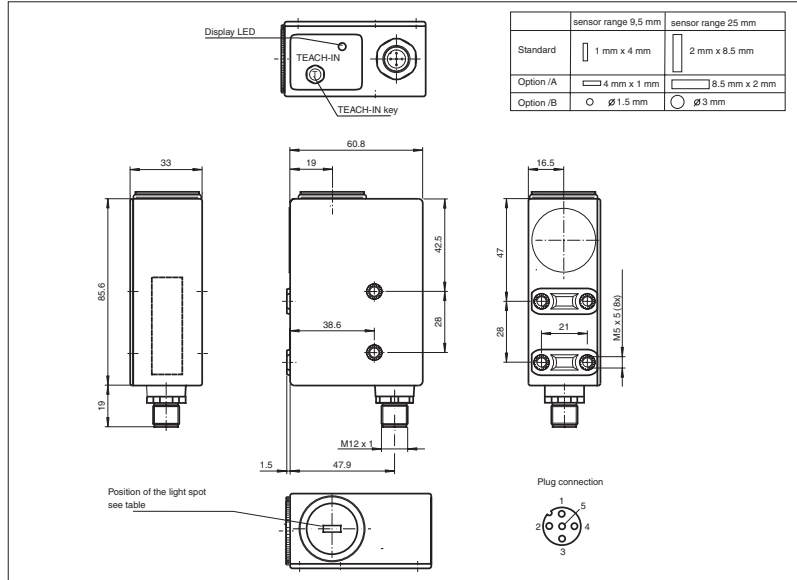


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Date of edition 2008-03-20



- 30 μs response time, suitable for extremely rapid scanning processes
- TEACH-IN procedure for automatic threshold value setting
- 3 emitter colours: green, red and blue
- Powerful push-pull output
- High accuracy for precise positioning operations
- Sturdy, waterproof plastic housing

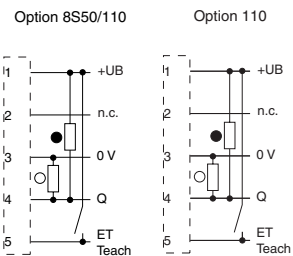


4.8

Photoelectric sensors, print mark scanners

		DK3 1-9,5/110/124	DK3 4-9,5/110/124	DK3 4-9,5/BS 50/110/124	DK3 5-9,5/110/124
Static TEACH-IN		◆	◆	◆	◆
Dynamic TEACH-IN		◆	◆	◆	◆
Sensor range	9.5 mm ± 3 mm	◆	◆	◆	◆
Light type	Visible green/red/blue, modulated light	◆	◆	◆	◆
Light source	3 LEDs (R,G,B)	◆	◆	◆	◆
Teach-In	Dynamic Teach-In static Teach-In	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 75 mA	◆	◆	◆	◆
Signal output	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆	◆	◆
Switching type	Output switches to U <sub>B</sub> when print mark is detected and to 0 V when background is detected	◆	◆	◆	◆
	light/dark ON switchable, results from the order of the Teach-In	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆
Response time	30 μs	◆	◆	◆	◆
Function input	Teach-In input	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	M12 connector, 5 pin	◆	◆	◆	◆
Material					
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆
Mass	200 g	◆	◆	◆	◆

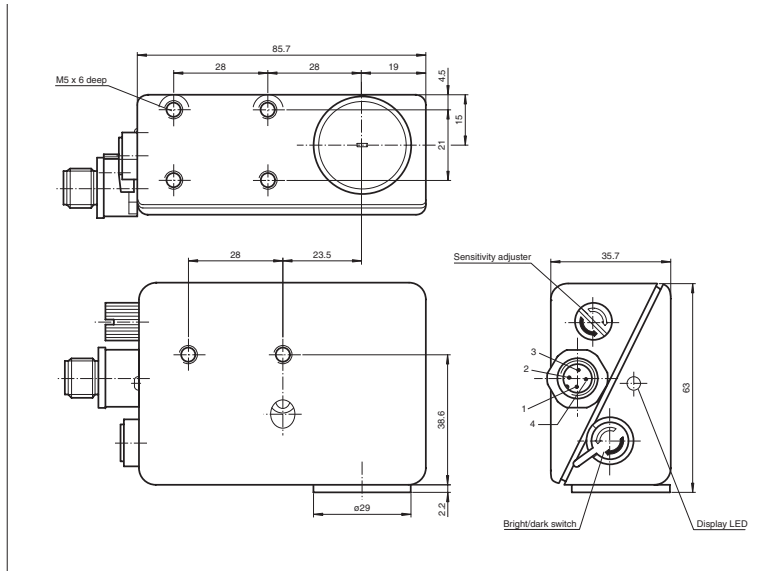
Electrical connection



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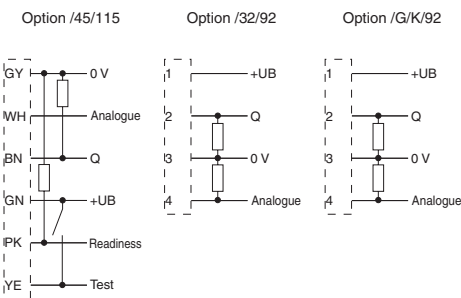
- Diffuse mode sensor for recording fluorescent marks or materials
  - UV, emitter light
  - Switch output and analogue output
  - Sturdy, waterproof metal housing
  - Emitter deactivation
- RL-UV345/115



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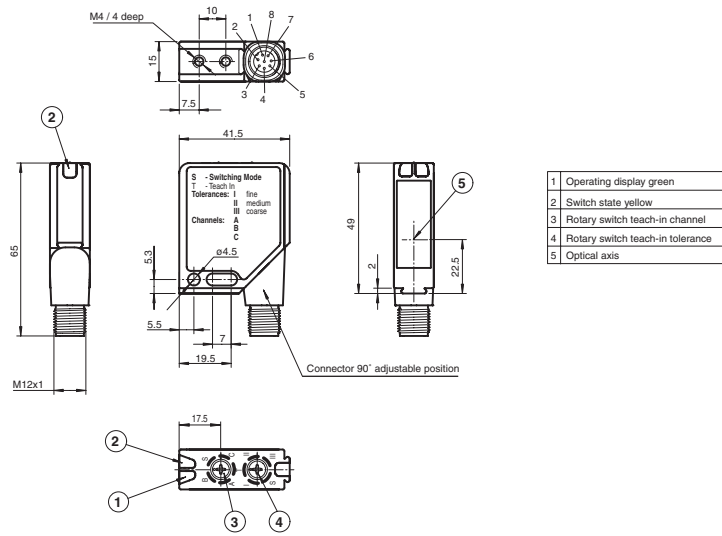
		RL-U V3/32/92	RL-U V3/45/115	RL-U V3/G/K/92	RL-U V3/H/9s/32/92	RL-U V4/32/92
Detection range	0 ... 100 mm	♦	♦	♦	♦	♦
	0 ... 130 mm	♦	♦	♦	♦	♦
	0 ... 80 mm	♦	♦	♦	♦	♦
	28 mm +/- 3 mm	♦	♦	♦	♦	♦
Light type	UV, modulated light	♦	♦	♦	♦	♦
Light source	LED	♦	♦	♦	♦	♦
Operating voltage	12 ... 30 V DC	♦	♦	♦	♦	♦
No-load supply current	55 mA	♦	♦	♦	♦	♦
Signal output	1 npn	♦	♦	♦	♦	♦
	1 npn, short-circuit proof	♦	♦	♦	♦	♦
	1 pnp, short-circuit proof	♦	♦	♦	♦	♦
Switching type	light/dark switching	♦	♦	♦	♦	♦
Switching current	200 mA	♦	♦	♦	♦	♦
	30 mA	♦	♦	♦	♦	♦
Response time	0.7 ms	♦	♦	♦	♦	♦
	100 µs	♦	♦	♦	♦	♦
Measurement output	Analogue output 0.5 ... 8 V DC	♦	♦	♦	♦	♦
Other outputs	Standby output: 1 x PNP, 30mA short-circuit proof	♦	♦	♦	♦	♦
Test input	emitter deactivation at +UB	♦	♦	♦	♦	♦
Ambient temperature	-20 ... 50 °C (253 ... 323 K)	♦	♦	♦	♦	♦
Protection degree	IP67	♦	♦	♦	♦	♦
Connection	M12 connector, 4-pin	♦	♦	♦	♦	♦
	2 m fixed cable	♦	♦	♦	♦	♦
Material						
Housing	aluminium pressure moulding	♦	♦	♦	♦	♦
Optical face	glass	♦	♦	♦	♦	♦
Mass	290 g	♦	♦	♦	♦	♦

**Electrical connection**





- Diffuse mode sensor for recording coloured print marks on backgrounds with different colours
- Colour detection by means of the active three-range method
- TEACH-IN procedure for automatic threshold value setting
- 3 independent channels
- 3 tolerance steps per channel
- 3 Push-pull outputs



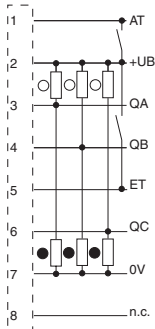
4.9

Photoelectric sensors, colour sensors

Static TEACH-IN		◆	DF12-11-3K/145/151	◆	DF12-11-3K/9s20/145/151
Time function		◆		◆	
Sensor range	11 mm ± 2 mm	◆		◆	
Light type	Visible green/red/blue, modulated light	◆		◆	
Light source	3 LEDs (R,G,B)	◆		◆	
Operating voltage	10 ... 30 V DC	◆		◆	
No-load supply current	≤40 mA	◆		◆	
Protection class	II, rated voltage ≤250 V AC with degree of pollution 1-2 according to IEC 60664-1	◆		◆	
Function input	Ext. Teach-In input (ET) Ext. blanking-input (AT)	◆		◆	
Signal output	3 Push-pull outputs, short-circuit proof, reverse polarity protection	◆		◆	
Switching current	max. 100 mA	◆		◆	
Response time	1 ms	◆		◆	
Timer function	Impulsed time element off-delay 20 ms	◆		◆	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆		◆	
Protection degree	IP 67	◆		◆	
Connection	Metal connector M 12, 8-pin, 90° convertible	◆		◆	
Material					
Housing	Frame: die-cast zinc, nickel-plated Laterals: plastic PC, glass-fiber reinforced	◆		◆	
Optical face	Plastic pane	◆		◆	
Mass	60 g	◆		◆	

Electrical connection

Option /145/151

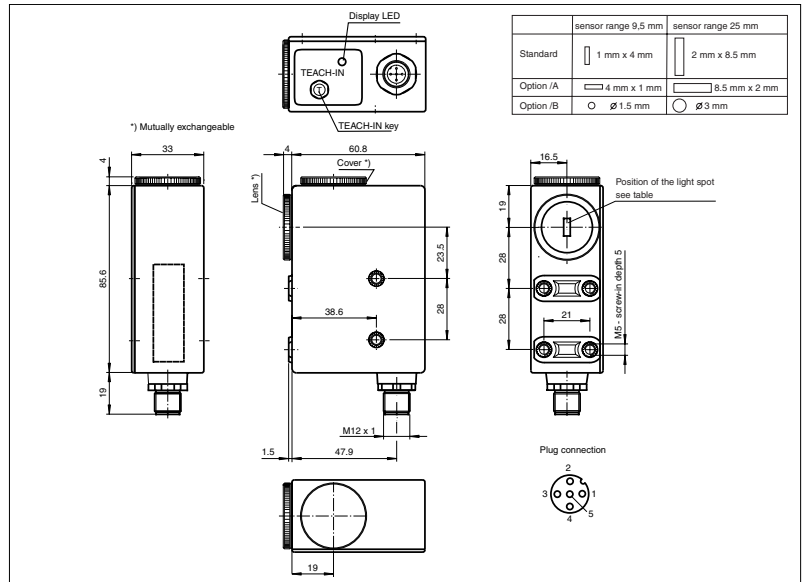


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Date of edition 2008-03-20

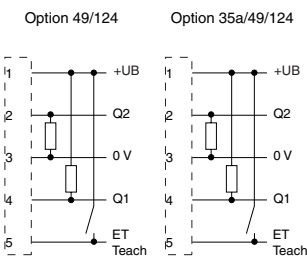


- Diffuse mode sensor for recording coloured print marks on backgrounds with different colours
  - TEACH-IN procedure for automatic threshold value setting
  - 3 emitter colours: green, red and blue
  - Very short response time
  - Optical system exchangeable by 90°
  - Sturdy, waterproof plastic housing
  - Impulsed time element off-delay
- DF20/9S20/49/124



		DF20/35A/49/124	DF20/49/124	DF20/9S20/49/124	DF20/B/49/124
Static TEACH-IN		◆	◆	◆	◆
Time function					
Sensor range	25 mm ± 4 mm 9.5 mm ± 2 mm	◆		◆	◆
Light type	Visible green/red/blue, modulated light	◆	◆	◆	◆
Light source	3 LEDs (R,G,B)	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	≤ 55 mA	◆	◆	◆	◆
Function input	Teach-In input	◆	◆	◆	◆
Signal output	1 pnp and 1 npn short-circuit proof, open collector, synchronized-switching	◆	◆	◆	◆
Switching type	pnp switches according to +UB, npn according to 0 V for detected mark	◆	◆	◆	◆
Switching current	max. 200 mA	◆	◆	◆	◆
Response time	300 µs	◆	◆	◆	◆
Timer function	Impulsed time element off-delay 20 ms	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	connector M 12 x 1, 5-pin	◆	◆	◆	◆
Material					
Housing	PC (Makrolon, glass-fibre-reinforced)	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆
Mass	200 g	◆	◆	◆	◆

Electrical connection

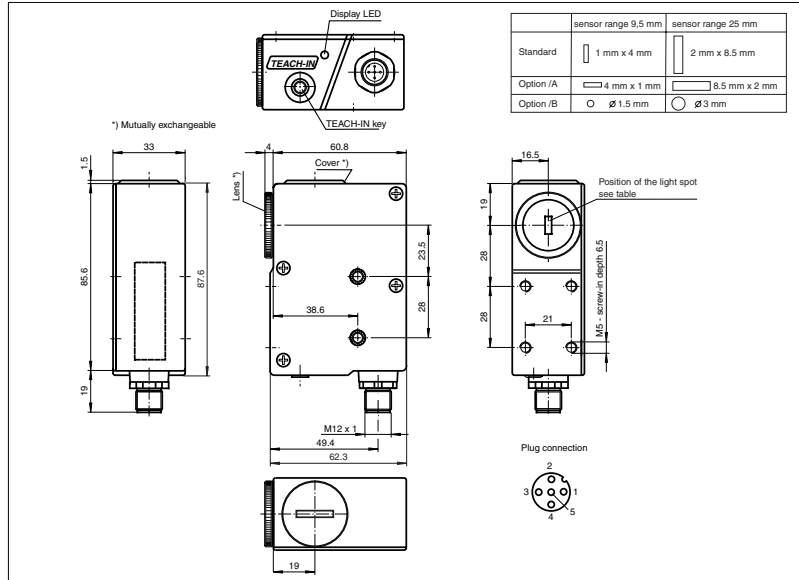


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- Diffuse mode sensor for recording coloured print marks on backgrounds with different colours
- TEACH-IN procedure for automatic threshold value setting
- 3 emitter colours: green, red and blue
- Very short response time
- Optical system exchangeable by 90°
- Stainless steel version, especially suitable for applications in the food industry



4.9

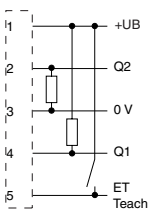
Photoelectric sensors, colour sensors

Static TEACH-IN		
Sensor range	9.5 mm ± 2 mm	◆
Light type	Visible green/red/blue, modulated light	◆
Light source	3 LEDs (R,G,B)	◆
Operating voltage	10 ... 30 V DC	◆
No-load supply current	≤ 55 mA	◆
Function input	Teach-In input	◆
Signal output	1 pnp and 1 npn short-circuit proof, open collector, synchronized-switching	◆
Switching type	pnp switches according to +UB, npn according to 0 V for detected mark	◆
Switching current	max. 200 mA	◆
Response time	300 µs	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆
Protection degree	IP 67	◆
Connection	Metal connector M 12 x 1, 5-pin	◆
Material		
Housing	Stainless steel	◆
Optical face	glass	◆
Mass	530 g	◆

DFE20/49/124

Electrical connection

Option 49/124



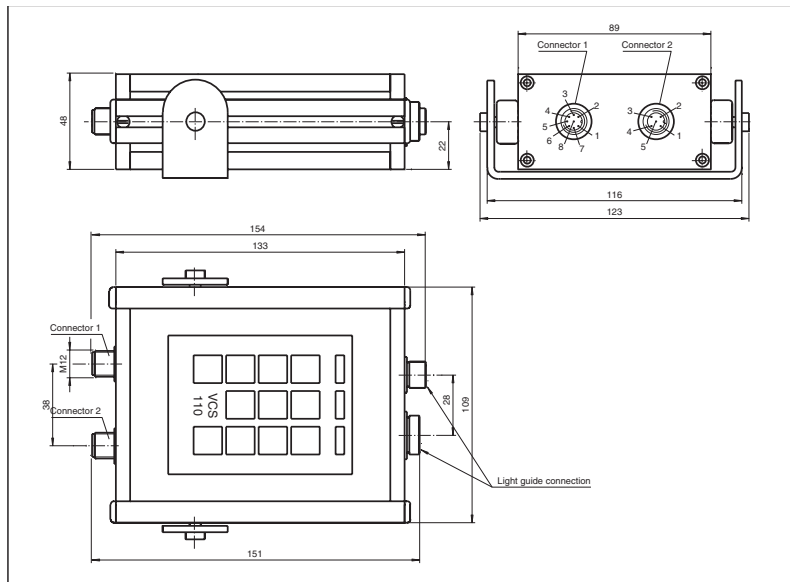
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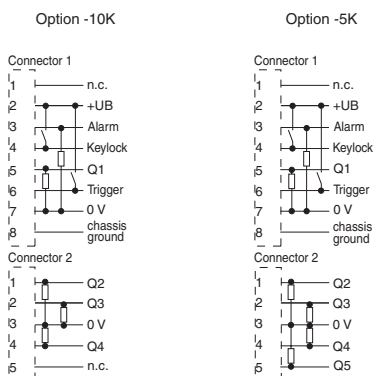
- Colour saving by TEACH-IN key
- Programmable up to 10 channels
- Colour tolerances memorisable
- Light source white-light LED
- Signal outputs direct or binary coded
- For glass fibre optics or for plastic fibre optics



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		VCS110-10K	VCS110-5K
Static TEACH-IN		◆	◆
Sensor range	max. 100 mm	◆	◆
Light type	White light, modulated light	◆	◆
Light source	LED	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
No-load supply current	max. 100 mA	◆	◆
Function input	Trigger, keyboard disable	◆	◆
Signal output	4 pnp, short-circuit proof, binary coded, as assigned to the value memory slots 5 pnp, short-circuit proof, each with two assigned value memory slots The last activated channel is exported.	◆	◆
Switching type	according to +U <sub>B</sub> switching, if colour detected	◆	◆
Switching current	max. 200 mA per output	◆	◆
Response time	4 ms	◆	◆
Output of the pre-fault indication	pnp, active in TEACH-IN mode or if all value memory slots are empty	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆
Protection degree	IP 65	◆	◆
Connection	M12 connector, 8-pin and M12 connector, 5 pin	◆	◆
Material			
Housing	aluminium	◆	◆
Optical face	Fibre optics	◆	◆
Mass	300 g	◆	◆

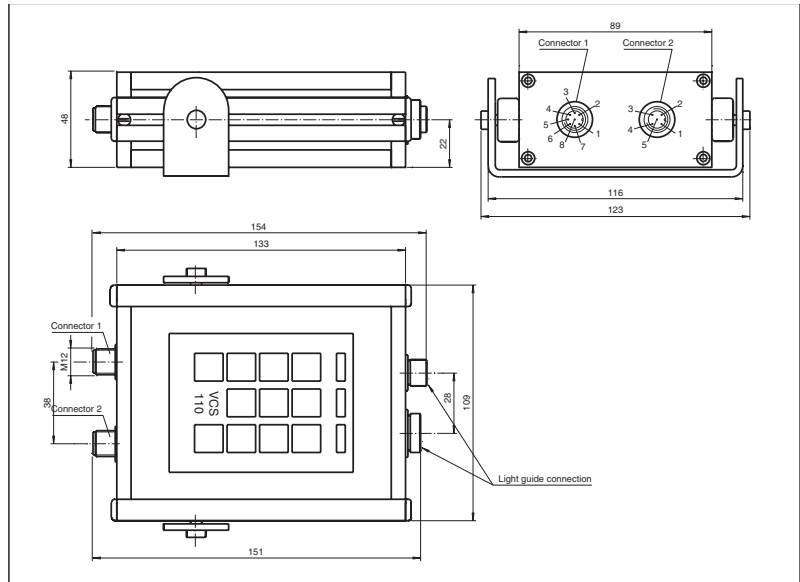
**Electrical connection**



Date of edition 2008-03-20



- Colour saving by TEACH-IN key
- Programmable up to 10 channels
- ATEX-approval for zone 2
- Colour tolerances memorisable
- Light source white-light LED
- For glass fibre optics or for plastic fibre optics

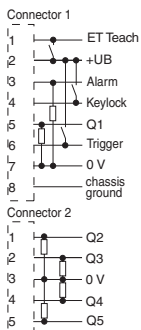


Static TEACH-IN			
Sensor range	max. 100 mm	◆	◆
Light type	White light, modulated light	◆	◆
Light source	LED	◆	◆
Marking	Ex II 2/3G EE x nA II T4/EE x II T4	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
No-load supply current	max. 100 mA	◆	◆
Function input	Trigger, key board disable, external teach	◆	◆
Signal output	5 pnp, short-circuit proof, each with two assigned value memory slots The last activated channel is exported.	◆	◆
Switching type	according to +U <sub>B</sub> switching, if colour detected	◆	◆
Switching current	max. 200 mA per output	◆	◆
Response time	4 ms	◆	◆
Output of the pre-fault indication	pnp, active in sensing range	◆	◆
EC-Type Examination Certificate	TÜV 02 ATEX 1969 X	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆
Protection degree	IP 65	◆	◆
Connection	M12 connector, 8-pin and M12 connector, 5 pin	◆	◆
Material			
Housing	anodised aluminium	◆	◆
Optical face	Fibre optics	◆	◆
Mass	300 g	◆	◆

VCS110/133

**Electrical connection**

Option 133



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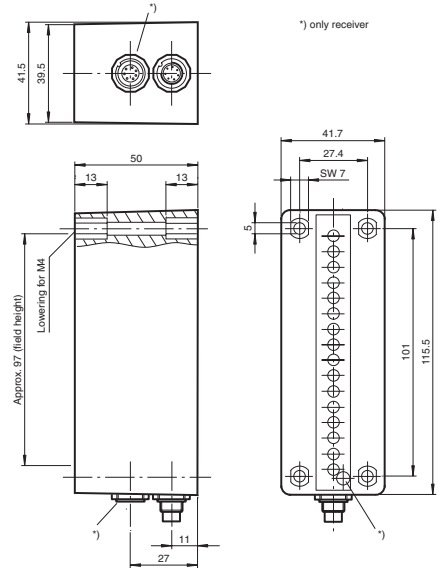
Date of edition 2008-03-20

Photoelectric sensors, colour sensors

4.9



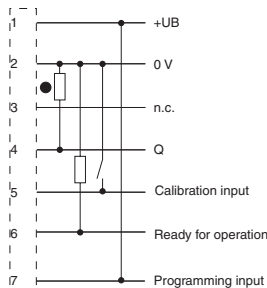
- High-resolution light grid
- Light grid with 16 beams, crossed
- Suitable for recording of transparent objects
- Automatic switching threshold adaptation eliminates soiling effects
- Smallest obstacle size 1 mm



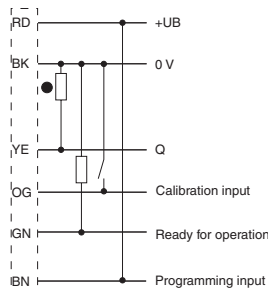
		PR16A-150-K-2-F-F	PR16A-150-K-2-F-S	PR16A-150-K-2-W-S	PR16A-30-K-2-F-F	PR16A-30-K-2-F-S	PR16A-30-K-2-W-S
Effective detection range	300 ... 500 mm	◆	◆	◆	◆	◆	◆
	500 ... 1500 mm	◆	◆	◆	◆	◆	◆
Field height	97 mm	◆	◆	◆	◆	◆	◆
Number of beams	16	◆	◆	◆	◆	◆	◆
Beam spacing	6.5 mm	◆	◆	◆	◆	◆	◆
Obstacle size	1 mm	◆	◆	◆	◆	◆	◆
Resolution	1 mm, crossed	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆
Light source	IRE D	◆	◆	◆	◆	◆	◆
Operating voltage	24 ... 28 V DC	◆	◆	◆	◆	◆	◆
Function input	Automatic calibration according to application of the power supply, duration approx. 5 s	◆	◆	◆	◆	◆	◆
	Calibration input > 10 ms, ground active, fixed saving the switching threshold	◆	◆	◆	◆	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector	◆	◆	◆	◆	◆	◆
Switching type	dark ON	◆	◆	◆	◆	◆	◆
Switching current	100 mA	◆	◆	◆	◆	◆	◆
Response time	5 ms	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	7-pin, M8 x 1 connector	◆	◆	◆	◆	◆	◆
	2.5 m cable	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆
Mass	Emitter: 130 g, Receiver: 160 g	◆	◆	◆	◆	◆	◆

Electrical connection

Connector version



Cable version

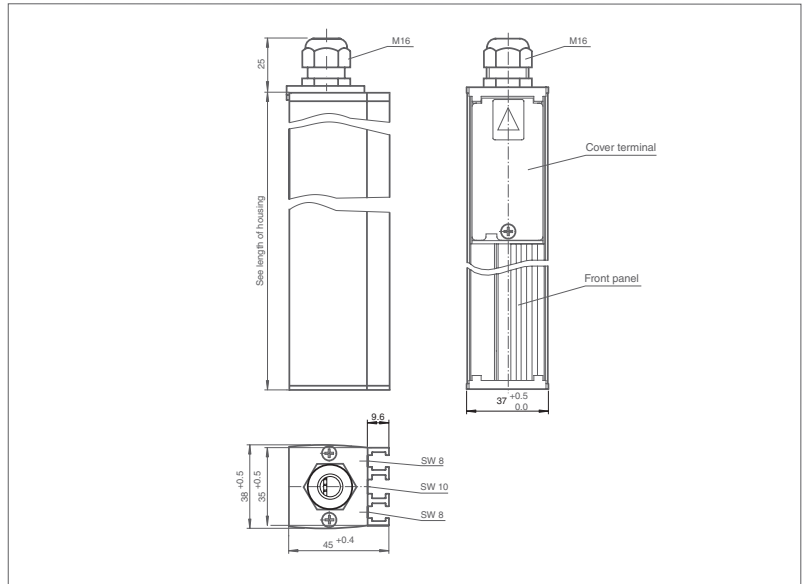


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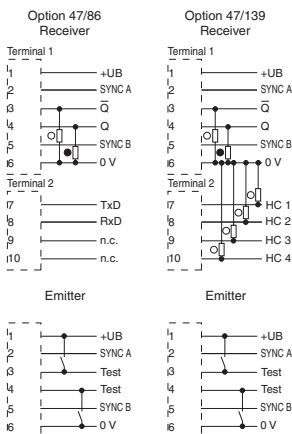


- Beam spacing 20 mm
- Parameterisable via Windows software
- sturdy housing
- no additional switching device necessary



		PLV ScanP 16-030 0-20/47/139	PLV ScanP 32-062 0-20/47/139	PLV ScanP 48-094 0-20/47/139	PLV ScanP 48-094 0-20/47/86	PLV ScanP 64-126 0-20/47/139	PLV ScanP 64-126 0-20/47/86
Effective detection range	1.5 ... 4 m, can be reduced to > 0.3 m	◆	◆	◆	◆	◆	◆
Field height	[mm]	300	620	940	940	1260	1260
Number of beams		16	32	48	48	64	64
Beam spacing	20 mm	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆
Light source	IRED	◆	◆	◆	◆	◆	◆
Operating voltage	15 ... 30 V DC	◆	◆	◆	◆	◆	◆
Power consumption	max. 7 W	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation with +U <sub>B</sub> on terminal 3 or 0V on terminal 4	◆	◆	◆	◆	◆	◆
Function input	RS 232 interface for system programming	◆	◆	◆	◆	◆	◆
Signal output	2 pnp, antivalent, short-circuit proof (monitoring field), 4 pnp, short-circuit proof, light ON (height monitoring)	◆	◆	◆	◆	◆	◆
	2 pnp, antivalent, short-circuit proof (monitoring field) and 1 x RS 232 interface with serial data output				◆		◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆
Switching current	200 mA	◆	◆	◆	◆	◆	◆
Response time	for triple crossing of beams [ms]	24	48	72	24	96	32
Timer function	Off-delay program mable from 0 ... 1.25 s in 5 ms steps	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	◆	◆	◆	◆	◆
Length of housing L	[mm]	432	745	1072	1072	1392	1392
Protection degree	IP 50	◆	◆	◆	◆	◆	◆
Connection	terminal compartment PG9 with screw terminals	◆	◆	◆	◆	◆	◆
Material							
Housing	aluminium, silver anodised	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆
Mass	[g] each device	900	1500	2100	2100	2700	2700

**Electrical connection**

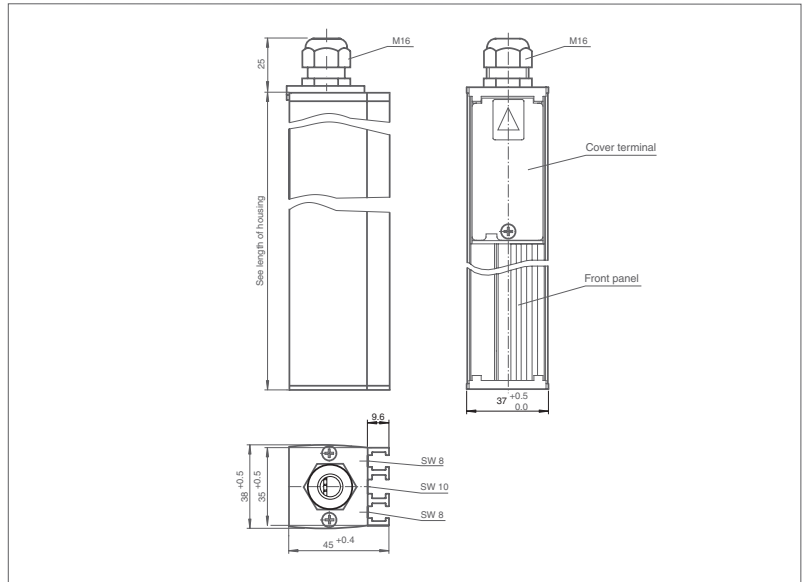


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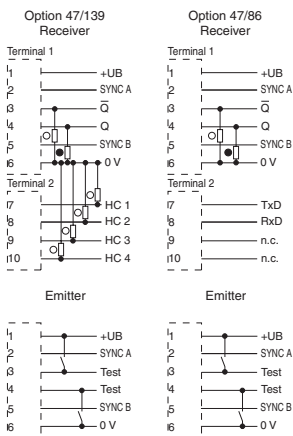


- Beam spacing 42.5 mm
- Parameterisable via Windows software
- sturdy housing
- no additional switching device necessary



		PLV ScanP 08-030 0-42/47/139	PLV ScanP 16-064 0-42/47/139	PLV ScanP 24-098 0-42/47/139	PLV ScanP 32-132 0-42/47/139	PLV ScanP 40-166 0-42/47/139	PLV ScanP 48-200 0-42/47/139	PLV ScanP 48-200 0-42/47/86	PLV ScanP 56-234 0-42/47/139	PLV ScanP 56-234 0-42/47/86	PLV ScanP 64-268 0-42/47/139	PLV ScanP 64-268 0-42/47/86
Effective detection range	1.5 ... 4 m, can be reduced to > 0.3 m	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Field height	[mm]	300	640	980	1320	1660	2000	2000	2340	2340	2680	2680
Number of beams		8	16	24	32	40	48	48	56	56	64	64
Beam spacing	42.5 mm	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Light source	IRED	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Operating voltage	15 ... 30 V DC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Power consumption	max. 7 W	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Test input	emitter deactivation with +U <sub>B</sub> on terminal 3 or 0V on terminal 4	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Function input	RS 232 interface for system programming	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Signal output	2 pnp, antivalent, short-circuit proof (monitoring field), 4 pnp, short-circuit proof, light ON (height monitoring) 2 pnp, antivalent, short-circuit proof (monitoring field) and 1 x RS 232 interface with serial data output	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching type	light/dark switching	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Switching current	200 mA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Response time	for triple crossing of beams [ms]	12	24	36	48	60	72	24	84	28	96	32
Timer function	Off-delay programmable from 0 ... 1.25 s in 5 ms steps	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Length of housing L	[mm]	387	727	1067	1407	1747	2087	2087	2427	2427	2767	2767
Protection degree	IP50	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Connection	terminal compartment PG9 with screw terminals	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Material												
Housing	aluminium, silver anodised	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Optical face	P MMA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Mass	[g] each device	700	1100	1500	1900	2300	2700	2700	3200	3200	3600	3600

**Electrical connection**



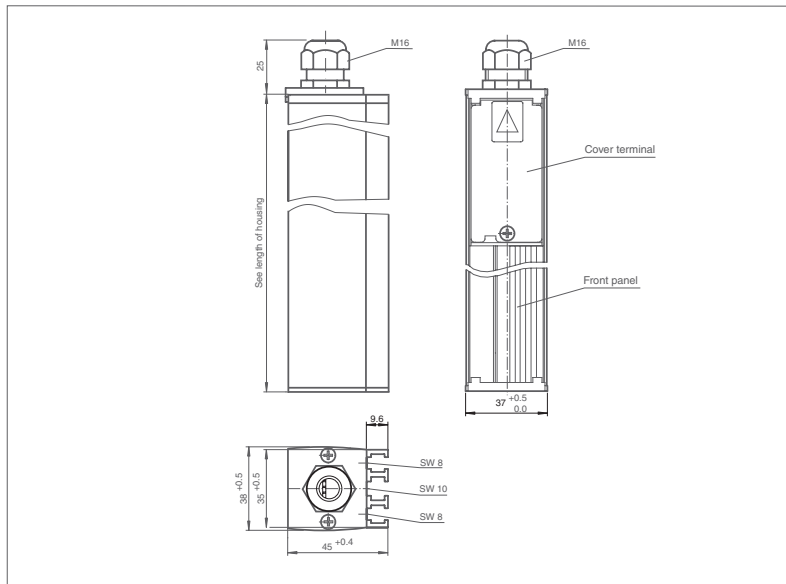
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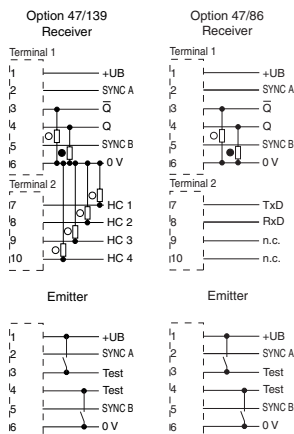


- Beam spacing 48.5 mm
- Parameterisable via Windows software
- sturdy housing
- no additional switching device necessary



	PLV ScanP 08-0340-48/47/139	PLV ScanP 16-0728-48/47/139	PLV ScanP 16-0728-48/47/86	PLV ScanP 24-1116-48/47/139	PLV ScanP 24-1116-48/47/86	PLV ScanP 32-1504-48/47/139	PLV ScanP 40-1892-48/47/139	PLV ScanP 48-2280-48/47/139	PLV ScanP 56-2668-48/47/139	PLV ScanP 64-3056-48/47/139	PLV ScanP 64-3056-48/47/86
Effective detection range	3 ... 8 m , can be reduced to > 0.3 m										
Field height	[mm]										
Number of beams	8	16	16	24	24	32	40	48	56	64	64
Beam spacing	48.5 mm										
Light type	infrared, modulated light										
Light source	IRED										
Operating voltage	20 ... 30 V DC										
Power consumption	max. 10 W										
Test input	emitter deactivation with +UB on terminal 3 or 0V on terminal 4										
Function input	RS 232 interface for system programming										
Signal output	2 pnp, antivalent, short-circuit proof (monitoring field) , 4 pnp, short-circuit proof, light ON (height monitoring)										
	2 pnp, antivalent, short-circuit proof (monitoring field) and 1 x RS 232 interface with serial data output										
Switching type	light/dark switching										
Switching current	200 mA										
Response time	for triple crossing of beams [ms]										
Timer function	Off-delay programmable from 0 ... 1.25 s in 5 ms steps										
Ambient temperature	-10 ... 60 °C (263 ... 333 K)										
Length of housing L	429	817	817	1205	2427	1593	1981	2369	2757	3145	3145
Protection degree	IP50										
Connection	terminal compartment PG9 with screw terminals										
Material											
Housing	aluminium, silver anodised										
Optical face	PMMA										
Mass	800	1200	1200	1600	1600	2000	2400	2800	3200	3600	3600

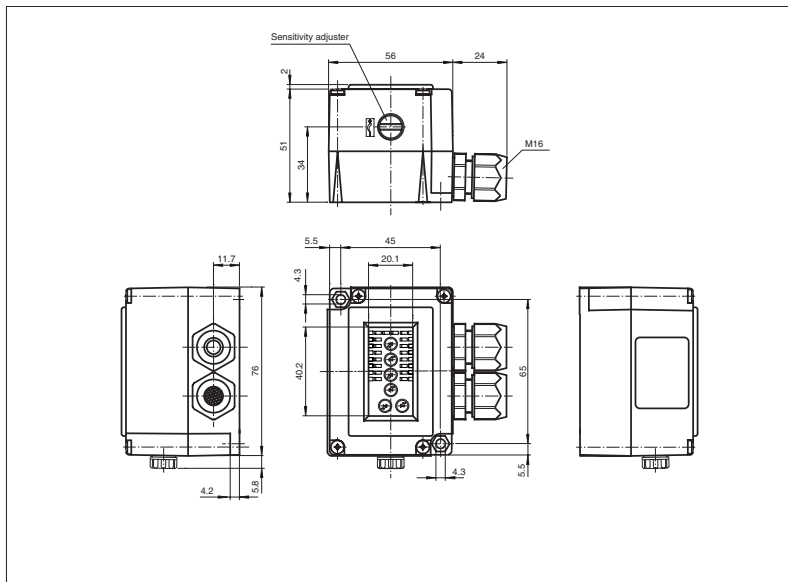
Electrical connection



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- 8 bit parallel data transfer
- Very large angle of divergence
- Cascadable
- Connection with spring-loaded terminals
- Protection degree IP67



		DAD15-8P	DAD15-8P/35	DAD15-8P-NP N	DAD15-8P-NP N/35
Effective detection range	0 ... 1500 mm	◆	◆	◆	◆
	0 ... 2500 mm				◆
Light type	infrared, modulated light	◆	◆	◆	◆
Light source	IREL	◆	◆	◆	◆
Diameter of the light spot	approx. 1000 mm at 1.5 m	◆	◆	◆	◆
	approx. 500 mm at 1.5 m		◆		◆
Angle of divergence	± 20 °	◆	◆	◆	◆
	± 8 °		◆		◆
Cycle time	35 ms	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
	10 ... 60 V DC	◆	◆	◆	◆
No-load supply current	40 mA	◆	◆	◆	◆
Data rate	225 Bit/s	◆	◆	◆	◆
Data sampling blanking	Enable input emitter deactivation	◆	◆	◆	◆
Interface type	8 bit parallel, bidirectional	◆	◆	◆	◆
	10 inputs, npn ; 10 outputs, npn		◆		◆
	8 bit parallel, bidirectional	◆	◆	◆	◆
	10 inputs, pnp ; 10 outputs, pnp		◆		◆
Switching current	max. 200 mA per channel, short-circuit proof, total ≤ 800 mA	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	2 M16-screwed connections, spring-loaded terminals in the terminal space	◆	◆	◆	◆
Material					
Housing	Terluran, black	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆
Mass	170 g	◆	◆	◆	◆

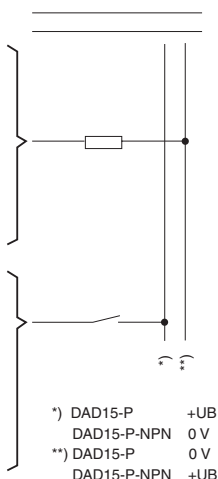
4.11

Photoelectric sensors, data couplers

Electrical connection

Pin	Function	Description
1, 14	0 V	- Supply voltage
2	+UB	+ Supply voltage
3	SYNC	Synchronization
4	REC	Receive indicator
5	D8OUT	Output data bit 8
6	D7OUT	Output data bit 7
7	D6OUT	Output data bit 6
8	D5OUT	Output data bit 5
9	D4OUT	Output data bit 4
10	D3OUT	Output data bit 3
11	D2OUT	Output data bit 2
12	D1OUT	Output data bit 1
13, 25	-	not connected
15	D8IN	Input data bit 8
16	D7IN	Input data bit 7
17	D6IN	Input data bit 6
18	D5IN	Input data bit 5
19	D4IN	Input data bit 4
20	D3IN	Input data bit 3
21	D2IN	Input data bit 2
22	D1IN	Input data bit 1
23	IN-Master/Slave	Master/Slave select
24	IN Enable	Input enable

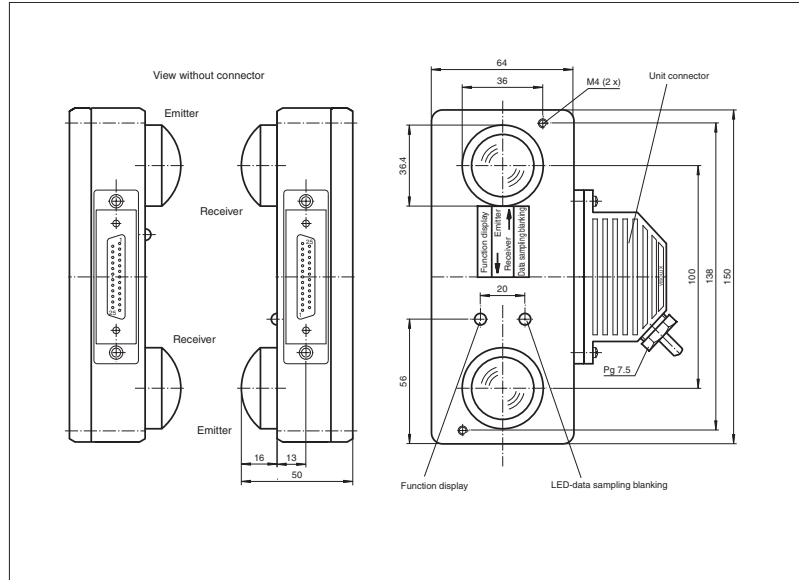
Schematic



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- Compact, flat aluminium housing
- 3 interfaces in a device can be selected via DIP switches
- Mating connector with protective cover included delivery



		DAD30	DAD30/35	DAD30-RT	DAD30-RT/35	DAD30-W
Effective detection range	0 ... 100 m		◆		◆	
	0 ... 15 m					◆
	0 ... 30 m	◆		◆		
Light type	infrared, modulated light	◆	◆			◆
	red, modulated light			◆	◆	
Light source	IRED	◆	◆			◆
	LED			◆	◆	
Diameter of the light spot	1800 mm at a distance of 100 m		◆			
	4200 mm at a distance of 15 m					◆
	500 mm at a distance of 30 m	◆		◆		
Angle of divergence	Emitter: 1 ° Receiver: 5 °	◆	◆	◆	◆	
	Emitter: 16 ° Receiver: 16 °					◆
Alignment aid	with function display	◆		◆	◆	◆
Transmission mode	FSK	◆	◆	◆	◆	◆
Operating voltage	24 V DC ± 25 %	◆	◆	◆	◆	◆
No-load supply current	200 mA	◆	◆	◆	◆	◆
Data rate	0 ... 19.2 kBit/s	◆	◆	◆	◆	◆
Operation frequency	F1 = 83 kHz F2 = 118 kHz	◆	◆	◆	◆	◆
Data sampling blanking	Input for incoming data blanking with +24 V DC	◆	◆	◆	◆	◆
Interface type	RS 232, RS 422, CL20 mA active/passive switchable	◆	◆	◆	◆	◆
Output of the pre-fault indication	2 pnp-outputs, short-circuit proof, 30 V DC 0.1 A activated for single or sufficient stability control	◆	◆	◆	◆	◆
Measurement output	+1.8 ... 5.8 V DC, max. 10 mA, simple stability control: 2.5 V triple stability control: 4.2 V	◆	◆	◆	◆	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆	◆	◆
Protection degree	IP 65	◆	◆	◆	◆	◆
Connection	25-pin Sub-D connector	◆	◆	◆	◆	◆
Material						
Housing	aluminium	◆	◆	◆	◆	◆
Optical face	glass	◆	◆	◆	◆	◆
	Plastic lens	◆	◆	◆	◆	◆
Mass	500 g	◆	◆	◆	◆	◆

Electrical connection

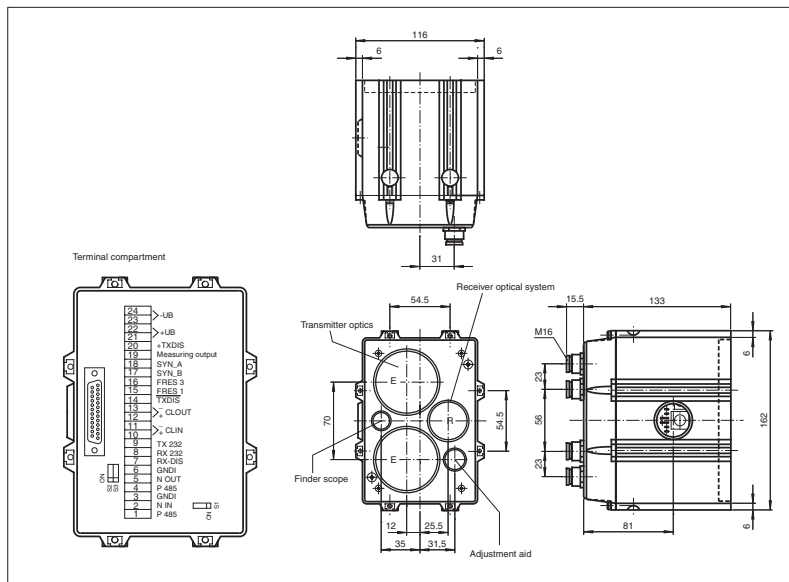
Pin	Function	Description	Schematic
2	RX232	RS 232 input	
3	TX232	RS 232 output	
5	TX-N	RS 422 Data- (A-output)	
6	Alarm 1	1-fold stability control	
7	0 V	- supply voltage	
9	Analog	Measure output	
10	RX-DIS	Data blanking	
11	+UB	+ supply voltage	
12	Alarm 2	sufficient stability control	
13	RX-DIS/TTL	Data disable	
14	RX-P	RS 422 (B-input)	
15	RX-N	RS 422 (A-input)	
16	TX-P	RS 422 (B-output)	
17	TX-N	RS 422 (A-output)	
18	CL-IN+	Current loop input	
19	CL-IN-	Current loop input	
21	CL-OUT-	Current loop output	
22	TX-DIS	Emitter disable	
25	CL-OUT+	Current loop output	
1, 4, 5, 8, 20, 23, 24	-	not connected	

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- 3 interfaces in a device can be selected via DIP switches
  - RS 232
  - RS 422
  - CL
- High detection ranges achievable
- Easy adjustment by integrated alignment LED and finder scope
- Band display for signal strength
- Sturdy aluminium housing



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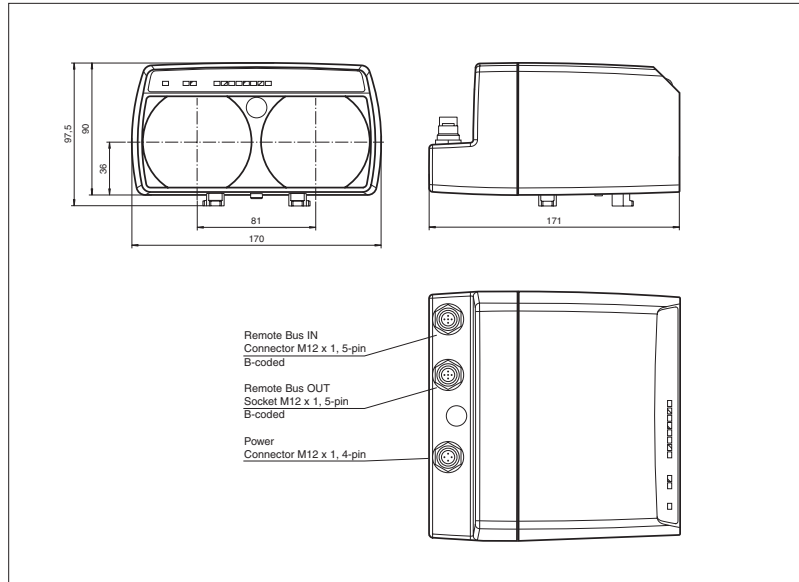
		LS230-DA	LS230-DA-GUF	LS230-DA-RT
Effective detection range	0 ... 180 m 0 ... 230 m	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆
Light source	LED	◆	◆	◆
Diameter of the light spot	6300 mm at a distance of 350 m 8000 mm at a distance of 230 m	◆	◆	◆
Angle of divergence	emitter 2 ° , receiver 5 °	◆	◆	◆
Alignment aid	Telescopic sight, frontal red LED flashing, off with Signal > sufficient stability control	◆	◆	◆
Transmission mode	FSK	◆	◆	◆
Operating voltage	24 V DC ± 25 %	◆	◆	◆
No-load supply current	max. 1000 mA 250 mA	◆	◆	◆
Data rate	0 ... 19.2 kBit/s	◆	◆	◆
Operation frequency	F1 = 83 kHz , F2 = 118 kHz	◆	◆	◆
Data sampling blanking	emitter deactivation for +UB, emitter deactivation TTL-compatible, receiver deactivation TTL-compatible	◆	◆	◆
Interface type	RS 232, RS 422, CL20 mA active/passive switchable	◆	◆	◆
Output of the pre-fault indication	2 pnp-outputs, short-circuit proof, 30 V DC 0.1 A activated for single or sufficient stability control	◆	◆	◆
Measurement output	2.5 ... 6 V DC, max. 10 mA, single stability control 3.5 V, sufficient stability control 5 V	◆	◆	◆
Ambient temperature	-20 ... 50 °C (253 ... 323 K) -30 ... 50 °C (243 ... 323 K) with heated housing	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	4 x M16 cable glands , spring terminals in the terminal compartment	◆	◆	◆
Material				
Housing	aluminium	◆	◆	◆
Optical face	Plastic lenses, glass windows	◆	◆	◆
Mass	1600 g	◆	◆	◆

**Electrical connection**

Pin	Function	Description	Schematic
1	RX-P	RS 422 Data+ (B-input)	
2	RX-N	RS 422 Data- (A-input)	
3, 6	GNDI	Data Ground isolated	
4	TX-P	RS 422 Data+ (B-output)	
5	TX-N	RS 422 Data- (A-output)	
7	RX-DIS	Disable TTL	
8	RX232	RS 232 input	
9	TX232	RS 232 output	
10	CL-IN+	20 mA input	
11	CL-IN-	20 mA input	
12	CL-OUT+	20 mA output	
13	CL-OUT-	20 mA output	
14	TX-DIS	Emitter disable TTL	
15	Alarm 1	1-fold stability control	
16	Alarm 2	sufficient stability control	
17, 18	-	not connected	
19	Analog	measure output 2,5 V ... 6 V	
20	TX-DIS	Emitter disable	
21, 22	+UB	+ supply voltage	
23, 24	0 V	- supply voltage (GND)	

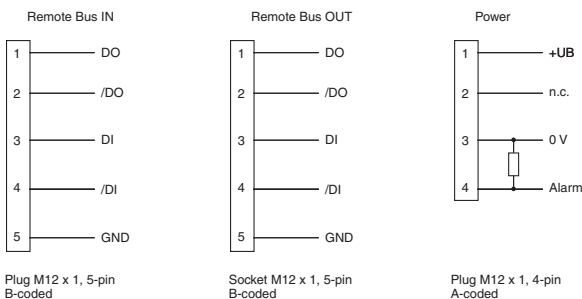


- Devices for INTERBUS
  - Plug connection for fast mounting
  - No parameterisation
  - Usable up to detection range 0
  - Line indicator for signal strength
  - Version for low temperature applications
- LS610-DA-IBS/F1/146  
LS610-DA-IBS/F2/146



		LS610-DA-IBS/F1	LS610-DA-IBS/F1/146	LS610-DA-IBS/F1/35	LS610-DA-IBS/F2	LS610-DA-IBS/F2/146	LS610-DA-IBS/F2/35
Effective detection range	0 ... 120 m 0 ... 240 m	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆
Diameter of the light spot	2 m at a distance of 100 m	◆	◆	◆	◆	◆	◆
Angle of divergence	1.1 °	◆	◆	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	200 mA	◆	◆	◆	◆	◆	◆
Data rate	0 ... 2 Mbit/s	◆	◆	◆	◆	◆	◆
Operation frequency	F1 = 8.25 MHz F2 = 12.5 MHz	◆	◆	◆	◆	◆	◆
Interface type	RS 422, electrically isolated	◆	◆	◆	◆	◆	◆
Output of the pre-fault indication	1 pnp (switches if there is sufficient stability control) short-circuit proof, max. 200 mA	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K) -30 ... 50 °C (243 ... 323 K), For use in dry coldness	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	M 12x1 connector, 4-pin, standard (supply), M 12x1 connector, 5-pin, B-coded (Remote Bus In), M 12x1 socket, 5-pin, B-coded (Remote Bus Out)	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS / PC	◆	◆	◆	◆	◆	◆
Optical face	plastic	◆	◆	◆	◆	◆	◆
Mass	700 g	◆	◆	◆	◆	◆	◆

Electrical connection



The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

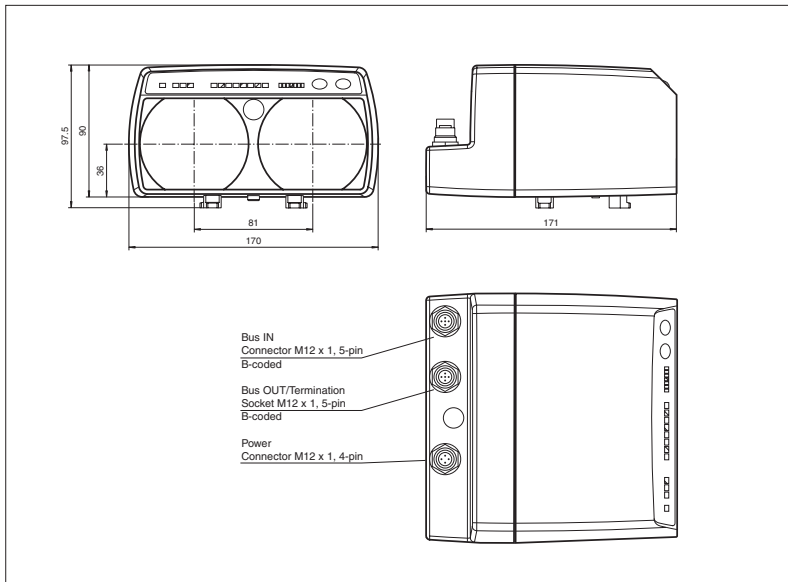
Date of edition 2008-03-20

4.11 Photoelectric sensors, data couplers



- Devices for PROFIBUS
- Problem-free light beam interruption due to TVT (Telegram Verification Technology)
- Plug connection for fast mounting
- Simple parameterisation without opening of the device
- Usable up to detection range 0
- Line indicator for signal strength
- Version for low temperature applications

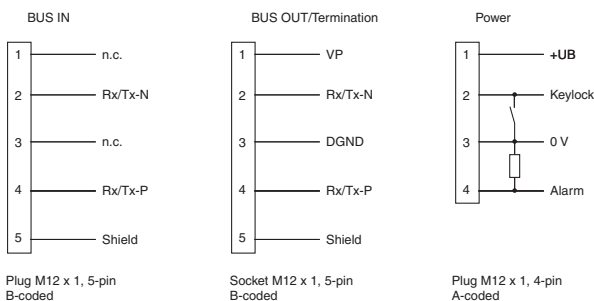
LS610-DA-P/F1/146  
LS610-DA-P/F2/146



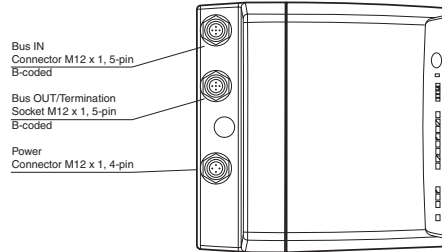
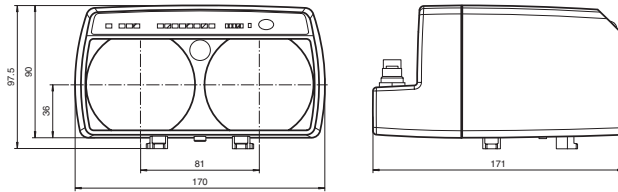
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

		LS610-DA-P/F1	LS610-DA-P/F1/146	LS610-DA-P/F1/35	LS610-DA-P/F2	LS610-DA-P/F2/35	LS610-DA-P/F2/146
Effective detection range	0 ... 120 m 0 ... 240 m	◆	◆	◆	◆	◆	◆
Light type	infrared, modulated light	◆	◆	◆	◆	◆	◆
Diameter of the light spot	2 m at a distance of 100 m	◆	◆	◆	◆	◆	◆
Angle of divergence	1.1 °	◆	◆	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	200 mA	◆	◆	◆	◆	◆	◆
Data rate	93,75; 187,5;(350); 500;1500 kBit/s , adjustable	◆	◆	◆	◆	◆	◆
Operation frequency	F1 = 8.25 MHz F2 = 12.5 MHz	◆	◆	◆	◆	◆	◆
Interface type	PROFIBUS, electrically isolated	◆	◆	◆	◆	◆	◆
Function input	Keylock, internal Pull-up resistor keypad locked with 0 V	◆	◆	◆	◆	◆	◆
Output of the pre-fault indication	1 pnp (switches if there is sufficient stability control) short-circuit proof, max. 200 mA	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K) -30 ... 50 °C (243 ... 323 K), Foruse in dry coldness	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	M12x1 connector, 4-pin, standard (supply) , M12x1 connector, 5-pin, B-coded (Bus In) , M12x1 socket, 5-pin, B-coded (Bus Out/Termination)	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS / PC	◆	◆	◆	◆	◆	◆
Optical face	plastic	◆	◆	◆	◆	◆	◆
Mass	700 g	◆	◆	◆	◆	◆	◆

**Electrical connection**



Date of edition 2008-03-20

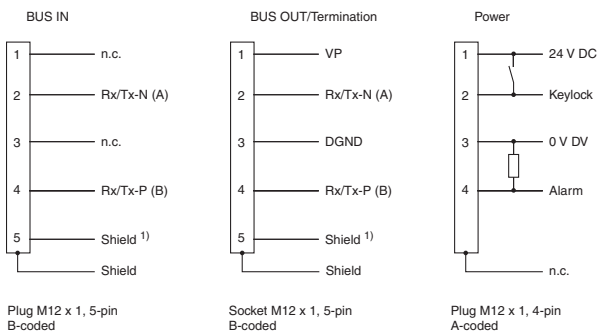


- Devices for PROFIBUS
- identical units data communication with identical units
- Problem-free light beam interruption due to TVT (Telegram Verification Technology)
- Plug connection for fast mounting
- Simple parameterisation without opening of the device
- Usable up to detection range 0
- Line indicator for signal strength



		LS611-DA-P	LS611-DA-P/35
Effective detection range	0 ... 150 m 0 ... 300 m	◆	◆
Light type	infrared, modulated light	◆	◆
Diameter of the light spot	2 m at a distance of 100 m	◆	◆
Angle of divergence	1.2°	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
Operating current	200 mA	◆	◆
Data rate	93.75/187.5/500/1500 kBit/s, adjustable	◆	◆
Operation frequency	8.25 MHz	◆	◆
Interface type	PROFIBUS DP-V0,-V1,-V2; FMS; MPI; FMS-DP mixed mode; galvanically isolated	◆	◆
Function input	Tastatursperre, Digital-Eingang (current sinking), gesperrt mit ON	◆	◆
Output of the pre-fault indication	1 pnp (switches if there is sufficient stability control) short-circuit proof, max. 200 mA	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆
Protection degree	IP 65	◆	◆
Connection	M 12x1 connector, 4-pin, standard (supply), M 12x1 connector, 5-pin, B-coded (Bus In), M 12x1 socket, 5-pin, B-coded (Bus Out/Termination)	◆	◆
Material			
Housing	ABS / PC	◆	◆
Optical face	plastic	◆	◆
Mass	700 g	◆	◆

Electrical connection



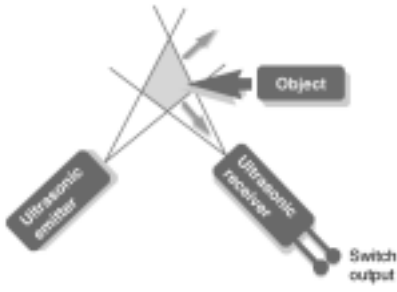
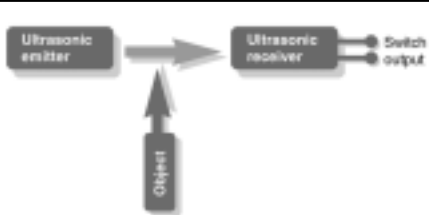
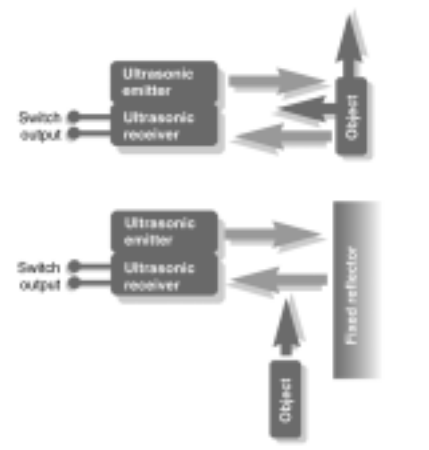
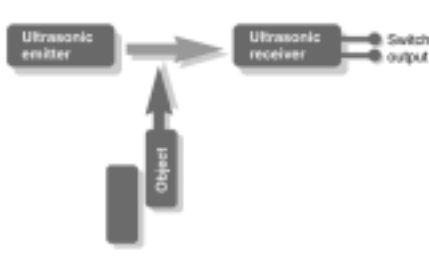
Photoelectric sensors, data couplers

The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

# Ultrasonic sensors

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 <b>Accessories for ultrasonic sensors</b> (see section 9.7 from page 701)	

Overview

	Sensing range (max.)	Output					Connection			
		PNP	NPN	Push-pull	Relay	Analog	Cable	Connector	Terminal hous-	
 <p><b>Sensors for separate evaluation</b></p>	30GM series	6000 mm						•		
	VariKont® series	3000 mm							•	
	FP series	6000 mm							•	
	F54 series	2000 mm							•	
 <p><b>Thru-beam sensors</b></p>	18GM40 series	1000 mm	•						•	
	30GM series	4000 mm	•	•						•
	VariKont® series	6000 mm	•							•
	F64 series	1500 mm	•	•				•	•	
 <p><b>Direct detection and retro-reflective sensors</b></p>	12GM series	400 mm	•						•	
	18GM40 series	800 mm	•							•
	18GM75 series	1000 mm	•	•						•
	30GM series	6000 mm	•	•						•
	VariKont® series	3000 mm	•	•				•		•
	FP series	6000 mm	•	•				•		•
	F12 series	800 mm			•					•
	F42 series	4000 mm	•	•		•	•			•
	F43 series	2000 mm				•	•			•
	F54 series	2000 mm	•	•						•
D1 series	550 mm				•				•	
LUC series	4000 mm								•	
 <p><b>Double sheet detection</b></p>	UDC-18GM(A) series (double sheet detector)	60 mm	•	•					•	
	ULB-18GM series (label detection)	60 mm	•	•						•
	UGB-18GM series (splice detection)	60 mm	•	•						•
	UDC-30GM(A) series (double material detection)	150 mm	•							•

- 1) upon request
- 2) 10 ... 30 V DC without current output function
- 3) 10 ... 252 V DC / 20 ... 252 V AC
- 4) DC types: 10 ... 30 V DC, DC/AC types: 20 ... 253 V DC, 15 ... 253 V AC
- 5) only DC types

	Supply voltage	Right-angled sensing head	Error message display	Timer function/pulse extension	No / NC programmable	Synchronized input	TEACH-IN programmable	adjustable sound beam width	serial port	parallel port (8 bit)	page
	10 ... 30 V DC					•					503
	10 ... 30 V DC					•					522
	10 ... 60 V DC					•					526
	10 ... 30 V DC					•					543
	10 ... 30 V DC	• <sup>1)</sup>	•					•			488
	18 ... 30 V DC		•	•							489
	20 ... 30 V DC		•								521
	7,5 ... 30 V DC										519
	10 ... 30 V DC		•		•						490
	10 ... 30 V DC	•	•		•						493
	18 ... 30 V DC	• <sup>1)</sup>	•		•	•		•			497
	10 ... 30 V DC		•		•	•			•		504
	15 ... 30 V DC		•		•	•			•	•	523
	15 ... 30 V DC		•		•	•			•	•	527
	10 ... 30 V DC		•		•	•		•			530
	DC/AC <sup>4)</sup>		•		•	• <sup>5)</sup>		•			531
	15 ... 30 V DC <sup>2)</sup>		•	•	•				•		542
	10 ... 30 V DC		•		•	•					544
	DC/AC <sup>3)</sup>		•								517
	10 ... 30 V DC		•								518
	18 ... 30 V DC	•		•			•				546
	18 ... 30 V DC						•				551
	18 ... 30 V DC			•			•				552
	18 ... 30 V DC			•			•				550

1) upon request

2) 10 ... 30 V DC without current output function

3) 10 ... 252 V DC / 20 ... 252 V AC

4) DC types: 10 ... 30 V DC,

DC/AC types: 20 ... 253 V DC

15 ... 253 V AC

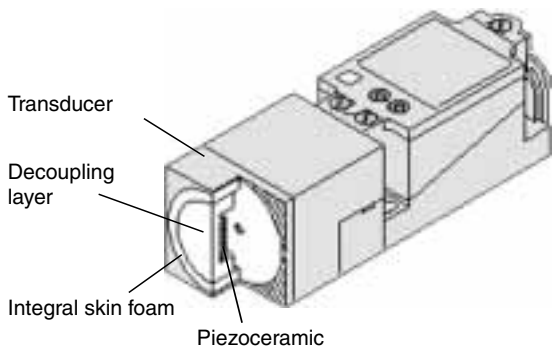
5) only DC types

## Physics and technology of ultrasonic sensors

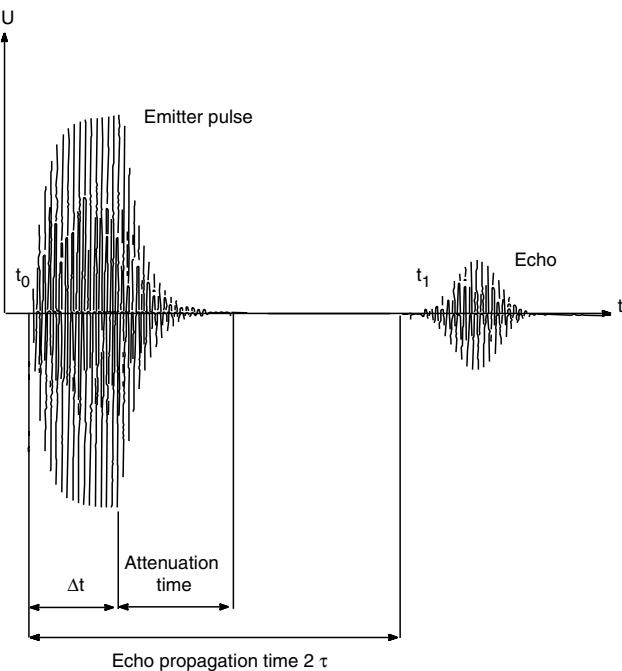
Sound with a frequency over 16kHz is inaudible to the human ear. These type of sounds are termed ultrasonic. Ultrasonics travels at 344 m/s through the air – the same as audible sound. By evaluating the speed of sound and its runtime, the distance of an object can be precisely measured.

Pepperl+Fuchs ultrasonic sensors operate with a piezoelectric transducer as the sound emitter and receiver. A patented decoupling layer in special material is used to decouple the ultrasonics to the air - an acoustically thin medium.

This watertight ultrasonic transducer is embedded in polyurethane foam.



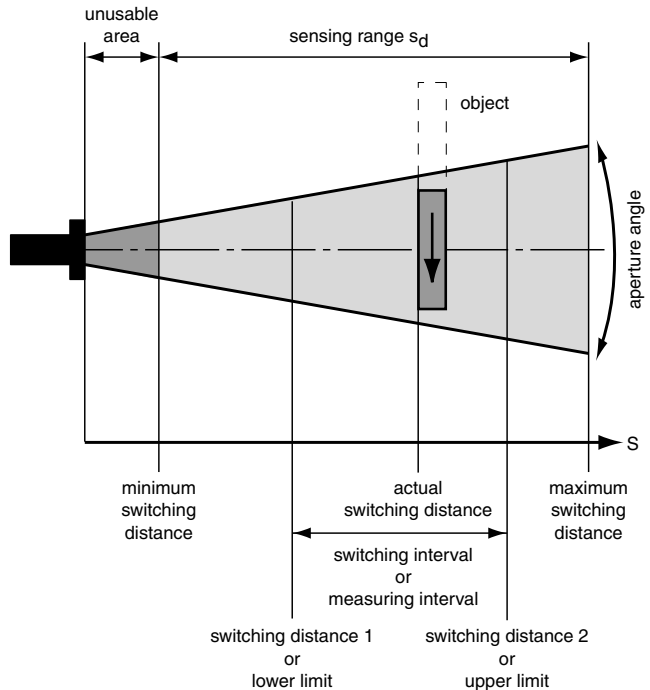
The transducer transmits a packet of sonic pulses and converts the echo pulse into a voltage. The integrated controller computes the distance from the echo time and the velocity of sound. The transmitted pulse duration  $t$  and the decay time of the sonic transducer result in an unusable area in which the ultrasonic sensor cannot detect an object. The ultrasonic frequency lies between 65 kHz and 400 kHz, depending on the sensor type; the pulse repetition frequency is between 14 Hz and 140 Hz.



The active range of the ultrasonic sensor is referred to as the sensing range  $s_d$ . The sensing range is the distance within which the ultrasonic sensor will detect a target. The model number defines the maximum sensing range of the sensor.

The ultrasonic sensor detects objects within its sensing range, regardless of whether these objects approach the sensor axially or move through the sound cone laterally.

Ultrasonic sensors are available with switching outputs and/or analog output. Various output functions are available according to model.



The ultrasonic beam has an opening angle of around  $\pm 5^\circ$ . The sound pressure level outside of this cone is less than half (-6 dB) that of the value on the sensor axis.

The opening angle defines the spatially dimension of the sound cone. The diameter of the sound cone  $D$  for a certain distance from the sensor  $S$  can be calculated by:

$$D = 2 \cdot \tan \alpha \cdot S$$

*In the above equation, only the angle between the curve and the center line ( $0^\circ$ ) is used (half the beam width).*

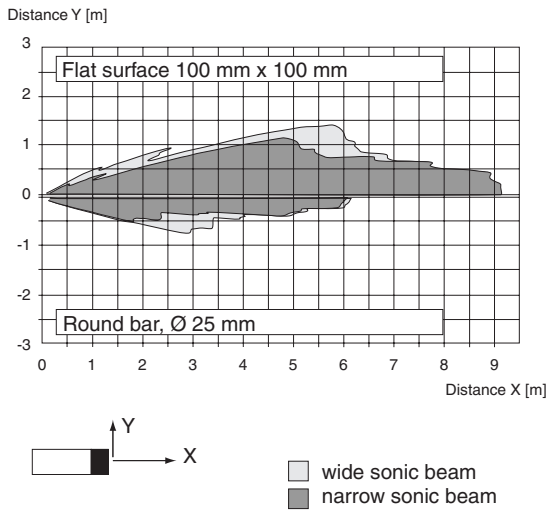
For a simple evaluation of the diameter  $D$ , the following is a list of the tangent values for angles between  $= 2^\circ \dots = 20^\circ$ .

Angle $\alpha$	$\tan \alpha$	Angle $\alpha$	$\tan \alpha$
2°	0.035	12°	0.213
4°	0.07	14°	0.249
6°	0.105	16°	0.287
8°	0.141	18°	0.325
10°	0.176	20°	0.364



The following figure shows the detection areas for typical objects. Within these areas the sensor detects the specified object.

Example: UB6000-F42...



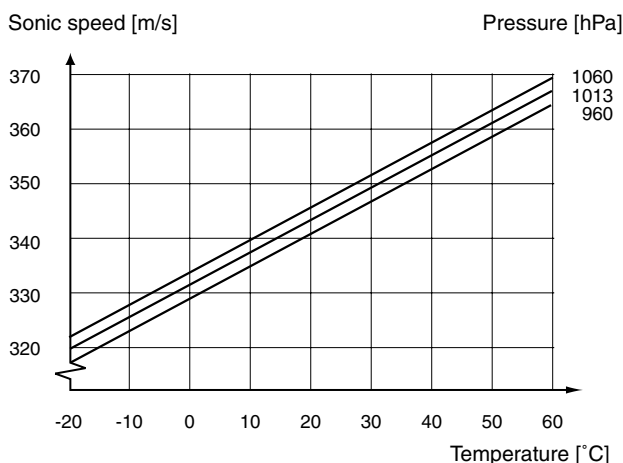
Where A = flat plate, 100 mm x 100 mm  
B = round bar, 25 mm diameter

The specifications given for a model number are in reference to a standard flat plate, 100 mm x 100 mm. This plate must be placed at a right angle to the axis of the beam in order for the echo to be reflected to the sensor. The target must be completely within its specified sensing envelope to ensure accurate detection. The sound pulses are reflected away if the object is angled to this axis and consequently the echo does not reach the sensor. The sensing characteristics of a round bar as a target are also shown. Take note that it must be placed perpendicular to the sensing axis in order to achieve the results shown.

Due to the physical properties of sound propagation, the range and velocity of the ultrasonic beam are dependent on:

- air temperature
- relative humidity
- barometric pressure

The following figure shows the theoretical relationship between the air temperature and pressure and the velocity of sound.



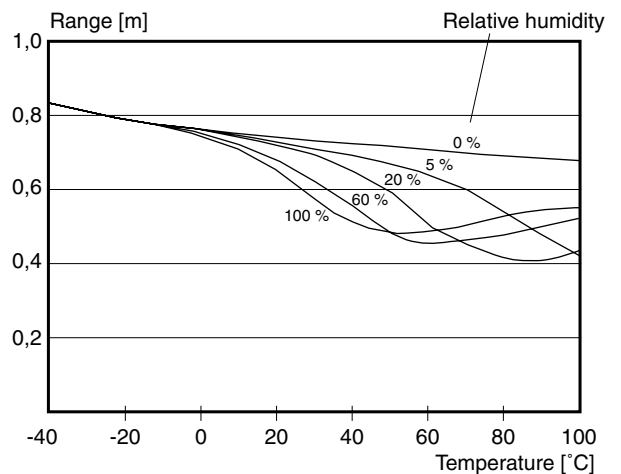
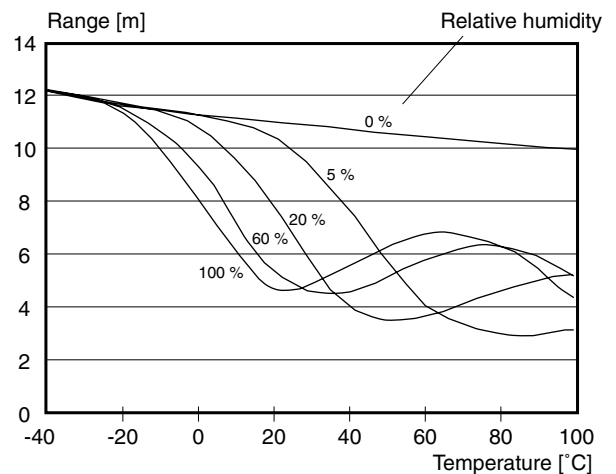
Because the signal echo time is evaluated in our ultrasonic sensors, most sensors are temperature-compensated. This eliminates most temperature effects on the sensor output.

This temperature compensation is performed by an electrical temperature sensor that is integrated into the sensor.

The sensor gives off a certain intrinsic heat that depends on the operating mode and the design. This intrinsic heat results in an additional temperature error of 2% during the first 60 minutes of operation after power on.

Fast transient temperature changes cannot be compensated for by the ultrasonic sensor.

The relationships between the sensing range of ultrasonic sensors and the air temperature, as well as those between the range and the relative humidity, are shown in the following charts. The charts shown here apply to sensors of the UC4000-30GM... and UC500-30GM... series, but apply in principle to all ultrasonic sensors.



There is a substantial increase in sensing range at low temperatures that is virtually independent of the relative humidity. The reduced range at high temperatures, however, is strongly influenced by the relative humidity.

**The sensing ranges stated in the data sheets for our ultrasonic sensors are based on an ambient temperature of +20 °C (+68 °F) and a relative humidity of 50%.**

## 7 steps for selecting the appropriate sensor

The product range for ultrasound sensors is huge; they are used in the most varied areas. To find the correct sensor type for every application five selection criteria have been described in more detail on the next five pages:

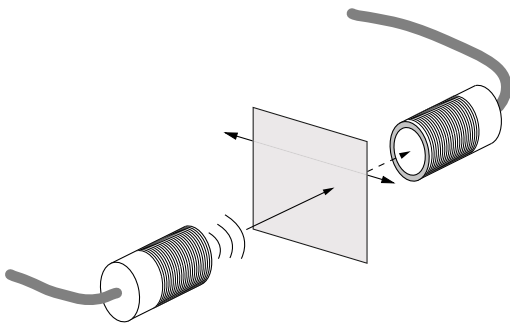
1. Sensing principles
2. Output functions
3. Housing styles
4. Electrical connections
5. Programming

### 1. Operating principle

Ultrasonic sensors evaluate the time it takes for the sound to travel from sensor to target and back to sensor (direct detection), or check whether the transmitted signal has been received by a separate receiver (detection by beam interruption).

#### Ultrasonic thru-beam sensors

The emitter and receiver are separate, mounted facing each other. If the ultrasonic beam is broken by an object, then the switch output becomes active.



#### Features:

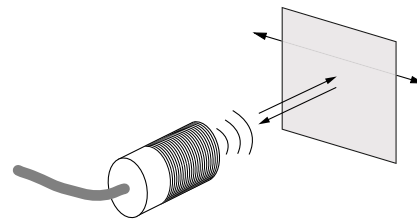
- High range, since the ultrasonic beam travels the signal distance once.
- Less susceptible to interference, suitable for difficult operating conditions
- Very fast switching behavior.
- Increased installation cost, both units must be wired.

#### Ultrasonic direct detection sensors

The transmitter and receiver are within the same housing. This minimizes the installation cost because only one device needs to be installed and cabled. The response time is longer than in thru-beam sensors.

#### Direct detection operation

The object itself serves as sound reflector.



#### Features:

- Sensing range depends on the surface properties and the angle of incidence of the target
- Simple installation, the complete sensor is a single unit

The object's detection is represented by a binary signal at the switching output or an analog distance signal at an analog output (4 ... 20 mA or 0 ... 10 V) or a digital distance value at a serial or parallel port.

#### Binary object detection

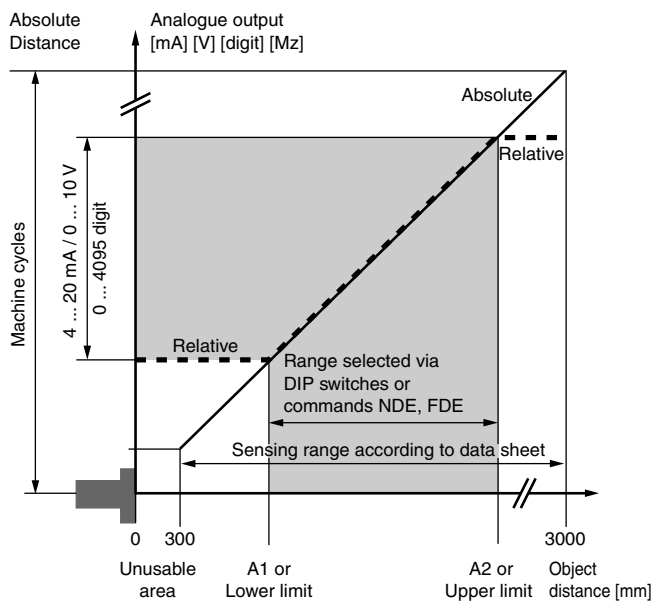
The runtime of the sound pulses is determined by the distance of the object. A switch point or switching window is defined with millimeter precision by either teach-in or programming. The object's distance from the sensor is compared to the switch point or switching window. The output switches on or off depending on the result of this comparison (see section "Output functions" on page 474).

#### Analog distance measurement

The sensor determines the distance to an object by measuring the time that elapses between the sending of an ultrasonic burst and the arrival of the echo reflected by the target. The sensors operate in direct detection mode and have various analog outputs, depending on the model:

- Analog voltage output: 0 V ... 10 V
- Analog current output: 4 mA ... 20 mA
- 8 bit parallel output
- Serial output RS 232
  - Absolute: distance as a sequence of digits in [mm]
  - Relative: type ...RS: three digit sequence (0 ... 254)
  - type ...R2: four digit sequence (0 ... 4095)

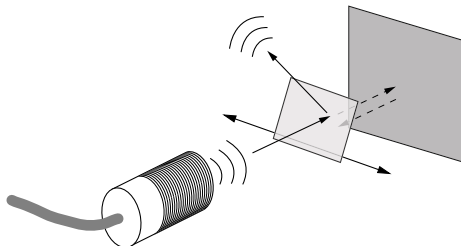
An arbitrary measuring window can be set within the near and far evaluation limits (lower/upper limit) of the sensor. The relative data determines the position of the object in the measuring window.



## Retro-reflective mode

The emitter and receiver are mounted in the same housing. The ultrasonic beam is reflected back to the receiver by a fixed reflector plate. Objects entering the sensing range are detected:

- by changes in the measured distance or
- by reflector signal loss due to absorption or reflection.



### Features:

- Only one sensing head
- High detection reliability of problematic objects (sound absorbent objects or objects with angled surfaces)
- Less susceptible to interference, suitable for difficult operating conditions

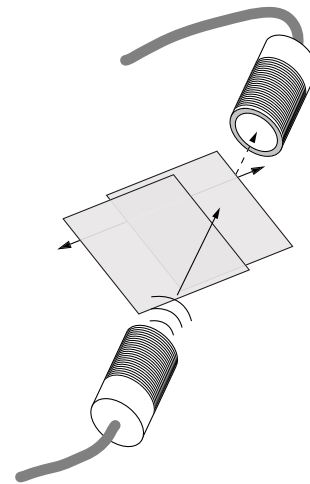
The retro-reflective operation can be implemented using our ultrasound diffused mode sensor with switching output. No special sensor types are required.

## Double sheet detection

Double sheet detection is a special application for thru-beam sensors specifically designed for:

- double sheet detection
- label detection
- splice detection
- double material detection

In this application originating in the print industry a thru-beam sensor system detects whether the object is a single or multiple sheet layer.



Ultrasonic double sheet detection sensors are suited for detecting:

- no sheet
- single sheet
- dual sheet

The devices suited for label / splice detection detect the difference between the material and the material with a label or the material with a glued or taped splice.

Ultrasonic double sheet monitoring is used where it is necessary to distinguish between single and double sheets in order to protect machines or avoid waste production.

A complete system consists of two parts: (1) an ultrasonic emitter and (2) an ultrasonic receiver with an integrated evaluation unit.

### Features:

- Detecting paper from 10 g/m<sup>2</sup> to 2000 g/m<sup>2</sup>
- Detecting thin plastic or metal films
- TEACH-IN of various materials
- Suitable for use with glossy and transparent materials
- Automatically adapts output to slowly changing ambient conditions
- Ultrafast processing speeds
- Insensitive to dust and dirt.

### Application examples are:

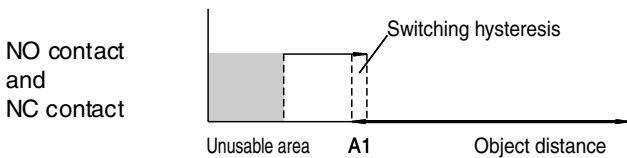
- Use in printing machines
- monitor adhesive labels in labeling machines
- Letter openers
- Document counting machines
- Packaging machines
- Detection of air, single, and double sheets in paper processing machines such as printers or copiers.

## 2. Output functions

### Switching output

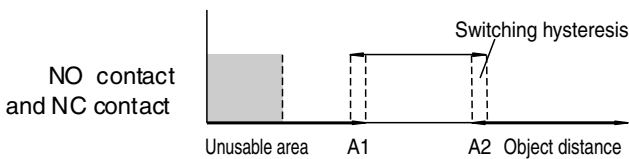
#### Switch point

On sensors with up to two independent switch points, each output becomes active when the object is inside the switch range A1, A2. These switch points can be arbitrarily taught-in to the sensing range.



#### Window mode

In window mode, the ultrasonic sensor changes its output state when the first detected echo, and thus the object, is within the switching window. The window limits A1 and A2 can be taught-in as required. If multiple echoes arrive at different times and one of these is before A1, the output will not switch, even if a later echo is within the switching window. The sensor only evaluates the first echo detected. Multiple echoes cannot be evaluated.



“Retro-reflective mode” on page 473)

#### Retro-reflective mode

The output of the ultrasonic sensor switches in the following cases:

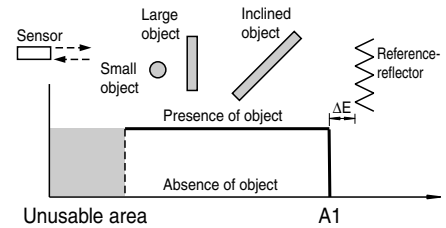
- The sensor receives an echo from a small object in the sound cone and from the reference reflector.
- The sensor detects a large object and no longer receives an echo from the reference reflector.
- The sensor does not receive an echo because an inclined object deflects the sound.

The position of the reference reflector must not be changed. The set or taught-in switching distance, A1, must be shorter than the distance to the reflector by the distance of E.

Example:

UC3000...  $\Delta E > 2\%$  of 3000 mm = 60 mm  
 UC6000...  $\Delta E > 2\%$  of 6000 mm = 120 mm

NO contact



Note

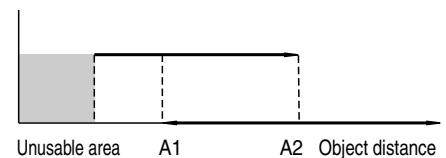
The retro-reflective sensing mode is possible with all of our ultrasonic sensors that support the window mode. A small window area is defined by switch points A1 and A2. The fixed reference reflector must be placed outside this area. An object inside the defined window will cause an output status change, independent of its reflection properties. The desired output function (NO or NC) can be set by programming a window operation for the opposite output function.

Example: to detect an object with NO output function, a window must be set up with NC output function.

#### Latching mode (hysteresis operation)

Dual switch point mode sensors have two independently adjustable transistor outputs. The output switches when the object approaches the near switching point A1. It does not switch back until the object passes the far switching point A2. The two switching points form a large range hysteresis. Dual switch point mode can be used in many applications (such as monitoring fill levels) to perform tasks with a single output that would otherwise require two outputs in normal switching-distance mode.

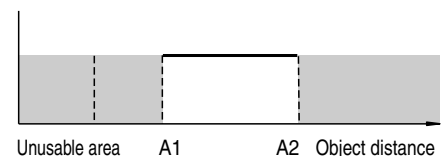
NO contact



#### Area monitoring

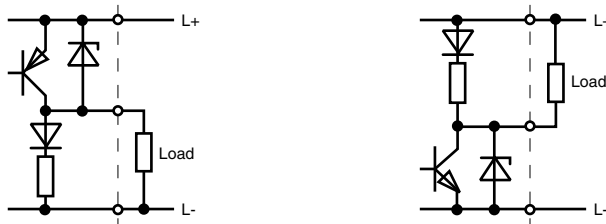
The ultrasonic sensor monitors the evaluation window. The output switches only if an object is detected in the window. Echoes other than those from the evaluation window are ignored by the sensor software. Thanks to this active masking of the foreground in the area monitoring mode, echoes from areas outside of the switching window (foreground) do not cause interference.

NO contact



## NPN/PNP transistor output

Switch point ultrasonic sensor outputs can be either NPN or PNP. The sensors of this catalog are predominantly PNP types. Here the load is connected to -L, at the switching output of the sensor +L is connected to the load.



pnp

nnp

## Relay output

A number of ultrasonic sensors feature relay outputs. Please refer to the individual data sheets for the maximum switching loads and electrical design of the sensors. Information related to the mechanical service life refers to the number of switching actions of the relay contacts in a no-load condition. This value can also be reached with low electrical contact loads. At the rated load for the electrical contacts, the service life is reduced to the value indicated for the electrical service life. The life time data stated are MTBF values.

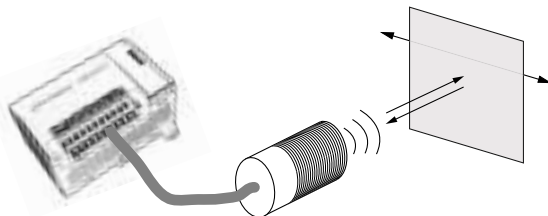
## Analog output: 4 mA ... 20 mA/0 V ... 10 V

Outputs are available as current or voltage signals proportional to distance. The limits of the analog measuring window can be programmed as required within the sensing range. Depending on the type of sensor, this can be accomplished with:

- TEACH-IN with programming wire or programming plug
- DIP switch
- RS 232 interface

## External evaluation

For sensors UB...-H3... an external synchronizing pulse triggers the measuring cycle. The sensor transmits the ultrasonic pulse and, on receipt of the time-delayed echo, outputs a voltage pulse. The echo time evaluation is performed by the evaluation unit.



## Digital, parallel

The distance is issued in the form of an 8-bit data word in parallel on three lines.

## Digital, serial

These ultrasonic sensors can be programmed via a bi-directional RS-232 interface, or issue the measured distance in serial form.

Outputs:

- absolute/relative distance 8- or 12-bit resolution
- switching states
- object in the measuring window (A1, A2 or NDE, FDE)\*
- object in sensing range
- etc.

- \* NDE = lower limit (Near Distance of Evaluation)
- FDE = upper limit (Far Distance of Evaluation)

Programming inputs:

- switching distances A1, A2
- measuring window (NDE, FDE)
- rising/falling ramp of the analog output
- NO/NC function
- filter (for adaptation to the application)
- etc.

The programming is done with the Ultra 3000 service program or a terminal program with individual commands. A list of valid commands is contained in the Ultra 3000 manual. Programming and instructions are available on our website <http://www.pepperl-fuchs.com>.

## Digital, serial/parallel

These ultrasonic sensors function in the same way as those with the serial interface, but also feature an 8-bit parallel output for the measured distance. The parallel interface is programmable via RS-232 using the Ultra 3000 software.

## 3. Housing styles

### Cylindrical

**Series:** 12GM...  
18GM40... / 18GM40A...  
18GM75...  
30GM...



**Features:**

- Material: nickel-plated brass or stainless steel.  
Thread: M12 x 1, M18 x 1 or M30 x 1.5
- Active area on the axial face  
(18GM40 and 18GM75 also with right-angled sensing head)
- Installation: In an existing threaded hole or with Pepperl+Fuchs mounting aids (see Accessories)

**Series:** UC...-30GM... -T...



**Features:**

- Material: Plastic, stainless steel.  
Thread: M30 x 1.5
- Active area on the axial face
- Best suitable for low-temperature applications
- Installation: In an existing threaded hole or with Pepperl+Fuchs mounting aids (see Accessories)

**Series:** UC...-30GM... -K-...



**Features:**

- Sensor head and evaluation unit are separate. This permits installation in tight spaces.
- Material: Stainless steel.  
Thread: M30 x 1.5 (amplifier electronics)  
M18 x 1 or M30 x 1.5 (transducer head).
- Active area on the axial face
- Installation: In existing thread inserts or with Pepperl+Fuchs mounting aids (see Accessories)

**Series:** LUC...



**Features:**

- Material: PBT.  
Thread: G1½A and 1½" NPT in stainless steel or Polypropylene
- Active area on the axial face
- Installation: In existing threaded flange
- Teflon-coated ultrasonic sensor for use in corrosive environments

**Series: D1**

The D1 type was designed specifically for single-hole mounting in container lids to monitor fill levels. The display and operating elements are located under the transparent, permanently attached screw cap.



**Features:**

- Material (housing): Plastic
- Material (flange): Stainless steel
- Single hole mounting
- Easy programming via DIP switches
- Large operating voltage range

## Rectangular

**VariKont<sup>®</sup>** (designation: +U1+ and +U9+)

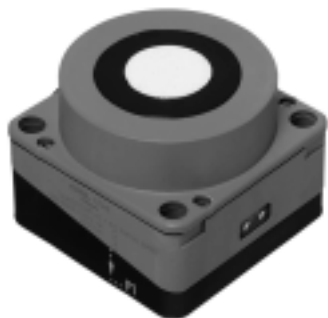
The **VariKont<sup>®</sup>** housing mounts in a footprint that is identical to a mechanical limit switch. It is extremely flexible due to the 5-way quick pivot head. The electronics section can be replaced independently of the base.



### Features:

- Material: PBT
- Active section is adjustable in 5 directions without affecting the mounting.
- The electronic section is replaced without changes to the base of the sensor. The wiring and adjustment are not affected.
- Connection through terminal compartment
- Standardized mounting hole pattern identical to mechanical limit switches (compliant with EN 60947)

**Series:** FP



### Features:

- Material: PBT
- Active area at right angle to mounting surface
- The electronic section can be replaced without changes to the base. The wiring and adjustment are unaffected.
- Connection through terminal compartment

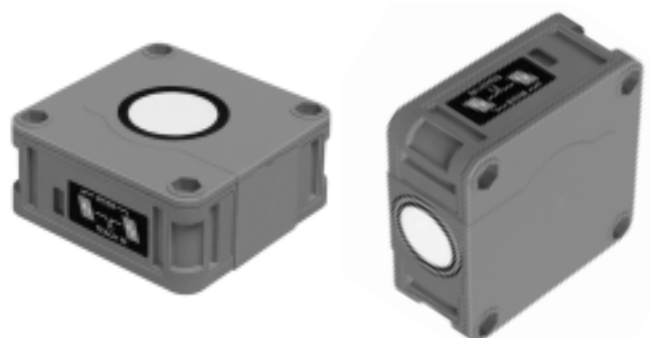
**Series:** F12



### Features:

- Robust housing, waterproof and nonbreakable  
Material: nickel-plated zinc diecast, PC, PBT
- Active area on the front face
- Multiple installation possibilities with slotted hole & dove tail mount
- Highly visible LEDs at front and rear
- Connection: Rotatable M12 Micro quick disconnect

**Series:** F42



### Features:

- Material: PBT
- Direct surface mounting without additional mounting bracket
- Easy programming via integrated keypad. No external programming aid required
- LEDs for status indication and for user support
- Top-sensing or side-sensing to suit application
- DC-versions with semiconductor switching outputs or analogue outputs
- AC/DC-versions with wide voltage supply range and relay output

## Series:F43



### Features:

- Material: PBT
- Direct surface mounting without additional mounting bracket
- LEDs on the connector side
- No unusable area in the twin-head version

## Series: F54



### Features:

- Material: PBT
- Direct surface mounting without additional mounting bracket

## Series: F64



### Features:

- Ultrasonic thru-beam sensor
- Material: PA
- Direct surface mounting without additional mounting bracket

## Double sheet detection

The ultrasound double sheet control is a measuring system consisting of a cylindrical ultrasound sensor and receiver with integrated evaluation unit, each in a threaded sleeve M18.



### Features:

- Material evaluation unit (only UDB...types): Makrolon
- In the UDC...models, the evaluation unit is integrated in the receiver (left figure).
- Material (sensor heads): Nickel-plated brass
- Non-contact distinction between single and double sheets
- Ultrafast processing speed
- Insensitive to dust and dirt
- Material weight covers 10 g/m<sup>2</sup> paper to 2000 g/m<sup>2</sup> carton
- Installation: In an existing threaded hole or with bracket MH-UDB01 (see Accessories)

### Applications:

Ultrasonic double sheet detectors are used wherever an automatic differentiation of single or double sheets is necessary to protect machinery or prevent waste.

Typical applications are:

- use in printing machines
- detection of labels in labeling machines
- use in letter openers
- use in document counters
- use in packaging machines
- detection of air, single sheets and double sheets in paper processing machines.



## 4. Electrical connections

### 3-wire DC (type E)

Three-wire sensors have separate connections for the power supply and the load. The load can be switched towards positive (pnp) or negative (npn).

They are overload, short-circuit, and reverse polarity protected. The leakage current is negligible.

### With analog output

These are DC sensors that provide an output signal proportional to the measured value. They also have separate connections for the power supply and the load.

The output signal is in the 0/4 mA ... 20 mA (current output) or 0/2 V ... 10V (voltage output) range.

Additionally, they can feature switching or control outputs and are overload, short-circuit, and reverse polarity protected.

### With external evaluation

These are DC sensors with a clock pulse input that issue a pulse for the echo time at a separate output connection. The time at which the echo pulse is output is proportional to the echo time. A separate back-end unit is required for these sensors (see data section).

### With serial interface

These are DC sensors that feature connections for an RS-232 interface in addition to the supply connections. This interface can be used for programming, as well as to read out the sensor. Additional analog or switching outputs may also be present.

### With parallel interface

These are DC sensors that feature connections for the parallel output of the measured distance in addition to the supply connections. They can also feature control inputs, outputs, or a serial interface. Due to the large number of connection lines these sensors are only available with cable connections.

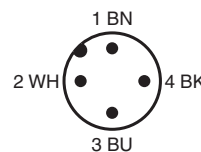
Pepperl+Fuchs' ultrasonic sensors are available in three different connection types:

**Cable connection** - The lengths, wire diameters and cable materials are stated in the individual data sheets. Sensors with cable connections do not have a supplementary designation in the type code.

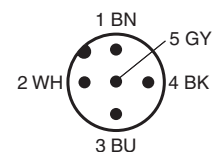
**Terminal compartment** - The *limit switch*® (+U1+ or +U9+) and *FP* series are equipped with a terminal compartment. The maximum diameter of the cable or cross section of the wires is stated in the data sheet.

**Quick disconnect** - The type of connector is marked by a V... in the type code (see figure).

V1  
(circular connector M12 x 1)



V15  
(M12 x 1)



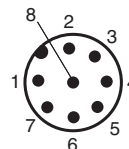
Device connector V3  
(M8 x 1)



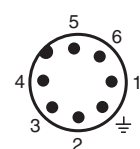
Color assignments of ready-to-use mating connectors V1, V15, V3:

Pin	Color	Abbreviation
1	Brown	BN
2	White	WH
3	Blue	BU
4	Black	BK
5	Gray	GY

V17  
(M12 x 1)



V7  
(PG13,5)



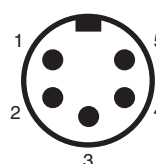
Color assignments of ready-to-use mating connector V17:

Pin	Color	Abbreviation
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YW
5	Gray	GY
6	Pink	PK
7	Blue	BU
8	Blank (shield)	

Recommended color assignments of ready-to-use mating connector V7:

Pin	Color	Abbreviation
1	White	WH
2	Brown	BN
3	Green	GN
4	Yellow	YW
5	Gray	GY
6	Pink	PK
7	Blue	B

V95  
(7/8" - 16 UN 2A)



Recommended color assignments of ready-to-use mating connector V95:

Pin	Color	Abbreviation
1	Black	BK
2	Blue	BU
3	Green/Yellow	GN/YE
4	Brown	BN
5	White	WH

Electrical connections overview

Typical electrical data	Type	Switching output / remarks	Standard symbol (selection)
<p><u>3-wire</u>                      Rated supply voltage                      10 V ... 30 V DC                      Output 100 mA/200 mA</p>	E0 npn E1 npn E01 npn E4 npn  E7 npn  E2 pnp E3 pnp E23 pnp E5 pnp  E6 pnp	NO NC* E0 + E1 NC*/ NO (programmable) 2 x E4*  NO NC* E2 + E3 NC/ NO* (programmable) 2 x E5*	<p>Standard symbol/Connections:                      (version E0, npn)</p> <p>Standard symbol/Connections:                      (version E2, pnp)</p>
<p><u>Analog</u>                      Rated supply voltage                      10 V ... 30 V DC                      Output 4 mA ... 20 mA                      Output 0 V ... 10 V</p>	IU IU U	Sensor for distance measurement with analog output	<p>Standard symbol/Connection:                      (version IU)</p> <p>Core colours in accordance with EN 60947-5-2.</p>
<p><u>Serial</u>                      Rated programmable voltage                      10 V ... 30 V DC</p>	R2  (RS)	Communication-enabled programmable sensor with RS-232 interface old designation	<p>Standard symbol/Connection:                      (Version E6, pnp)</p>
<p><u>Parallel</u>                      Rated supply voltage                      20 V ... 30 V DC</p>	8B	Communication-enabled programmable sensor with 8-bit parallel output	<p>Standard symbol/Connection:                      Transceiver (parallel interface)</p>
<p><u>External evaluation</u>                      Rated supply voltage                      10 V ... 30 V DC</p>	H3	Transmitter/receiver	<p>Standard symbol/Connection:</p>
<p>Note: The standard symbols shown are examples. The types marked * are not shown.</p>			

5 Ultrasonic sensors

Date of issue 04.04.2008

## 5. Programming

The switching points A1 and A2 or the lower and upper limits of the measuring window of ultrasonic sensors in diffuse mode can be programmed in a variety of ways depending on their type.

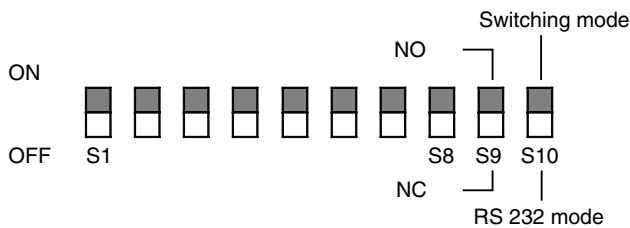
### DIP switches in the terminal compartment

The near and far switch points (A1 or A2) are set in steps using 4 DIP switches each. The step size of the adjustable switch points is determined by the sensor software. For the sensor in the following example, the DIP switch combinations 0000 ... 1000 correspond to 150 mm and for 1001 ... 1111 to 200 mm.

Different steps may apply to other sensors with coding switches (see the technical data for the relevant sensortype). The following models are equipped with DIP switches in the terminal compartment:

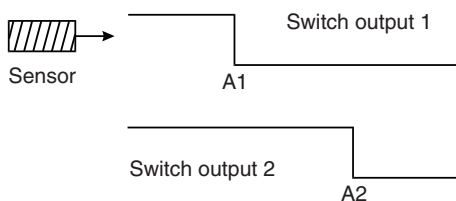
- UC500+U9+E6/E7+R2, UC500+U9+IUE2/IUE0+R2
- UC3000+U9+E6/E7+R2, UC3000+U9+IUE2/IUE0+R2
- UB1000+FP1+E6
- UC6000-FP-E6/E7-R2-P5, UC6000-FP-IUE2/IUE0-R2-P5

Example 1: UC3000+U9+E6+R2  
(sensor with 2 switch outputs or RS-232 interface)



near				far				A1/mm	A2/mm
S1	S2	S3	S4	S5	S6	S7	S8		
0	0	0	0	0	0	0	0	300	400
0	0	0	1	0	0	0	1	450	550
0	0	1	0	0	0	1	0	600	700
...	...								
0	1	0	1	1	1	0	0	1050	2400
...	...								
1	1	1	1	1	1	1	1	2900	3000

(1 = ON, 0 = OFF)



(S9 = ON, NO)

Example 2: UB1000+FP1+E6  
(sensor with 2 switch outputs or 1 switch output and switch window)

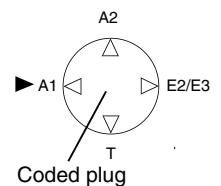
S10	Operating behaviour	
0		Output 1 Output 2
1		Output 1 (window) Output 2

- Switch S1 ... S8: Adjustment of the switching range (200 mm ... 1000 mm)
- Switch S9: (0) NC/(1) NO
- Switch S10: (0) two independent switch points (1) Measuring window

### Programming plug

The following ultrasonic sensors are equipped with a programming plug with an integrated temperature probe. It can be connected in four different positions:

UC300 UC500 UC1000 UCC1000 UC2000 UC4000 UC6000	30GM	E6 E6R2 E7R2 IU IUR2	(K)	V1 V15
LUC4T	G5P G5S N5P N5S	IU		V15



The switch points A1 and A2 of the evaluation (E2/E3) or the lower and upper limits of the measuring window are set using TEACH-IN.

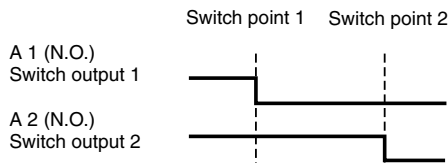
Position	Function
A1	Distance A1 is taught (switch point or measuring window limit)
A2	Distance A2 is taught (switch point or measuring window limit)
E2/E3	E2: individual switch points/falling analog ramp E3: window/rising analog ramp
T	Temperature compensation is enabled

The state is stored when the plug is removed. The taught-in switch points and functions are retained when power is switched off.

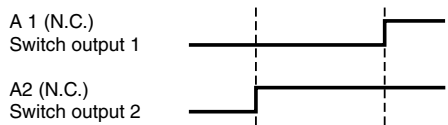
## Switching outputs types ...-E6R2/E7R2

### 1. Switch point mode

When  $A1 < A2$ , both switch outputs are activated as N.O. contacts.

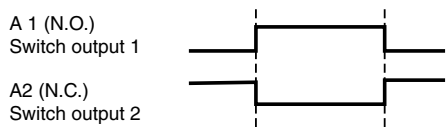


When  $A1 > A2$ , both switch outputs are activated as N.C. contacts.



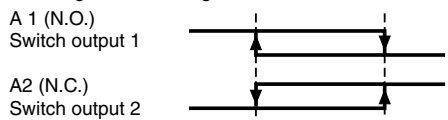
### 2. Window mode

To exchange the switching distances is of no effect.

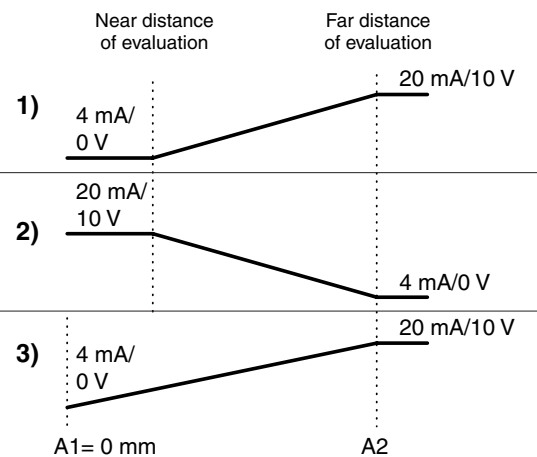


### 3. Hysteresis mode

To exchange the switching distances is of no effect.



## Analog output: types ...-IU und ...-IUR2



## Programming units UB-PROG 2/UB-PROG 3

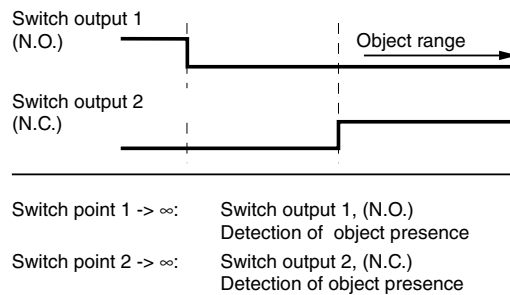
Ultrasonic sensors:

UB300		-E01	
UB400	-12GM	-E23	
UB500	-18GM40	-E4	
UB1000	-18GM75	-E5	-V1
UB2000	-30GM	-E6	-V15
UB4000	-F54	-E7	
UB6000		-I	
		-U	

permit the UB-PROG 2/UB-PROG 3 programming units to be inserted in the supply line. This permits the switch points A1 and A2 or the evaluation limits to be set using teach-in. Each switch point/each evaluation limit has its own button.

A window function or a normally closed/normally open function can be set for sensors with switching outputs depending on the order in which programming buttons A1 and A2 are pressed. The evaluation range and the mode of operation of the analog output can be set for sensors with analog output.

## Switch output: types ...E01/E02



- Switch point 1  $\rightarrow \infty$ : Switch output 1, (N.O.)  
Detection of object presence
- Switch point 2  $\rightarrow \infty$ : Switch output 2, (N.C.)  
Detection of object presence

## Switch output: types ...E4/E5

- Window mode, normally open function  
 $A1 < A2$ : [Timing diagram showing output high between A1 and A2]
- Window mode, normally closed function  
 $A2 < A1$ : [Timing diagram showing output low between A2 and A1]
- One switch point, normally open function  
 $A1 \rightarrow \infty$ : [Timing diagram showing output high after A1]
- One switch point, normally closed function  
 $A2 \rightarrow \infty$ : [Timing diagram showing output low after A2]
- $A1 \rightarrow \infty, A2 \rightarrow \infty$ : Detection of object presence  
Object detected: Switch output closed  
No object detected: Switch output open

## Switch outputs: types ...E6/E7

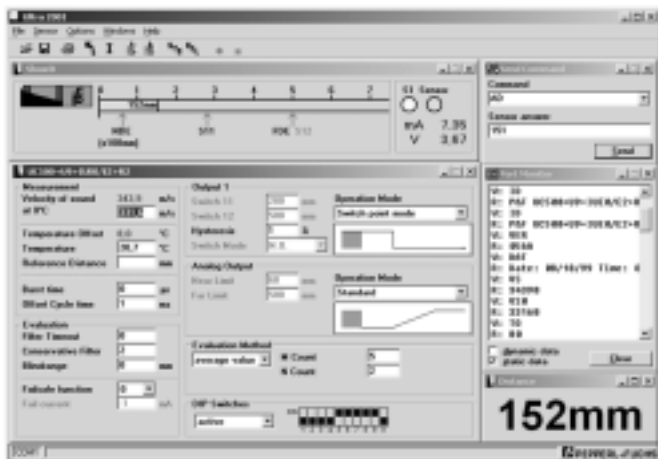
- Switch point 1, Switch point 2  
Switch output 1 (N.O.) and Switch output 2 (N.O.) [Timing diagram showing both high after first switch point]
- Switch point 2, Switch point 1  
Switch output 2 (N.C.) and Switch output 1 (N.C.) [Timing diagram showing both low after second switch point]
- Switch point 1  $\rightarrow \infty$ : Switch output 1, (N.C.)  
Detection of object presence  
Switch point 2  $\rightarrow \infty$ : Switch output 2, (N.O.)  
Detection of object presence  
Switch point 1 a. 2  $\rightarrow \infty$ : Both switch outputs, (N.O.)  
Detection of object presence

### Ultra 3000 PC service program (RS-232, bi-directional interface)

The Ultra 3000 application can be used to program and read out the parameters and measured values of ultrasonic sensors with the designation ...R2 (RS) in their model number.

The sensors must be connected to a PC/notebook using the suitable interface cable (see below), which can be ordered separately.

Ultra 3000 operates under WINDOWS™ 32-Bit systems (WINDOWS 95™ and higher) and features a modern user interface. The operation of the program is mouse-based.



### UC-F43-R2 programming adapter

The UC-F43-R2 programming adapter is designed to be inserted between -F43- series sensors and the supply lead. A 9-pin cable socket with a 1 m long cable permits the sensor to be easily connected to the RS-232 interface of a PC. Using the programming adapter does away with the otherwise necessary cabling.

The PC service program Ultra 3000 can be used for the actual programming of the -F43- series ultrasonic sensor.

### UC-30GM-R2 programming adapter

The UC-30GM-R2 interface cable permits the programming of the UC...-30GM-..R2-V15 ultrasonic sensors series using the PC service program ULTRA 3000. It connects the RS-232 port on the PC to the program/temperature socket of the sensor. The program/temperature plug is unplugged during programming.

### UC-FP/U9-R2 programming adapter

This adapter enables you to program limit switch (U9) and FP styles that are equipped with a serial interface. It connects the PC RS 232-port to the terminal screws in the sensor base.

## 6. General information

### Resolution

Pepperl+Fuchs ultrasonic sensors of the UC... series are equipped with an integrated 12-bit DA converter. A resolution of 12 bits corresponds to 4096 steps. The echo time of an ultrasonic series is determined with a resolution of 1 s (sensors without an RS 232 interface) or 1.085 s (sensors with an RS 232 interface) due to the clocking of the microcontroller. This corresponds to a physical resolution of 0.172 mm or 0.186 mm. This maximum sensor resolution is available if the measuring window (the range between A1 and A2 or between

the lower and upper limits) is less than or equal to

$$4096 \times 0.172 \text{ mm} = 705 \text{ mm}$$

or

$$4096 \times 0.186 \text{ mm} = 762 \text{ mm}$$

Up to this window size, the resolution is solely dependent on the clock rate of the microcontroller. The DA converter controls the sensor resolution if a larger measuring window is selected. It can then be calculated using the following formula:

$$(A2 - A1) / 4096$$

or

$$(\text{upper limit} - \text{lower limit}) / 4096$$

### Example:

A UC4000-30GM-IUR2-V1 sensor is set up with the following parameters:

upper limit:	3500 mm
lower limit:	800 mm

In this application, the physical resolution of the sensor amounts to

$$(3500 \text{ mm} - 800 \text{ mm}) / 4096 = 0.66 \text{ mm.}$$

Ultrasonic sensors with 8-bit parallel output resolve the measuring window in 256 steps. Their resolution can be calculated as follows:

$$(\text{upper limit} - \text{lower limit}) / 256$$

if the defined measuring window is larger than 44 mm. For smaller measuring windows, the resolution is 0.172 mm. The resolution given in the data sheet is based on the largest possible measuring window.

### Accuracy

To determine the absolute accuracy of the measured value of an ultrasonic sensor, the following factors must be taken into consideration:

- temperature
- atmospheric pressure
- relative humidity
- turbulence
- hot spots in the air surrounding the sensor or target
- sensor in hot operating mode status.

In addition, tolerances of the electronic components and differences in the response characteristic of the ultrasonic sensor due to varying signal strengths of the sound reflected by the object also have an effect. Considering these influences, an accuracy, repeatability, and linearity of >0.2% can be achieved.

## Resistance to shock and vibration

Pepperl+Fuchs ultrasonic sensors fulfill the DIN EN 60947-5-2 standards for low-voltage switching equipment, Part 5, Section 2: Proximity Switches. A reference is made to the applicable environmental testing procedures within the framework of this standard.

### Shock resistance

Our ultrasonic sensors were tested for their resistance to mechanical shocks in accordance with IEC 60068-2-27 under the following conditions:

6 impacts in each direction along 3 axes at right angles to each other (6 individual tests).

Pulse form:	half sine
Peak acceleration:	30 g (300 m/s <sup>2</sup> )
Pulse duration:	11 ms

### Vibration resistance

Our ultrasonic sensors were tested for their resistance to vibration in accordance with IEC 60068-2-6 under the following conditions:

Vibration along 3 axes at right angles to each other.

Frequency range:	10 Hz ... 55 Hz
Amplitude:	1 mm
Duration:	each 30 min (55 Hz)

## Electromagnetic compatibility

The DIN EN 60947-5-2 "proximity switch standard" also refers to the applicable standards for the documentation of electromagnetic compatibility. Pepperl+Fuchs ultrasonic sensors fulfill the requirements of:

- Interference immunity in accordance with DIN EN 61000-4-2 (immunity to electrostatic discharge)
- Interference immunity in accordance with DIN EN 61000-4-3 (immunity to high-frequency interference)
- Interference immunity in accordance with DIN EN 61000-4-4 (immunity to fast transients)
- Emitted interference in accordance with EN 55011 and DIN EN 50081-2.

## 7. Installation and operation

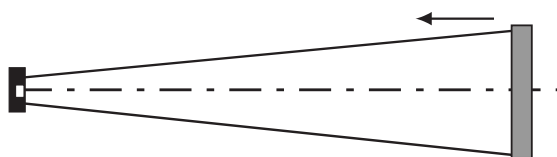
Ultrasonic sensors can be installed and operated in any position. However, excessive exposure to dust or dirt deposits should be avoided.

When cleaning ultrasonic sensors, take care not to damage the sensor surface (decoupling layer) or the integral foam in which the transducer is embedded.

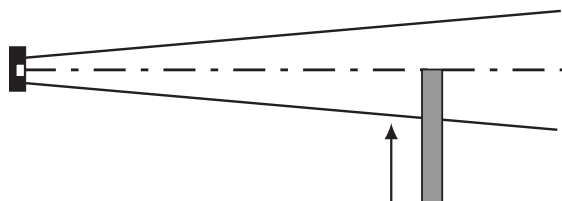
Water drops or the formation of crusts on the decoupling layer will impair the ultrasonic sensor's functionality. Light dust deposits are not critical.

### Actuation direction

The objects to be detected can enter the sound beam from any arbitrary direction. The sensor ranges and response curves in the data sheets can be used to determine the expected switch points.

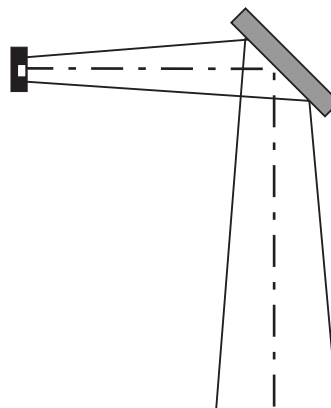


For objects moving radially (at right angles or any other angle lateral to the sound cone axis), refer to the response curve in the data sheet to determine the switch points



### Deflection of the beam angle

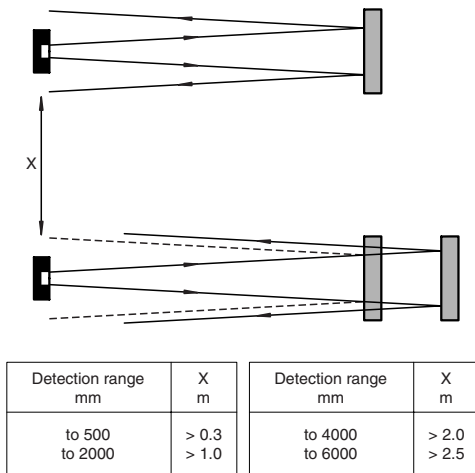
The beam angle can be deflected with smooth, even reflectors. But, do not deflect the signal more than twice, as the signal damping that occurs with each deflection will result in reduced range.



Exact alignment of the reflector surfaces is required. Pepperl+Fuchs offers 45° reflectors for some sensor types to achieve a deflection of 90°.

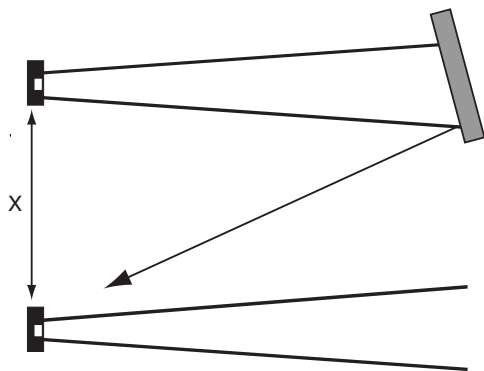
## Mutual interference

To prevent mutual interference, observe the minimum distances between sensors of the same type shown in the following drawings.



The indicated values should be regarded as guidelines. They apply if the beam angles are aligned parallel to one another and the surfaces of the objects are at right angles to the axes of the beam angles. The actual required spacing "X" is dependent on alignment, the nature of the target objects to be detected, and conditions related to other objects that are located in the beam angle.

If objects with an unfavorable alignment are to be detected, a larger distance "X" must be maintained.



The indicated spacing can be reduced significantly by synchronizing the ultrasonic sensors. Pepperl+Fuchs offers a series of sensors equipped with synchronisation inputs for this purpose. These can be used in synchronized or multiplex mode. The synchronization can be achieved with an external synchronization signal or with self-synchronization in some sensor types.

The opposing mounting of nonsynchronized sensors of the same type should be avoided.

## Synchronization

Mutual interference of sensors with synchronization inputs can be effectively prevented by synchronizing the transmission cycles of all the sensors. A distinction is made between synchronized and multiplex mode.

## Multiplex mode

In this operating mode, the sensors are activated for a brief period in a cyclic manner. Please note that in this operating mode the multiplex time T is extended by a factor of N, where N stands for the number of sensors in the multiplex mode.

$$T_{\text{Multiplex}} = N \times T_{\text{Sensor}} \quad \text{and} \quad f_{\text{Sync}} = 1 / T_{\text{Multiplex}}$$

If sensors of different types are being used, the total cycle time is the sum of the cycle times of the individual sensors.

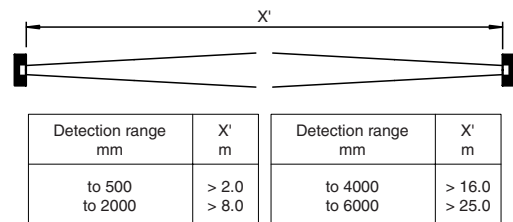
$$T_{\text{Multiplex}} = T_{\text{Sensor 1}} + T_{\text{Sensor 2}} + \dots + T_{\text{Sensor N}}$$

Many of our ultrasonic sensors have the self-synchronization option. If the self-synchronization option is used, the sensors work in multiplex mode.

## Synchronized mode

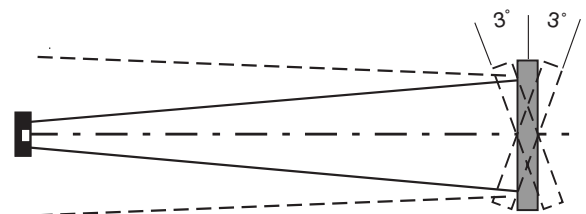
In this mode, the synchronization inputs of all sensors are connected to one another and controlled together. Unlike multiplexing, the cycle time does not increase. In addition to monitoring large areas, synchronized mode is useful when space is limited because less space is required between the sensors.

For opposed mounting, observe the distances specified below.



## Measuring plate/objects

Ultrasonic sensors can detect objects that are solid, liquid, or in powder form. The properties of the object's surface are important for the echo to be evaluated by the sensor. All level and smooth surfaces placed at a right angle to the beam angle provide an ideal reflection. The measuring plate can have a maximum angular deviation of 3° for reliable detection.



Material properties such as transparency, color, or surface finish (polished or matte) have no effect on detection reliability.

The roughness of the surface, together with the sensor-specific transducer frequency, determines whether the echo is reflected or diffused. The following table contains a list of the transducer frequencies used in Pepperl+Fuchs ultrasonic sensors and the associated degrees of surface roughness for the reflection or diffusion of the sensor signal. The following rule applies:

If the sound wavelength is longer than the peak-to-valley height of the surface roughness, the directional share of the reflection will predominate. If it is shorter than the peak-to-valley height, the diffuse share will predominate.

Transducer frequency	Degree of object surface roughness for a predominately directional reflection	Degree of object surface roughness for a predominately diffuse reflection
65 kHz	< 1 mm	> 25 mm
85 (90) kHz	< 0.8 mm	> 20 mm
120 (130) kHz	< 0.5 mm	> 13 mm
175 kHz	< 0.4 mm	> 10 mm
205 kHz	< 0.35 mm	> 8 mm
310 kHz	< 0.3 mm	> 7 mm
375 (400) kHz	< 0.2 mm	> 5 mm

The transition from directional to diffuse reflection is continuous. Depths of roughness between the indicated values will result in reflections with diffuse and directional shares. Objects with a great deal of surface roughness will result in reduced sensing range.

However, greater degrees of surface roughness permit greater angle deviations from the ideal position. The reason for this is the predominately diffuse reflection of the ultrasonic signal. As a result, filling levels or pouring cones of coarse-grained materials can be detected at an angular deviation of up to 45° (at a reduced sensing range).

The following objects are well-suited for detection:

- all smooth and solid objects aligned at a right-angle to the beam angle
- all solid objects with degrees of surface roughness that cause a diffuse reflection and which have random alignment
- liquid surfaces that are angled < 3° from the axis of the beam angle

The following materials are poorly suited:

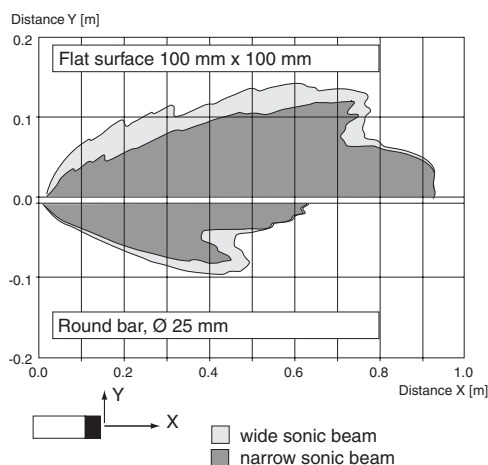
- materials that absorb ultrasonic signals, such as felt, cotton wool, coarse textiles, or foam
- materials at temperatures above 100 °C.

In these cases, it may be necessary to use thru-beam operation for such materials.

### Sensors with adjustable beam angle width

Some series offer an adjustable beam angle which enables the sensors to operate in narrow places, where objects might extend sideways into the beam angle. Such circumstances would cause erratic switching or erratic measurement on sensors without this feature.

Adjusting the shape of the beam angle has no influence on the maximum sensing range.



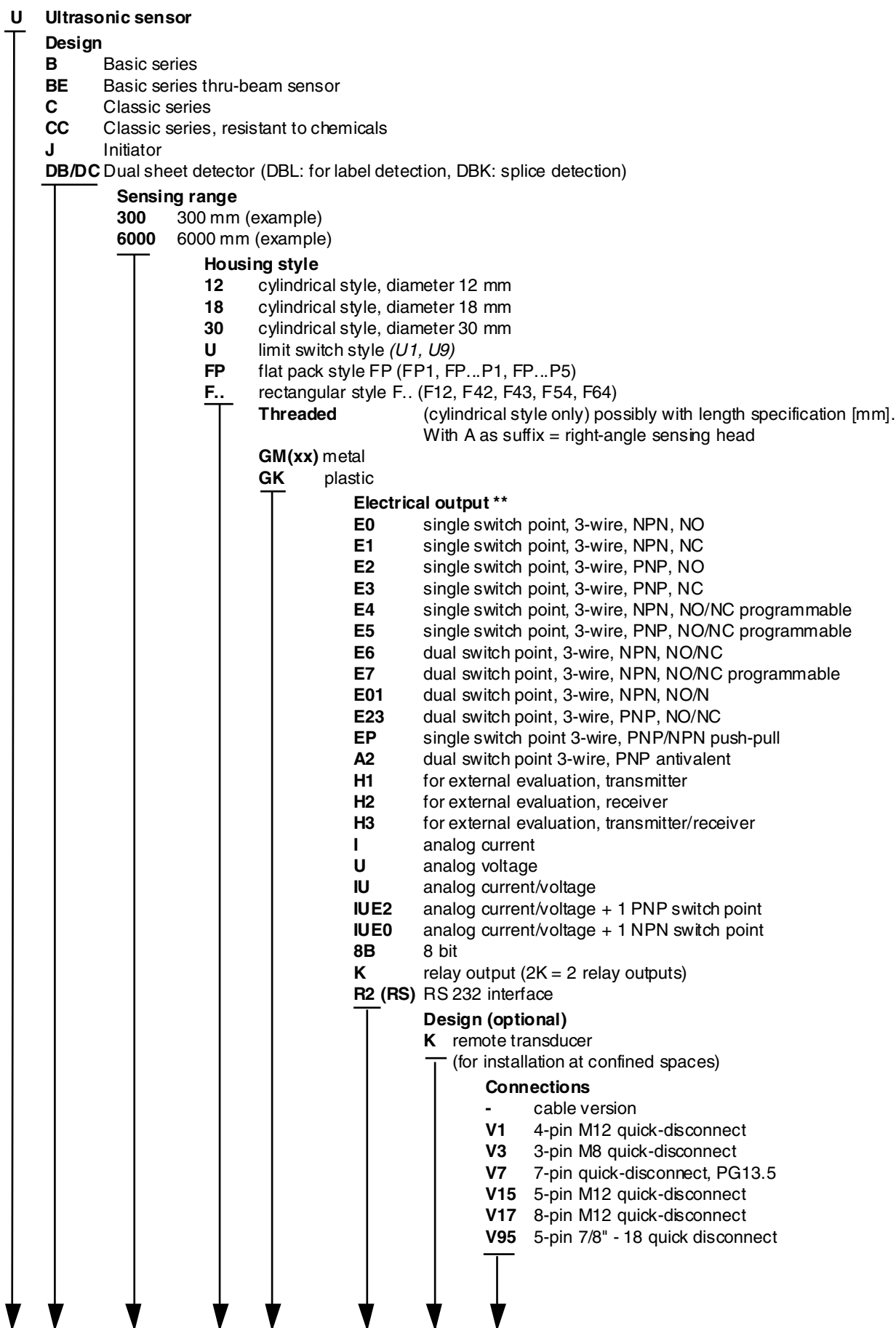
In the figure above, the characteristic response curve of the sensor UB500-F42... is shown for 2 different objects: a round bar with d= 25 mm (lower part), and flat surface 100 mm x 100 mm (upper part). From this we can see that the narrow beam width selection decreases the radial sensing range. This allows the sensor to be mounted in tight spaces.

**If you have questions pertaining to any application, simply give us a call. Take advantage of our help and experience. Our service team will be happy to assist you.**

**You can find the location of the Pepperl+Fuchs closest to you on the rear cover of this catalog and also in the section "Pepperl+Fuchs Worldwide" starting on page 733.**



Type codes (except LUC... series )



U			-			-		-	
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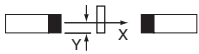
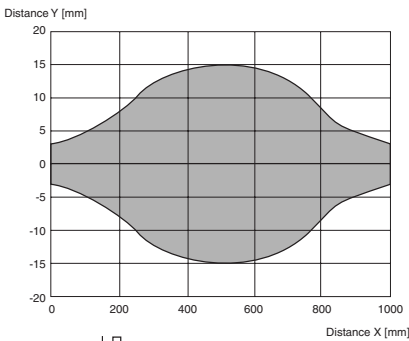
\*\* for thru-beam sets consisting of transmitter and receiver the electrical output is preceded by an S.  
(example: UBE 1000-18GM40-SE2-V1)

Date of issue 31.03.2008



- Short design, 40 mm
- Function indicators visible from all directions
- Switch output
- TEACH-IN input

**Characteristic response curve**

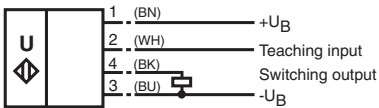


Obstacle: flat plate 100 mm x 100 mm

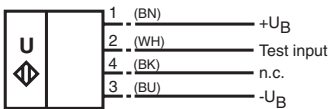
**Electrical connection**

Standard symbol/Connection:  
(version E2, pnp)

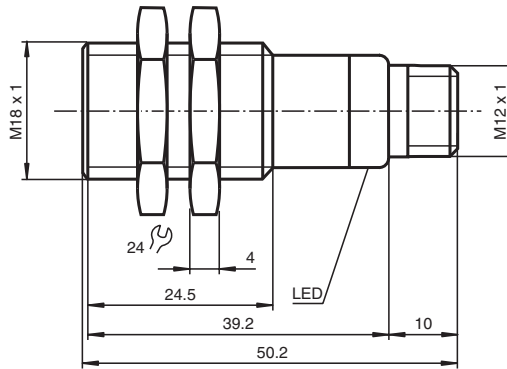
Receiver:



Emitter:



Core colours in accordance with EN 60947-5-2.



		UBE1000-18GM40-S-E2-V1
Sensing range	50 ... 1000 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 205 kHz	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆
No-load supply current	≤ 20 mA	◆
Input type	1 TEACH-IN input free air path: -U <sub>B</sub> ... +1 V, object: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆
Output type	NO pnp	◆
Rated operational current	200 mA, short-circuit/overload protected	◆
Switching frequency	≤ 100 Hz	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP67	◆
Connection	V 1 connector (M 12 x 1), 4-pin	◆
Material		
Housing	brass, nickel-plated	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆
Mass	25 g	◆

Ultrasonic sensors, standard, cylindrical style

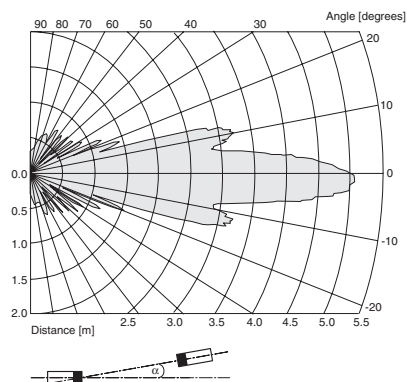
5.1

Date of edition 2008-03-20



- **Reliable detection of transparent materials**
- **High switching frequency**
- **Small angle of divergence**
- **Protective functions**

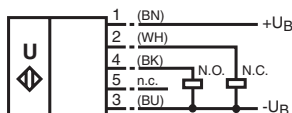
**Characteristic response curve**



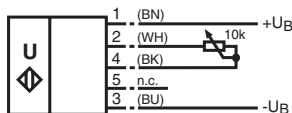
**Electrical connection**

Standard symbol/Connection:  
(version A2, pnp)

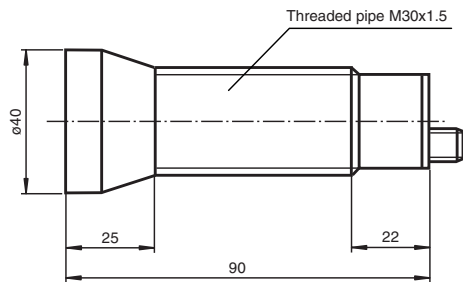
Receiver:



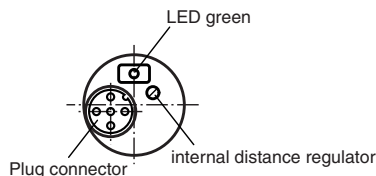
Emitter:



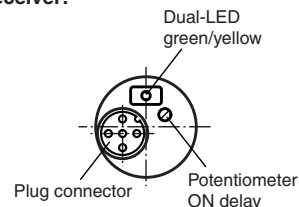
Core colours in accordance with EN 60947-5-2.



Emitter:



Receiver:

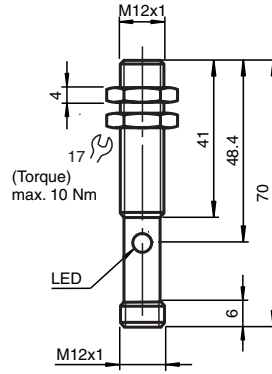


Sensing range	0 ... 4000 mm , distance emitter-receiver 500 mm ... 4000 mm	◆
Through-beam mode	Single path ultrasonic switch	◆
Transducer frequency	85 kHz	◆
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆
No-load supply current	35 mA emitter 25 mA receiver	◆
Output type	2 switch outputs pnp, normally open/closed (complementary)	◆
Rated operational current	200 mA	◆
Switching frequency	≤ 15 Hz	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆
Protection degree	IP65	◆
Connection	connector V15 (M12 x 1), 5 pin	◆
Material		
Housing	brass, nickel-plated, plastic components PBT	◆
Mass	160 g each sensor	◆

UBE4000-30GM-SA2-V15

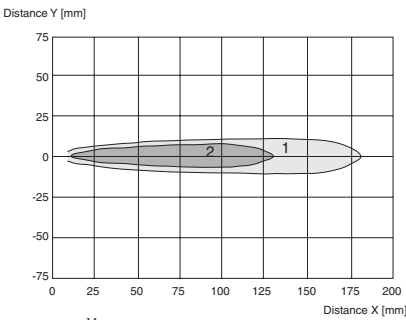
Ultrasonic sensors, standard, cylindrical style

5.1



- Extremely narrow projection cone
- Very small unusable area
- short response time
- Switch output

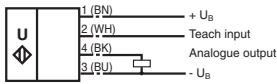
**Characteristic response curve**



Curve 1: flat surface 10 mm x 10 mm  
Curve 2: round bar, Ø 8 mm

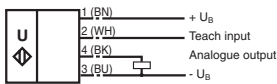
**Electrical connection**

Standard symbol/Connections:  
(version U)



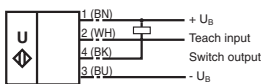
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)



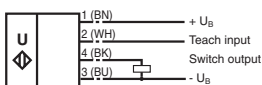
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

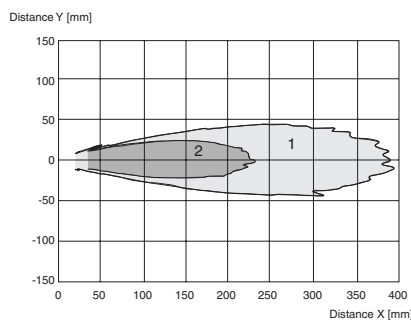


		UB 120-12GM-E4-V1	UB 120-12GM-E5-V1	UB 120-12GM-I-V1	UB 120-12GM-U-V1
Sensing range	15 ... 120 mm	◆	◆	◆	◆
Unusable area	0 ... 15 mm	◆	◆	◆	◆
Standard target plate	10 mm x 10 mm	◆	◆	◆	◆
Transducer frequency	approx. 850 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆		
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s			◆	◆
Output type	1 analogue output 0 ... 10 V				◆
	1 analogue output 4 ... 20 mA, short-circuit/overload protected			◆	
	1 switch output E4, npn NO/NC, parameterisable	◆			
	1 switch output E5, pnp NO/NC, parameterisable		◆		
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.17 mm			◆	◆
Rated operational current	100 mA, short-circuit/overload protected	◆	◆		
Switching frequency	≤ 52 Hz	◆	◆		
Load impedance	> 1 kΩ ohm			◆	◆
	0 ... 300 Ω ohm				◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	25 g	◆	◆	◆	◆



- Very small unusable area
- TEACH-IN input
- Temperature compensation
- Switch output

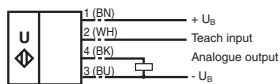
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

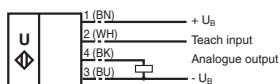
Electrical connection

Standard symbol/Connections:  
(version U)



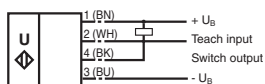
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)



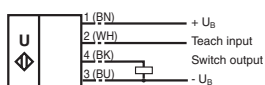
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E4, npn)

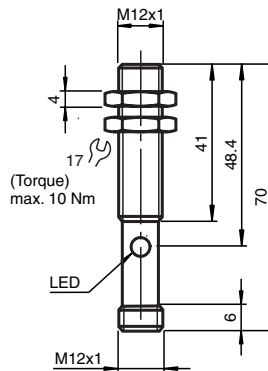


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



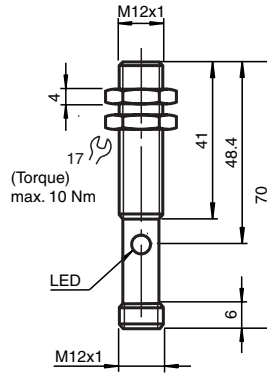
Core colours in accordance with EN 60947-5-2.



		UB 200-12GM-E4-V1	UB 200-12GM-E5-V1	UB 200-12GM-I-V1	UB 200-12GM-U-V1
Sensing range	15 ... 200 mm	◆	◆	◆	◆
Unusable area	0 ... 15 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 400 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
No-load supply current	≤ 30 mA			◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆		
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s			◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA, short-circuit/overload protected				◆
	1 switch output E4, npn NO/NC, parameterisable	◆			
	1 switch output E5, pnp NO/NC, parameterisable		◆		
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.17 mm			◆	◆
Rated operational current	100 mA, short-circuit/overload protected	◆	◆		
Switching frequency	≤ 13 Hz	◆	◆		
Load impedance	> 1 kΩ				◆
	0 ... 300 &Omega; at U <sub>B</sub> > 10 V; 0 ... 500 &Omega; at U <sub>B</sub> > 15 V			◆	
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	25 g	◆	◆	◆	◆

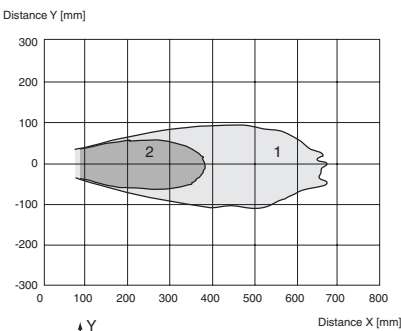
Ultrasonic sensors, standard, cylindrical style

5.1



- TEACH-IN input
- Temperature compensation
- Switch output
- UB400-12GM-E4-V1

**Characteristic response curve**

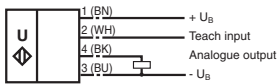


Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm



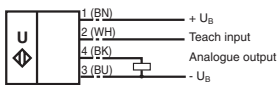
**Electrical connection**

Standard symbol/Connections:  
(version U)



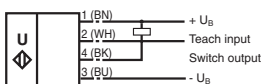
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)



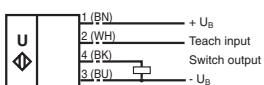
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



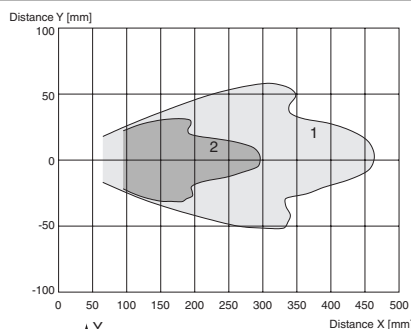
Core colours in accordance with EN 60947-5-2.

		UB 400-12GM-E4-V1	UB 400-12GM-E5-V1	UB 400-12GM-I-V1	UB 400-12GM-U-V1
Sensing range	30 ... 400 mm	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 310 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆		
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s			◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA, short-circuit/overload protected			◆	◆
	1 switch output E4, npn NO/NC, parameterisable	◆			
	1 switch output E5, pnp NO/NC, parameterisable		◆		
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.17 mm			◆	◆
Rated operational current	100 mA, short-circuit/overload protected	◆	◆		
Switching frequency	≤ 8 Hz	◆	◆		
Load impedance	> 1 kΩ hm			◆	◆
	0 ... 300 & Ω at U <sub>B</sub> > 10 V; 0 ... 500 & Ω at U <sub>B</sub> > 15 V			◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	V1 connector (M 12 x 1), 4-pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	25 g	◆	◆	◆	◆



- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation

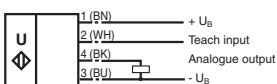
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

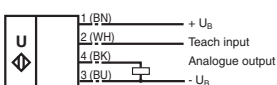
**Electrical connection**

Standard symbol/Connections:  
(version U)



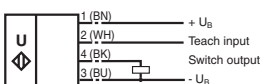
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)

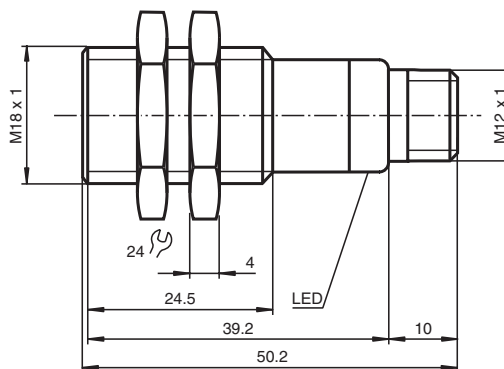


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version ES, pnp)



Core colours in accordance with EN 60947-5-2.



	UB300-18GM40-ES-V1	UB300-18GM40-I-V1	UB300-18GM40-U-V1
Sensing range	30 ... 300 mm	◆	◆
Unusable area	0 ... 30 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 390 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 20 mA	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s	◆	◆
Output type	1 analogue output 0 ... 10 V		◆
	1 analogue output 4 ... 20 mA, short-circuit/overload protected	◆	◆
	1 switch output E5, pnp NO/NC, parameterisable	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆
Resolution	0.4 mm at max. sensing range	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 13 Hz	◆	◆
Load impedance	> 1 kΩ 0 ... 300 Ω	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆
Material			
Housing	brass, nickel-plated	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆
Mass	25 g	◆	◆

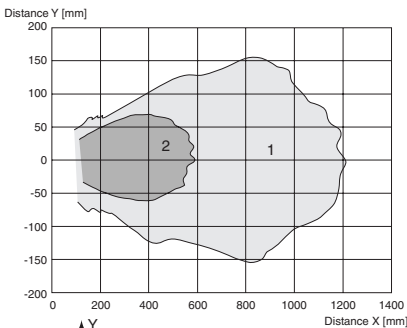
Ultrasonic sensors, standard, cylindrical style

5.1



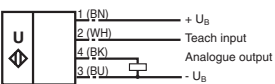
- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation

**Characteristic response curve**



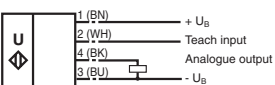
**Electrical connection**

Standard symbol/Connections:  
(version U)



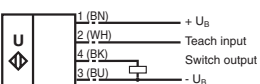
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)

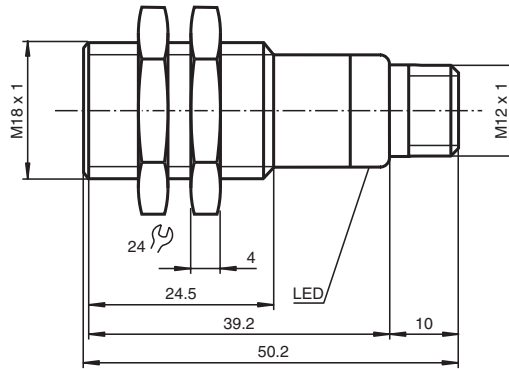


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version ES, pnp)



Core colours in accordance with EN 60947-5-2.



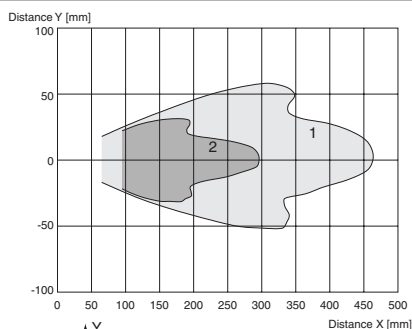
		UB800-18GM40-E5-V1	UB800-18GM40-I-V1	UB800-18GM40-U-V1
Sensing range	50 ... 800 mm	◆	◆	◆
Unusable area	0 ... 50 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 205 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 20 mA	◆	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆	◆
Output type	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s	◆	◆	◆
	1 analogue output 0 ... 10 V	◆	◆	◆
	1 analogue output 4 ... 20 mA, short-circuit/overload protected	◆	◆	◆
	1 switch output E5, pnp NO/NC, parameterisable	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆	◆
Resolution	0.4 mm at max. sensing range	◆	◆	◆
Rate of operational current	200 mA, short-circuit/overload protected	◆	◆	◆
Switching frequency	≤ 4 Hz	◆	◆	◆
Load impedance	> 1 kΩ hm	◆	◆	◆
	0 ... 300 Ω hm	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	V1 connector (M 12 x 1), 4-pin	◆	◆	◆
Housing	brass, nickel-plated	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆
Mass	25 g	◆	◆	◆





- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation

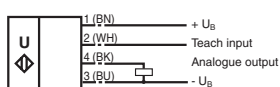
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

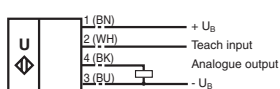
**Electrical connection**

Standard symbol/Connections:  
(version U)



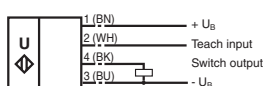
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)

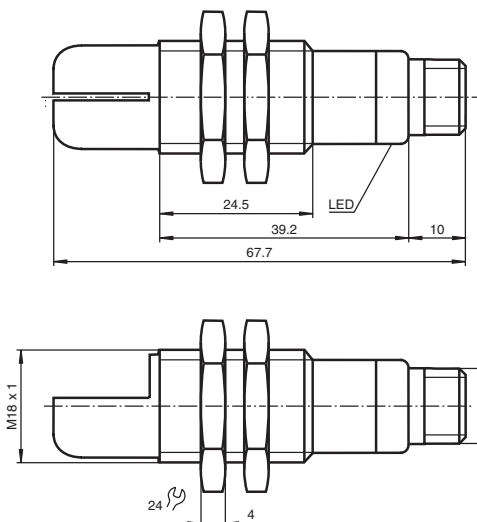


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB 300-18GM40A-E5-V1	UB 300-18GM40A-I-V1	UB 300-18GM40A-U-V1
Sensing range	30 ... 300 mm	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 390 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>			◆
No-load supply current	≤ 20 mA	◆	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆	◆
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s		◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA, short-circuit/overload protected		◆	◆
	1 switch output E5, pnp NO/NC, parameterisable	◆		
Deviation of the characteristic curve	± 1 % of full-scale value		◆	◆
Resolution	0.4 mm at max. sensing range		◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆		
Switching frequency	≤ 13 Hz	◆		
Load impedance	> 1 kOhm			◆
	0 ... 300 Ohm		◆	
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆
Mass	25 g	◆	◆	◆

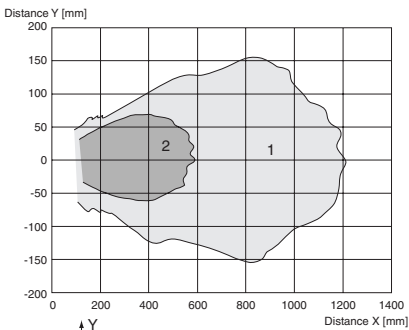
Ultrasonic sensors, standard, cylindrical style

5.1



- Short design, 40 mm
- Function indicators visible from all directions
- TEACH-IN input
- Temperature compensation

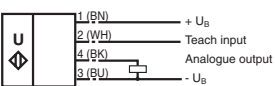
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
 Curve 2: round bar, Ø 25 mm

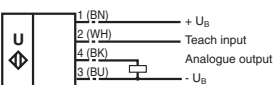
**Electrical connection**

Standard symbol/Connections:  
 (version U)



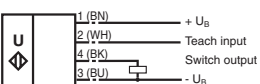
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
 (version I)

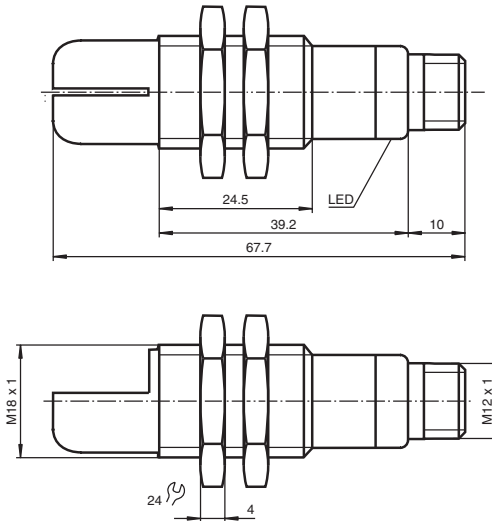


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
 (version ES, pnp)



Core colours in accordance with EN 60947-5-2.

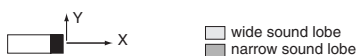
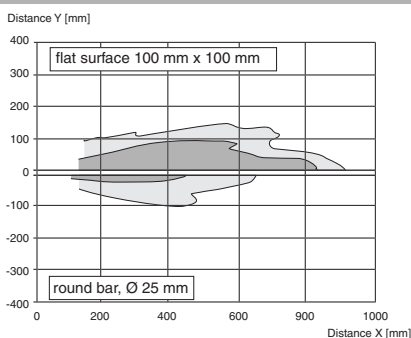


		UB800-18GM40A-E5-V1	UB800-18GM40A-I-V1	UB800-18GM40A-U-V1
Sensing range	50 ... 800 mm	◆	◆	◆
Unusable area	0 ... 50 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 205 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>			◆
No-load supply current	≤ 20 mA	◆	◆	◆
Input type	1 TEACH-IN input operating distance 1: -U <sub>B</sub> ... +1 V, operating distance 2: +6 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ TEACH-IN pulse: ≥ 1 s	◆	◆	◆
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4,7 kΩ, pulse duration: ≥ 1 s		◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA, short-circuit/overload protected		◆	◆
	1 switch output E5, pnp NO/NC, parameterisable	◆		
Deviation of the characteristic curve	± 1 % of full-scale value		◆	◆
Resolution	0.4 mm at max. sensing range		◆	◆
Rate operational current	200 mA, short-circuit/overload protected	◆		
Switching frequency	≤ 4 Hz	◆		
Load impedance	> 1 kΩ hm 0 ... 300 Ω hm		◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆
Mass	25 g	◆	◆	◆



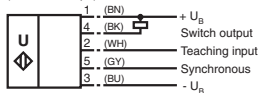
- Selectable sound lobe width
- TEACH-IN input
- Synchronisation options
- Deactivation option

**Characteristic response curve**



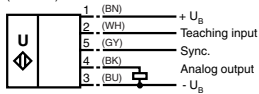
**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)



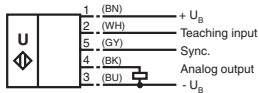
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)



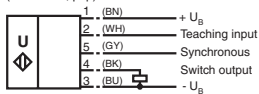
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version U)

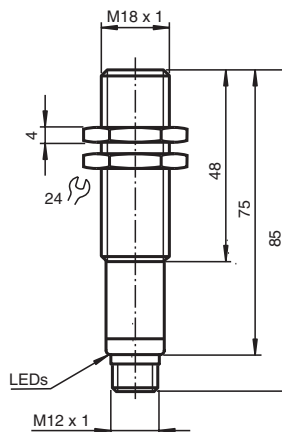


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.

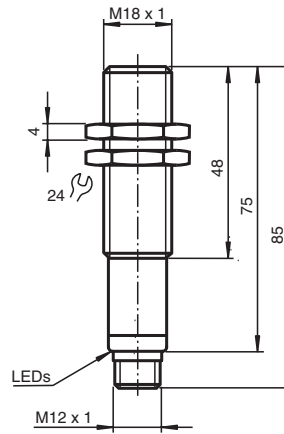


		UB500-18GM75-E-4-V15	UB500-18GM75-E-5-V15	UB500-18GM75-I-V15	UB500-18GM75-U-V15
Sensing range	30 ... 500 mm	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
No-load supply current	≤ 45 mA			◆	
	≤ 50 mA				◆
Synchronisation	1 synchronous connection, bi-directional 0-level: -U <sub>B</sub> ... +1 V 1-level: +4 V ... +U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 95 Hz Multiplex operation ≤ 95 Hz / n, n = number of sensors	◆	◆	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, TEACH-IN pulse: ≥ 1 s	◆	◆		
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s			◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable		◆		
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.11 mm at max. sensing range 0.13 mm for max. detection range			◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆		
Switching frequency	max. 8 Hz	◆	◆		
Load impedance	> 1 kΩ			◆	◆
	0 ... 300 Ohm				◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆

Ultrasonic sensors, standard, cylindrical style

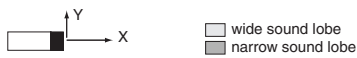
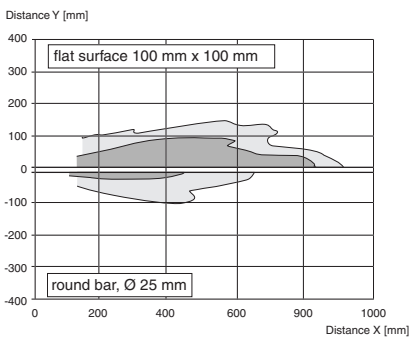
5.1

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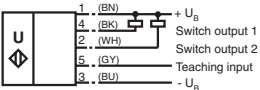
- 2 switch outputs
- Selectable sound lobe width
- TEACH-IN input
- Temperature compensation

**Characteristic response curve**



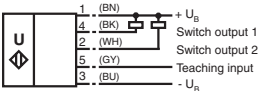
**Electrical connection**

Standard symbol/Connections:  
(version E7, npn)



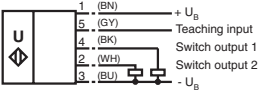
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E01, npn)



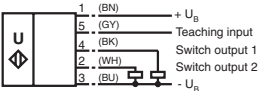
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E23, pnp)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E6, pnp)



Core colours in accordance with EN 60947-5-2.



		UB500-18GM75-E01-V15	UB500-18GM75-E23-V15	UB500-18GM75-E6-V15	UB500-18GM75-E7-V15
Sensing range	30 ... 500 mm	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10% <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆	◆	◆
Output type	2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	◆	◆	◆	◆
Rated operational current	2 x 100 mA, short-circuit/overload protected	◆	◆	◆	◆
Switching frequency	max. 8 Hz	◆	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆

Ultrasonic sensors, standard, cylindrical style

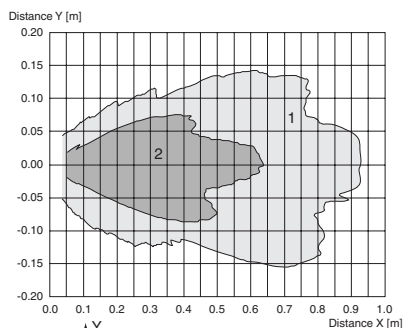
5.1

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- 3 different options of outputs parameterisable
- Parameterisation input
- Synchronisation options
- Deactivation option

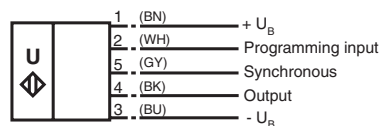
**Characteristic response curve**



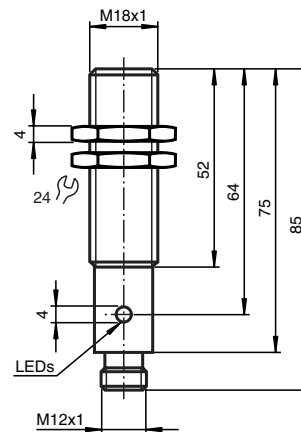
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connections:



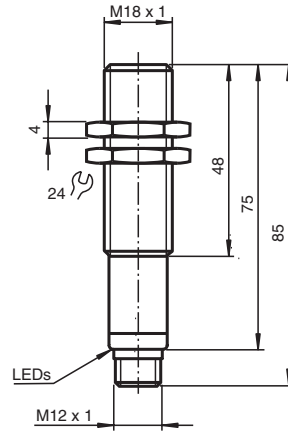
Core colours in accordance with EN 60947-5-2.



		UB500-18GM75-F-V15	UB500-18GM75-BIT-V15	UB500-18GM75-PWM-V15
Sensing range	30 ... 500 mm	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆
Synchronisation	1 synchronous connection, bi-directional 0-level: -U <sub>B</sub> ...+1 V 1-level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆
Synchronisation frequency				
Common mode operation	≤ 95 Hz	◆	◆	◆
Multiplex operation	≤ 95/n Hz, n = number of sensors	◆	◆	◆
Input type	1 Parameterisation input Input impedance: > 4.7 kΩ	◆	◆	◆
Output type	1 frequency output, push/pull, parameterisable 1 PWM output, push/pull, parameterisable 1 serial output, push/pull, parameterisable	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆	◆
Resolution	1 mm	◆	◆	◆
Load impedance	> 1000 Ohm < 100 nF	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆
Mass	60 g	◆	◆	◆

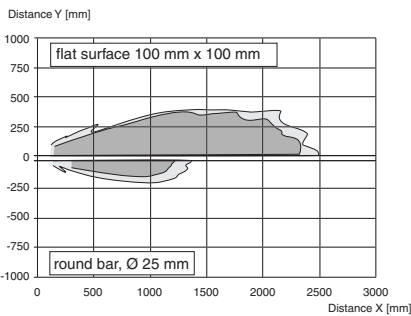
Ultrasonic sensors, standard, cylindrical style

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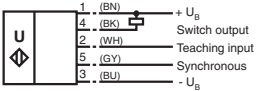
- Selectable sound lobe width
- TEACH-IN input
- Synchronisation options
- Deactivation option

**Characteristic response curve**



**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version I)



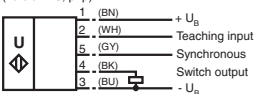
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version U)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB 1000-18GM 75-E4-V 15	UB 1000-18GM 75-E5-V 15	UB 1000-18GM 75-I-V 15	UB 1000-18GM 75-U-V 15
Sensing range	70 ... 1000 mm	◆	◆	◆	◆
Unusable area	0 ... 70 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 205 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
	≤ 45 mA				◆
	≤ 50 mA	◆	◆	◆	◆
Synchronisation	1 synchronous connection, bi-directional 0-level: -U <sub>B</sub> ...+1 V 1-level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 40 Hz Multiplex operation ≤ 40 Hz/n, n = number of sensors	◆	◆	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆		
Output type	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s 1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable			◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.35 mm			◆	◆
Rated operational current	200 mA, short circuit/overload protected	◆	◆		
Switching frequency	max. 3 Hz	◆	◆		
Load impedance	> 1 kΩ hm 0 ... 300 Ω hm			◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆

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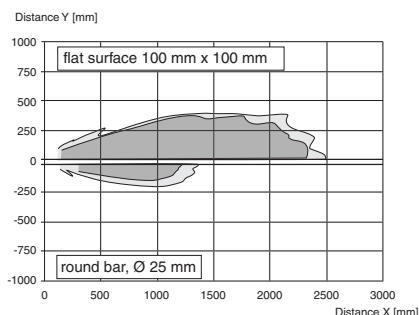
Ultrasonic sensors, standard, cylindrical style

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- 2 switch outputs
- Selectable sound lobe width
- TEACH-IN input
- Temperature compensation

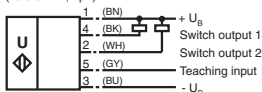
**Characteristic response curve**



□ wide sound lobe  
 ■ narrow sound lobe

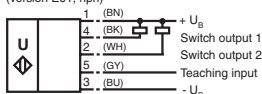
**Electrical connection**

Standard symbol/Connections:  
 (version E7, npn)



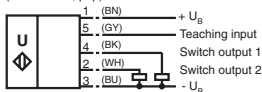
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
 (version E01, npn)



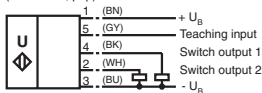
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
 (version E23, pnp)

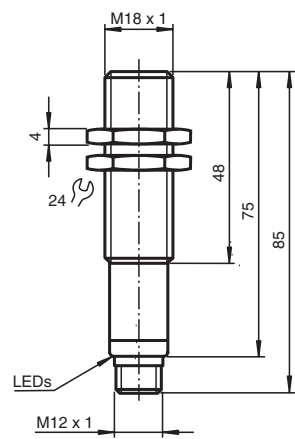


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
 (version E6, pnp)

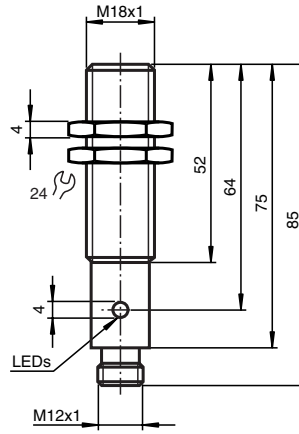


Core colours in accordance with EN 60947-5-2.



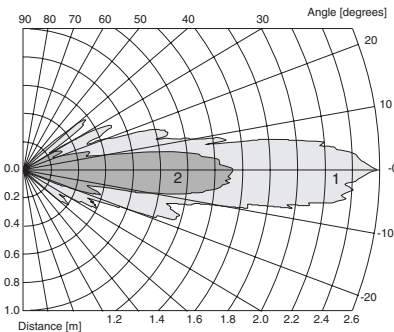
Sensing range	70 ... 1000 mm	UB 1000-18GM75-E01-V15	UB 1000-18GM75-E23-V15	UB 1000-18GM75-E6-V15	UB 1000-18GM75-E7-V15
Unusable area	0 ... 70 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 205 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆	◆	◆
Output type	2 switch outputs npn, normally open/closed 2 switch outputs npn, normally open/close selectable 2 switch outputs pnp, NO/NC 2 switch outputs pnp, normally open/close selectable	◆	◆	◆	◆
Rated operational current	2 x 100 mA, short circuit/overload protected	◆	◆	◆	◆
Switching frequency	max. 3 Hz	◆	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆

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- 3 different options of outputs parameterisable
- Parameterisation input
- Synchronisation options
- Deactivation option

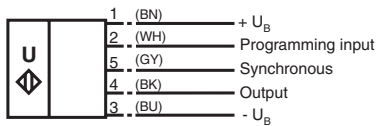
**Characteristic response curve**



Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connections:



Core colours in accordance with EN 60947-5-2.



		UB1000-18GM75-F-V15	UB1000-18GM75-BIT-V15	UB1000-18GM75-P-WM-V15
Sensing range	80 ... 1000 mm	◆	◆	◆
Unusable area	0 ... 80 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 205 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆
Synchronisation	1 synchronous connection, bi-directional 0-level: -U <sub>B</sub> ...+1 V 1-level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆	◆
Synchronisation frequency				
Common mode operation	≤ 30 Hz	◆	◆	◆
Multiplex operation	≤ 30/n Hz, n = number of sensors	◆	◆	◆
Input type	1 Parameterisation input Input impedance: > 4.7 kΩ	◆	◆	◆
Output type	1 frequency output, push/pull, parameterisable 1 PWM output, push/pull, parameterisable 1 serial output, push/pull, parameterisable	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆	◆
Resolution	1 mm	◆	◆	◆
Load impedance	> 1000 Ohm < 100 nF	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆
Material				
Housing	brass, nickel-plated	◆	◆	◆
Transducer	epoxy resin/low glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆
Mass	60 g	◆	◆	◆

Ultrasonic sensors, standard, cylindrical style

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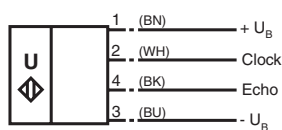




- Separate evaluation
- Direct detection mode

**Electrical connection**

Standard symbol/Connection:

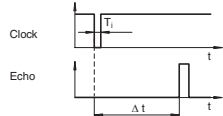


2 = Emitter pulse input  
4 = Echo propagation time output  
Core colours in accordance with EN 60947-5-2.

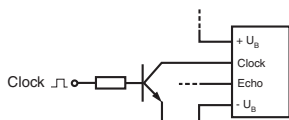
**Function**

The sensing range is determined in the downstream evaluation electronics such as PLC modules or other existing evaluation units.

The object distance in pulse-echo mode is obtained from the echo time  $\Delta t$ . The emission of an ultrasonic pulse starts simultaneously with the falling slope of the clock input signal.

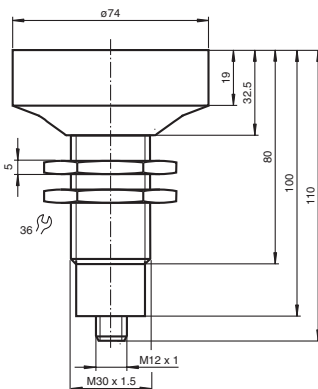


We recommend the usage of a npn-transistor to trigger the sensors clock input. The sensors clock input is connected to the +UB potential internally by means of a pull up resistor.

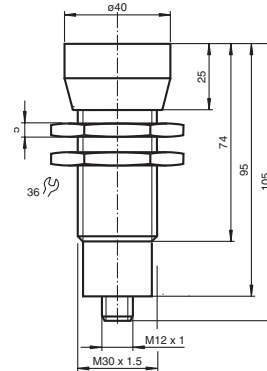


<sup>1)</sup> The unusable area (blind range) BR depends on the pulse duration  $T_i$ .  
The unusable area reaches a minimum with the shortest pulse duration.  
<sup>2)</sup> The sensors detection range depends on the pulse duration  $T_i$ .  
With pulse duration < typical pulse duration, the sensors detection range may be reduced.

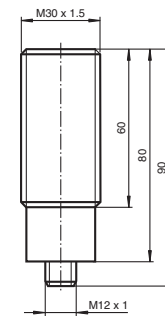
UB6000-30GM-H3-V1



UB4000-30GM-H3-V1

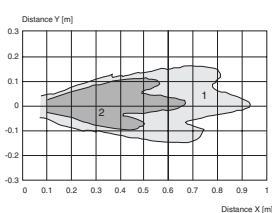


UB2000-30GM-H3-V1  
UB500-30GM-H3-V1

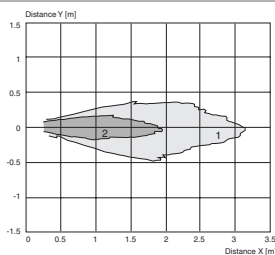


		UB500-30GM-H3-V1	UB2000-30GM-H3-V1	UB4000-30GM-H3-V1	UB6000-30GM-H3-V1
Sensing range	200 ... 4000 mm	◆			
	30 ... 500 mm		◆		
	350 ... 6000 mm				◆
	80 ... 2000 mm				◆
Unusable area	0 ... 200 mm <sup>1)</sup>		◆		
	0 ... 30 mm <sup>1)</sup>	◆			
	0 ... 350 mm <sup>1)</sup>			◆	
	0 ... 80 mm <sup>1)</sup>				◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. [kHz]	380	180	85	65
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	≤ 30 mA	◆	◆	◆	◆
Input type	1 pulse input for transmitter pulse (clock)	◆	◆	◆	◆
	0-level (active): < 5 V ( $U_B > 15 V$ )	◆	◆	◆	◆
Output type	1-level (inactive): > 10 V ... + $U_B$ ( $U_B > 15 V$ )	◆	◆	◆	◆
	0-level (active): < 1/3 $U_B$ ( $10 V < U_B < 15 V$ )	◆	◆	◆	◆
	1-level (inactive): > 2/3 $U_B$ ... + $U_B$ ( $10 V < U_B < 15 V$ )	◆	◆	◆	◆
	level 0 (no echo): - $U_B$	◆	◆	◆	◆
Rated operational current	level 1 (echo detected): ≥ (+ $U_B$ - 2 V)	◆	◆	◆	◆
	15 mA, short-circuit/overload protected	◆	◆	◆	◆
Temperature influence	the echo propagation time: 0.17 % / K	◆	◆	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆	◆	◆
Protection degree	IP 67	◆	◆	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆	◆	◆
Material	Housing	brass, nickel-plated, plastic components PBT	◆	◆	◆
	Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆
Mass	140 g	◆	◆		
	180 g			◆	
	250 g				◆

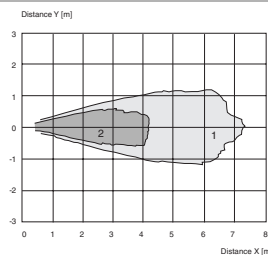
**Characteristic response curve**



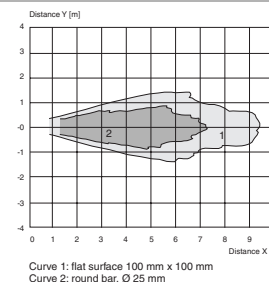
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm



UB4000-30GM-H3-V1

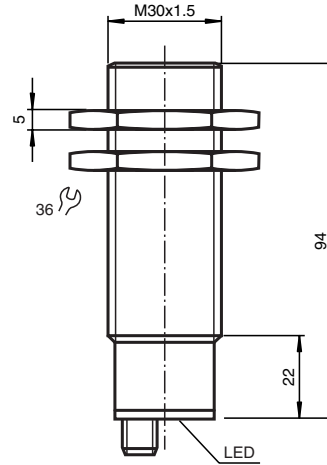


UB6000-30GM-H3-V1

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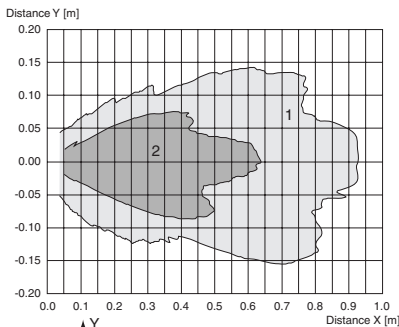
UB500-30GM-H3-V1

UB2000-30GM-H3-V1



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options

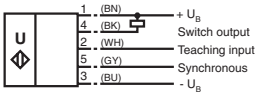
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

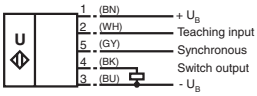
**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB500-30GM-E4-V15	UB500-30GM-E5-V15
Sensing range	30 ... 500 mm	◆	◆
Unusable area	0 ... 30 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency			
Common mode operation	≤ 95 Hz	◆	◆
Multiplex operation	≤ 95/n Hz, n = number of sensors	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆
Output type	1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 10 Hz	◆	◆
Temperature influence	< 2 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	135 g	◆	◆

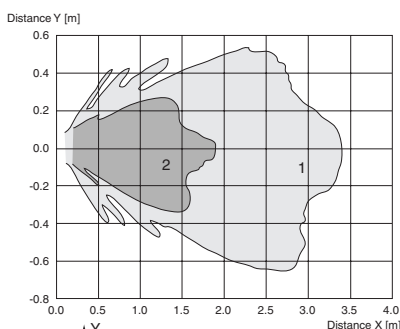
Ultrasonic sensors, standard, cylindrical style

5.1



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options

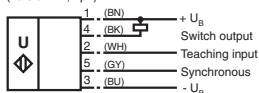
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

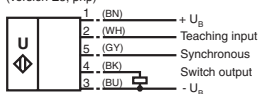
**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)

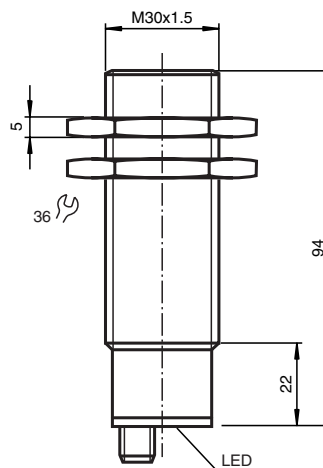


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



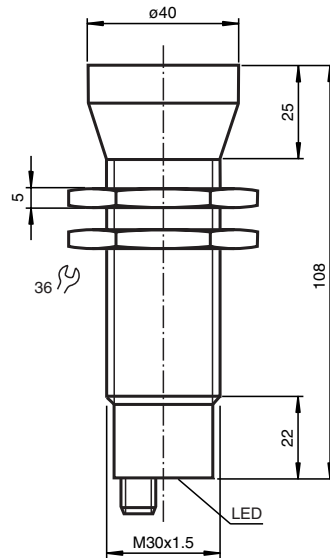
Core colours in accordance with EN 60947-5-2.



		UB2000-30GM-E4-V15	UB2000-30GM-E5-V15
Sensing range	80 ... 2000 mm	◆	◆
Unusable area	0 ... 80 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 180 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ... +1 V 1 level: +4 V ... +U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency	Common mode operation ≤ 30 Hz	◆	◆
Multiplex operation	≤ 30/h Hz, n = number of sensors	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆
Output type	1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 3.3 Hz	◆	◆
Temperature influence	< 2 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	140 g	◆	◆

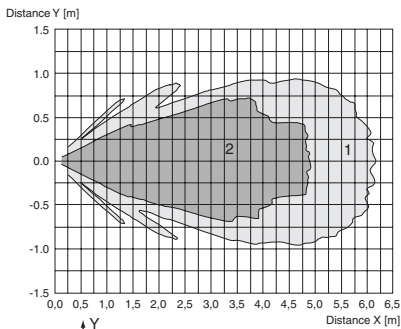
Ultrasonic sensors, standard, cylindrical style

5.1



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options

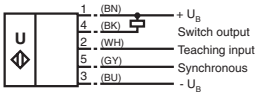
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

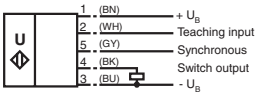
**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB4000-30GM-E4-V15	UB4000-30GM-E5-V15
Sensing range	200 ... 4000 mm	◆	◆
Unusable area	0 ... 200 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 85 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency	Common mode operation ≤ 13 Hz	◆	◆
Multiplex operation	≤ 13/n Hz, n = number of sensors	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆
Output type	1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 1.5 Hz	◆	◆
Temperature influence	< 2 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	180 g	◆	◆

Ultrasonic sensors, standard, cylindrical style

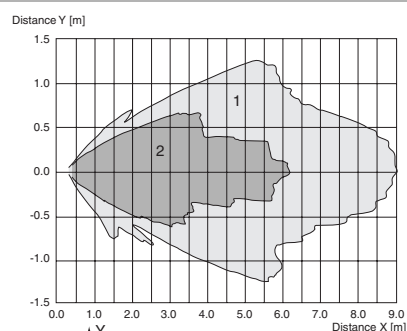
5.1

Date of edition 2008-03-20



- Switch output
- 5 different output functions can be set
- TEACH-IN input
- Synchronisation options

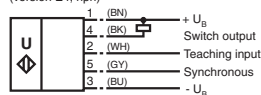
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

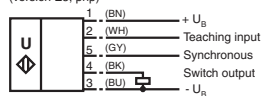
**Electrical connection**

Standard symbol/Connections:  
(version E4, npn)

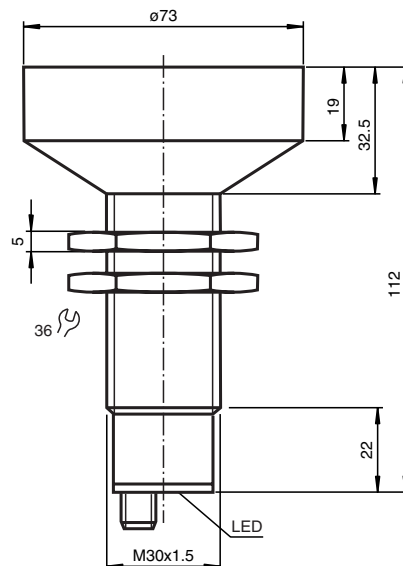


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections:  
(version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB6000-30GM-E4-V15	UB6000-30GM-E5-V15
Sensing range	350 ... 6000 mm	◆	◆
Unusable area	0 ... 350 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 65 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ... +1 V 1 level: +4 V ... +U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆
Synchronisation frequency			
Common mode operation	≤ 7 Hz	◆	◆
Multiplex operation	≤ 7/n Hz, n = number of sensors	◆	◆
Input type	1 TEACH-IN input, operating range 1: -U <sub>B</sub> ... +1 V, operating range 2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ; TEACH-IN pulse: ≥ 1 s	◆	◆
Output type	1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 0.8 Hz	◆	◆
Temperature influence	< 2 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	250 g	◆	◆

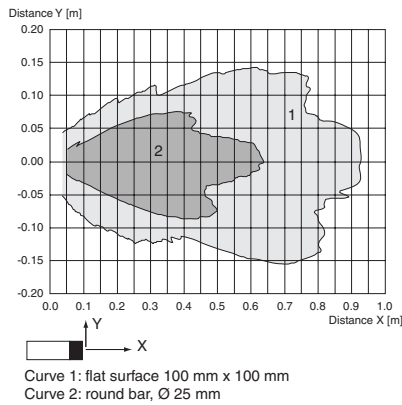
Ultrasonic sensors, standard, cylindrical style

5.1



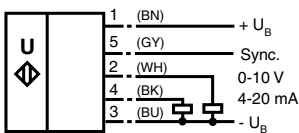
- Very small unusable area
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Current and voltage output
- Synchronisation options

**Characteristic response curve**

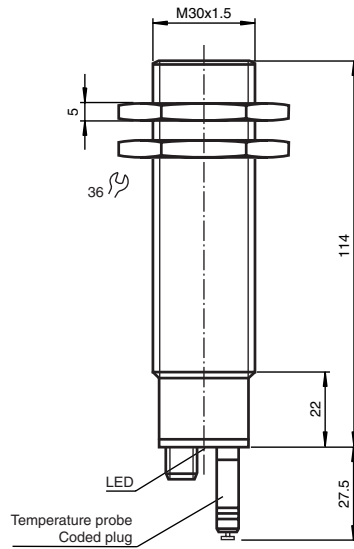


**Electrical connection**

Standard symbol/Connection:  
(version IU)



Core colours in accordance with EN 60947-5-2.



		<b>UC300-30GM-IUR2-V15</b>
Sensing range	15 ... 300 mm	◆
Unusable area	0 ... 15 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 380 kHz	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆
Power consumption	≤ 900 mW	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆
Synchronisation frequency		
Common mode operation	≤ 95 Hz	◆
Multiplex operation	≤ 95/n Hz, n = number of sensors	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆
Resolution	evaluation range [mm] 4000, but ≥ 0.05 mm	◆
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆
Ambient temperature	0 ... 70 °C (273 ... 343 K)	◆
Protection degree	IP65	◆
Connection	connector V15 (M12 x 1), 5 pin	◆
Material		
Housing	stainless steel 1.4303 plastic parts PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	170 g	◆

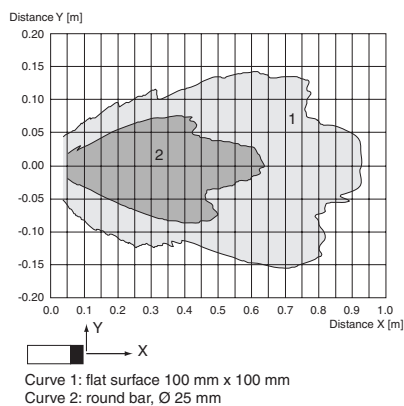
Ultrasonic sensors, standard, cylindrical style

5.1



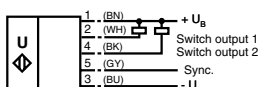
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

**Characteristic response curve**



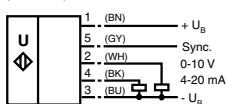
**Electrical connection**

Standard symbol/Connection:  
(version E7, npn)



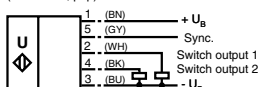
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version IU)



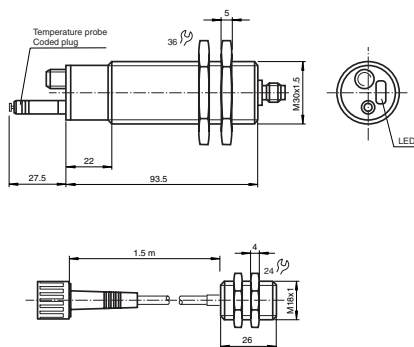
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

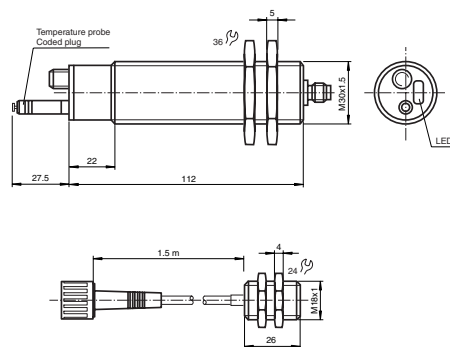


Core colours in accordance with EN 60947-5-2.

UC300-30GM-E6R2-K-V15  
UC300-30GM-E7R2-K-V15



UC300-30GM-IUR2-K-V15

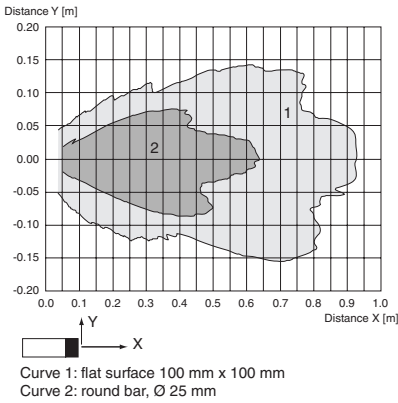


	UC300-30GM-E6R2-K-V15	UC300-30GM-E7R2-K-V15	UC300-30GM-IUR2-K-V15
Sensing range	30 ... 300 mm	♦	♦
Unusable area	0 ... 30 mm	♦	♦
Standard target plate	100 mm x 100 mm	♦	♦
Transducer frequency	approx. 380 kHz	♦	♦
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	♦	♦
No-load supply current	≤ 50 mA	♦	♦
Power consumption	≤ 900 mW	♦	♦
Interface type	RS 232, 9600 B it/s, no parity, 8 data bits, 1 stop bit	♦	♦
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ... +1 V 1 level: +4 V ... +U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	♦	♦
Synchronisation frequency			
Common mode operation	≤ 95 Hz	♦	♦
Multiplex operation	≤ 95/n Hz, n = number of sensors	♦	♦
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	♦	♦
Deviation of the characteristic curve	≤ 0.2 % of full-scale value		♦
Resolution	evaluation range [mm]/4000, but ≥ 0.05 mm		♦
Rated operational current	200 mA, short-circuit/overload protected	♦	♦
Switching frequency	≤ 7 Hz	♦	♦
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm		♦
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	♦	♦
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	♦	♦
Protection degree	sensor head: IP67 connector sensor head/controller unit IP52	♦	♦
Connection	connector V15 (M12 x 1), 5 pin	♦	♦
Material			
Housing	stainless steel 1.4303 plastic parts PB T	♦	♦
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	♦	♦
Mass	210 g 260 g	♦	♦



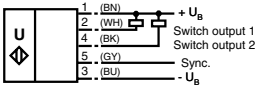
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

**Characteristic response curve**



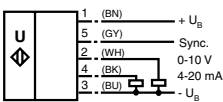
**Electrical connection**

Standard symbol/Connection:  
(version E7, npn)



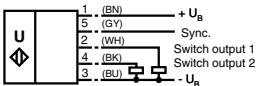
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version IU)



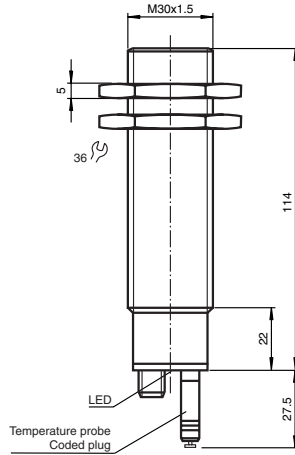
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

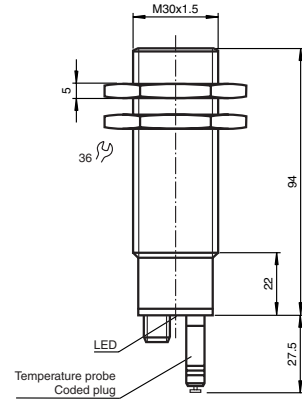


Core colours in accordance with EN 60947-5-2.

UC500-30GM-IUR2-V15



UC500-30GM-E6R2-V15  
UC500-30GM-E7R2-V15



		UC 500-30GM-E6R2-V15	UC 500-30GM-E7R2-V15	UC 500-30GM-IUR2-V15
Sensing range	30 ... 500 mm	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆
Power consumption	≤ 900 mW	◆	◆	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kOhm synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 95 Hz Multiplex operation ≤ 95/n Hz, n = number of sensors	◆	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	◆	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆	◆
Resolution	evaluation range [mm] 4000, but ≥ 0.05 mm	◆	◆	◆
Rated operational current	200 mA, short circuit/overload protected	◆	◆	◆
Switching frequency	≤ 7 Hz	◆	◆	◆
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm	◆	◆	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆
Material	Housing: stainless steel 1.4303 plastic parts PBT	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆
Mass	140 g	◆	◆	◆
	170 g	◆	◆	◆

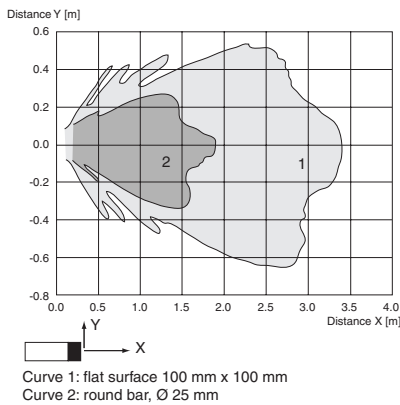
Date of edition 2008-03-20





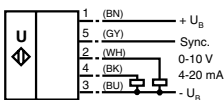
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

**Characteristic response curve**



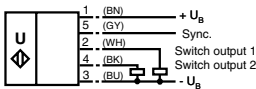
**Electrical connection**

Standard symbol/Connection:  
(version IU)

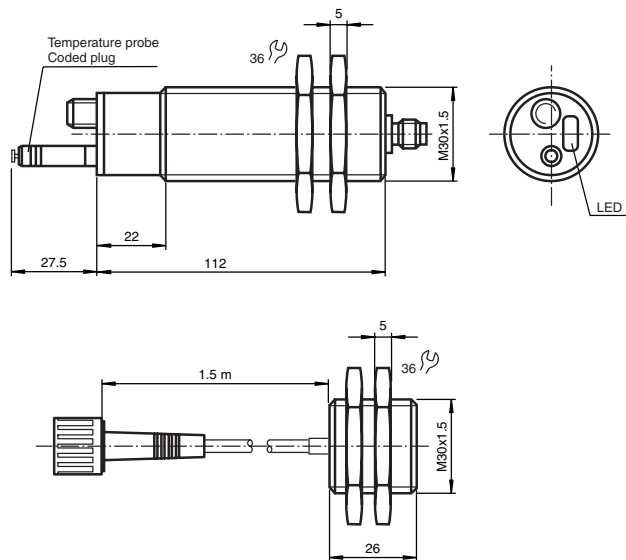


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)



Core colours in accordance with EN 60947-5-2.



	UC1000-30GM-E6R2-K-V15	UC1000-30GM-IJR2-K-V15
Sensing range	80 ... 1000 mm	◆
Unusable area	0 ... 80 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 180 kHz	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆
No-load supply current	≤ 50 mA	◆
Power consumption	≤ 900 mW	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆
Synchronisation frequency		
Common mode operation	≤ 30 Hz	◆
Multiplex operation	≤ 30/n Hz, n = number of sensors	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs pnp, NO/NC, parameterisable	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆
Resolution	evaluation range [mm]/4000, but ≥ 0.35 mm	◆
Rated operational current	200 mA, short-circuit/overload protected	◆
Switching frequency	≤ 2.5 Hz	◆
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	sensor head: IP67 connector sensor head/controller unit IP52	◆
Connection	connector V15 (M12 x 1), 5 pin	◆
Material		
Housing	stainless steel 1.4303 plastic parts PB T	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	210 g	◆
	260 g	◆

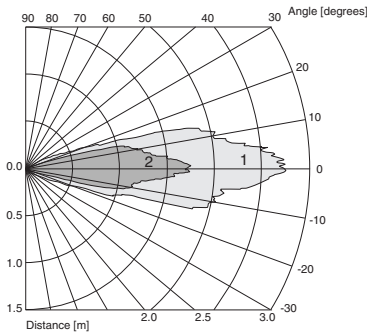
Ultrasonic sensors, standard, cylindrical style

5.1



- High chemical resistance through teflon-coated transducer surface
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity

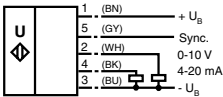
Characteristic response curve



Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

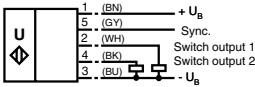
Electrical connection

Standard symbol/Connection:  
(version IU)



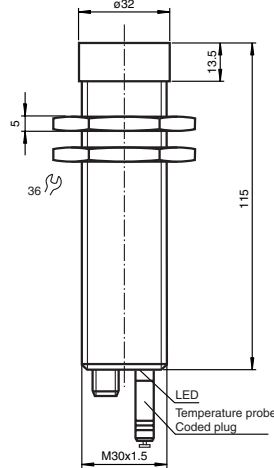
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

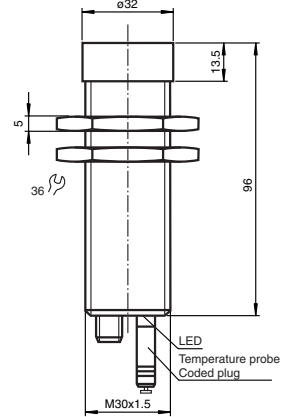


Core colours in accordance with EN 60947-5-2.

UCC1000-30GM-IUR2-V15



UCC1000-30GM-E6R2-V15



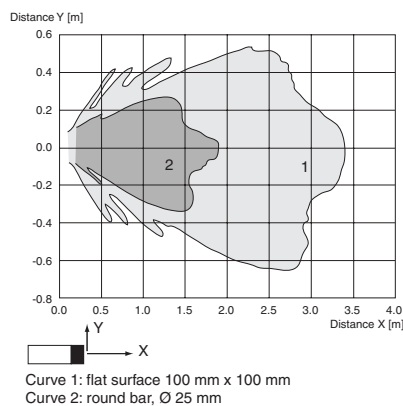
		UCC1000-30GM-E6R2-V15	UCC1000-30GM-IUR2-V15
Sensing range	80 ... 1000 mm	◆	◆
Unusable area	0 ... 80 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10% SS	◆	◆
No-load supply current	≤ 50 mA	◆	
Power consumption	≤ 900 mW		◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency			
Common mode operation	≤ 30 Hz	◆	◆
Multiplex operation	≤ 30/n Hz, n = number of sensors	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs pnp, NO/NC, parameterisable	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆
Resolution	evaluation range [mm] 4000, but ≥ 0.35 mm		◆
Rated operational current	200 mA, short circuit/overload protected	◆	
Switching frequency	≤ 2.5 Hz	◆	
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm		◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆
Ambient temperature	0 ... 70 °C (273 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	stainless steel 1.4303 plastic parts PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	140 g	◆	
	170 g		◆

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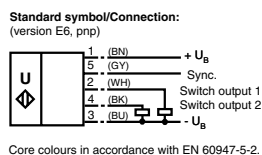
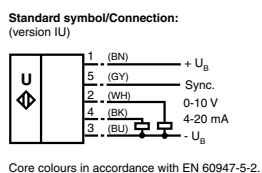
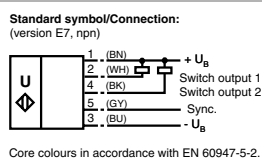


- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

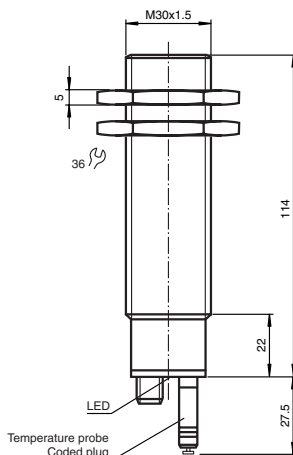
Characteristic response curve



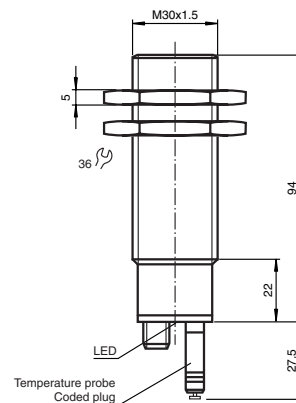
Electrical connection



UC2000-30GMUR2-V15



UC2000-30GMEFR2-V15  
UC2000-30GMEFR2-V15

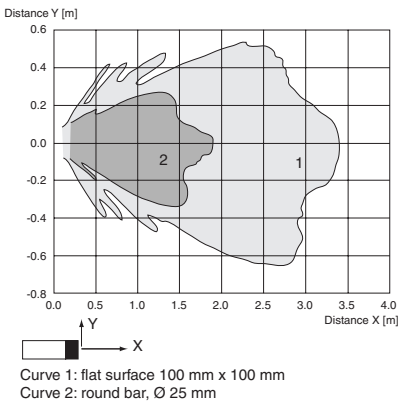


	UC2000-30GM-E6 R2-V15	UC2000-30GM-E7 R2-V15	UC2000-30GM-IUR2-V15
Sensing range	80 ... 2000 mm	◆	◆
Unusable area	0 ... 80 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 180 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Power consumption	≤ 900 mW	◆	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency	Common mode operation ≤ 30 Hz Multiplex operation ≤ 30/n Hz, n = number of sensors	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆
Resolution	evaluation range [mm]/4000, but ≥ 0.35 mm	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 2.5 Hz	◆	◆
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm	◆	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material	Housing: stainless steel 1.4303 plastic parts: PB T	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	140 g	◆	◆
	170 g	◆	◆



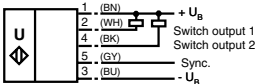
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

**Characteristic response curve**



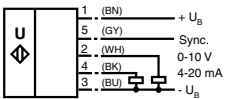
**Electrical connection**

Standard symbol/Connection:  
(version E7, npn)



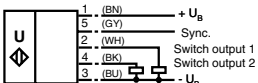
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version IU)



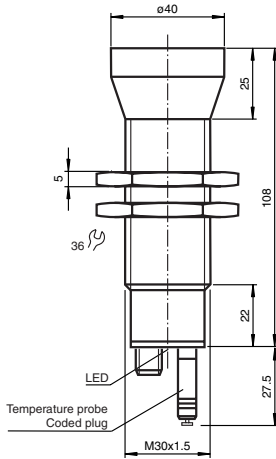
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

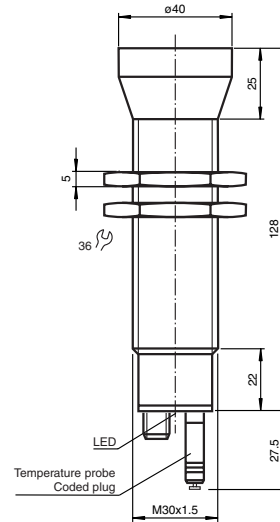


Core colours in accordance with EN 60947-5-2.

UC2000-30GM-E6R2-T-V15  
UC2000-30GM-E7R2-T-V15



UC2000-30GM-IUR2-T-V15



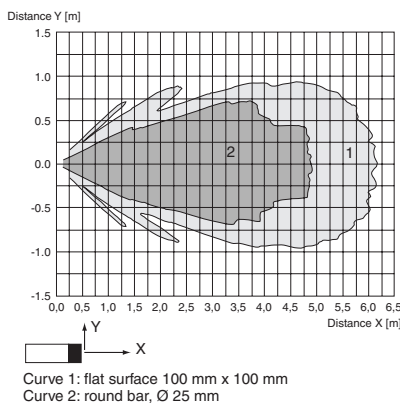
		UC2000-30GM-E6R2-T-V15	UC2000-30GM-E7R2-T-V15	UC2000-30GM-IUR2-T-V15
Sensing range	80 ... 2000 mm	◆	◆	◆
Unusable area	0 ... 80 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆
Power consumption	≤ 900 mW	◆	◆	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆	◆
Synchronisation	bi-directional 0 level -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆	◆	◆
Synchronisation frequency				
Common mode operation	≤ 30 Hz	◆	◆	◆
Multiplex operation	≤ 30/n Hz, n = number of sensors	◆	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	◆	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆	◆
Resolution	evaluation range [mm] 4000, but ≥ 0.35 mm	◆	◆	◆
Rate operational current	200 mA, short-circuit overload protected	◆	◆	◆
Switching frequency	≤ 2.5 Hz	◆	◆	◆
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm	◆	◆	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆
Material				
Housing	stainless steel 1.4303 plastic parts PBT	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆
Mass	180 g 210 g	◆	◆	◆

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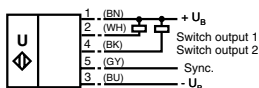
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

Characteristic response curve



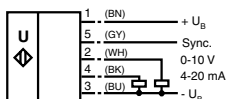
Electrical connection

Standard symbol/Connection:  
(version E7, npn)



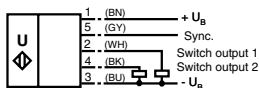
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version IU)



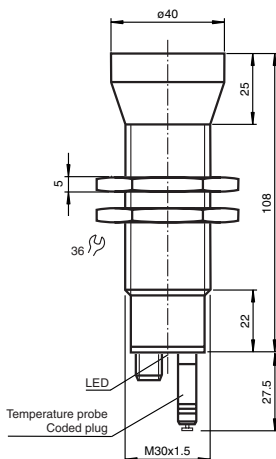
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

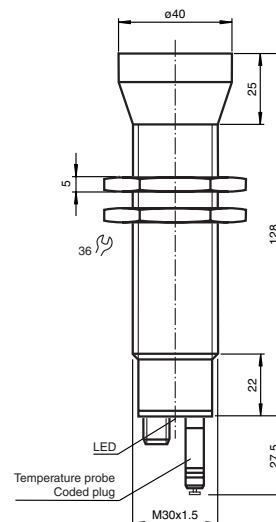


Core colours in accordance with EN 60947-5-2.

UC4000-30GM-E6R2-V15  
UC4000-30GM-E7R2-V15



UC4000-30GM-IUR2-V15



	UC4000-30GM-E6R2-V15	UC4000-30GM-E7R2-V15	UC4000-30GM-IUR2-V15
Sensing range	200 ... 4000 mm	◆	◆
Unusable area	0 ... 200 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 85 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	≤ 50 mA	◆	◆
Power consumption	≤ 900 mW	◆	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation interpulse period: ≥ 2 ms	◆	◆
Synchronisation frequency			
Common mode operation	≤ 13 Hz	◆	◆
Multiplex operation	≤ 13/n Hz, n = number of sensors	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V	◆	◆
	2 switch outputs npn, NO/NC, parameterisable	◆	◆
	2 switch outputs pnp, NO/NC, parameterisable	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆
Resolution	evaluation range [mm]/4000, but ≥ 0.35 mm	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆
Switching frequency	≤ 1 Hz	◆	◆
Load impedance	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm	◆	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆
Material			
Housing	stainless steel 1.4303 plastic parts PB T	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	180 g 210 g	◆	◆

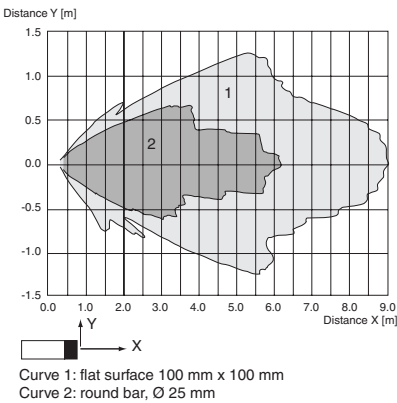
Ultrasonic sensors, standard, cylindrical style

5.1



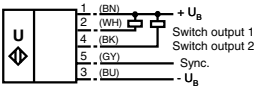
- Parameterisation interface for the application-specific adjustment of the sensor setting via the service program ULTRA 3000
- Synchronisation options
- Adjustable acoustic power and sensitivity
- Temperature compensation

**Characteristic response curve**



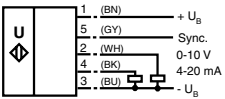
**Electrical connection**

Standard symbol/Connection:  
(version E7, npn)



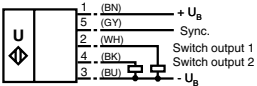
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version IU)



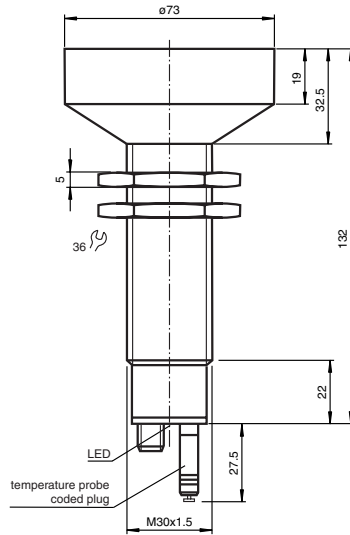
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connection:  
(version E6, pnp)

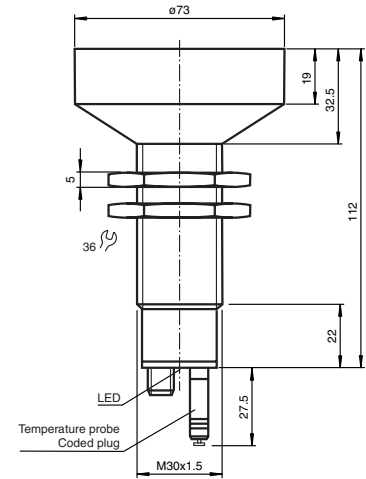


Core colours in accordance with EN 60947-5-2.

UC6000-30GMUR2-V15



UC6000-30GME6R2-V15  
UC6000-30GME7R2-V15



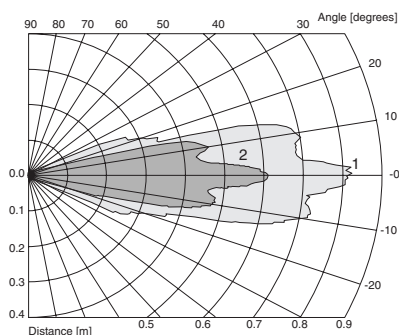
		UC6000-30GM-E6R2-V15	UC6000-30GM-E7R2-V15	UC6000-30GM-IUR2-V15
Sensing range	350 ... 6000 mm	◆	◆	◆
Unusable area	0 ... 350 mm	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆
Transducer frequency	approx. 65 kHz	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆
Power consumption	≤ 900 mW	◆	◆	◆
Interface type	RS 232, 9600 Bit/s, no parity, 8 data bits, 1 stop bit	◆	◆	◆
Synchronisation	bi-directional 0 level -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 μs, synchronisation interspersed period: ≥ 2 ms	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 7 Hz Multiplex operation ≤ 7/n Hz, n = number of sensors	◆	◆	◆
Output type	1 current output 4 ... 20 mA 1 voltage output 0 ... 10 V 2 switch outputs npn, NO/NC, parameterisable 2 switch outputs pnp, NO/NC, parameterisable	◆	◆	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆	◆	◆
Resolution	evaluation range [mm] 4000, but ≥ 0,35 mm	◆	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆
Switching frequency	≤ 0.5 Hz	◆	◆	◆
Load impedance	current output: ≤ 500 Ohm Voltage output: ≥ 1000 Ohm	◆	◆	◆
Temperature influence	≤ 2 % from full-scale value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆
Protection degree	IP65	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆
Material				
Housing	stainless steel 1.4303 plastic parts PBT	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆
Mass	270 g 280 g	◆	◆	◆

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- Specially for level monitoring in vessels
- Large operating voltage range  
10 V DC ... 252 V DC  
20 V AC ... 252 V AC
- 3 relay outputs
- Parameter assignment via DIP-switches

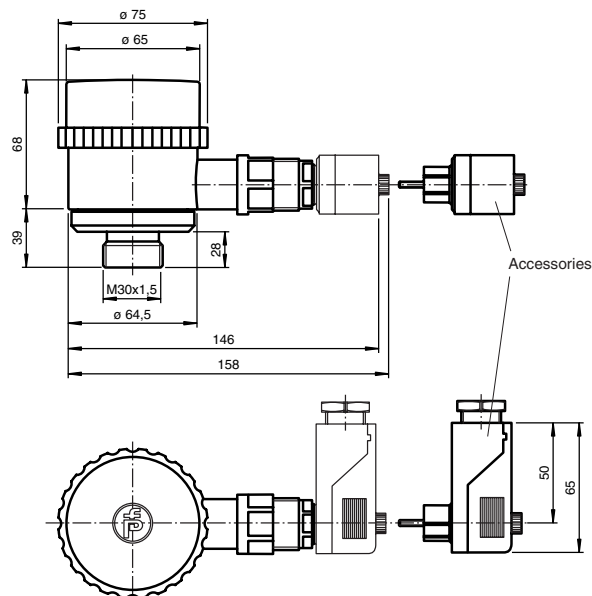
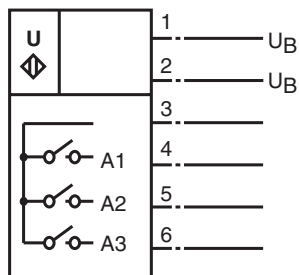
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

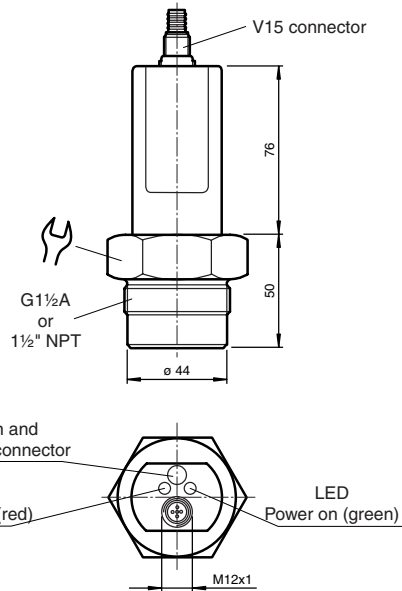
Standard symbol/Connection:



		UC 500-D1-3K-V7
Sensing range	60 ... 550 mm	◆
Unusable area	0 ... 60 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 380 kHz	◆
Operating voltage	10 ... 252 V DC	◆
	20 ... 252 V AC, 47 ... 63 Hz	◆
No-load supply current	< 30 mA with $U_B = 30$ V DC	◆
	< 110 mA at $U_B = 10$ V DC	◆
	< 25 mA at $U_B = 220$ V AC	◆
Output type	3 relay outputs, normally open/closed, selectable	◆
Contact loading	252 V AC/150V DC, 3 A (ohm. load)	◆
Lifetime	Electrical: $10^5$ switching cycles at resistive load (3 A / 252 V AC or 3 A / 30 V DC) min. contact load: 100 $\mu$ A / 100 mV DC mechanical: $20 \times 10^6$ switching cycles	◆
Temperature influence	< 4 %	◆
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	◆
Storage temperature	-40 ... 85 °C (233 ... 358 K)	◆
Protection degree	IP65	◆
Connection	Cable connector 90° V7, (7-pin)	◆
Material		
Housing	cover: PC housing: PBT	◆
	threaded flange: stainless steel installation connector/cable socket: PETP	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	700 g	◆

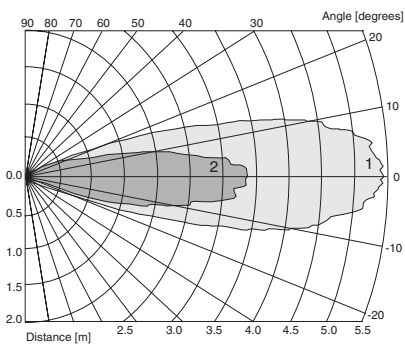
Ultrasonic sensors, standard, cylindrical style

5.1



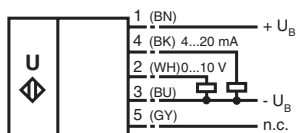
- Fixed target suppression
- Simple calibration
- Function monitoring
- Fail-safe behaviour in the event of no echo

**Characteristic response curve**



Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**



Core colours in accordance with EN 60947-5-2.



		LUC4T-N5S-IU-V15	LUC4T-N5P-IU-V15	LUC4T-G5S-IU-V15	LUC4T-G5P-IU-V15
Sensing range	0.3 ... 4 m , with fluids	◆	◆	◆	◆
Transducer frequency	approx. 85 kHz	◆	◆	◆	◆
Operating voltage	20 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
Power consumption	≤ 1200 mW	◆	◆	◆	◆
Output type	1 analogue output 4 ... 20 mA, R <sub>L</sub> ≤ 500 Ohm, error ≥ 21 mA 1 voltage output 0 ... 10 V, R <sub>L</sub> ≥ 1000 Ohm, error ≥ 10.5 V	◆	◆	◆	◆
Deviation of the characteristic curve	0.5 % of upper limit of measuring range	◆	◆	◆	◆
Resolution	2 mm	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Storage temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	PBT, stainless steel 1.4571	◆		◆	
Transducer	PBT, polypropylene PTFE (diaphragm surface)		◆		◆
Mass	220 g	◆	◆	◆	◆
Mounting	screwed connection G1 1/2 A screwed connection 1 1/2" NPT	◆	◆		

Ultrasonic sensors, standard, cylindrical style

5.1

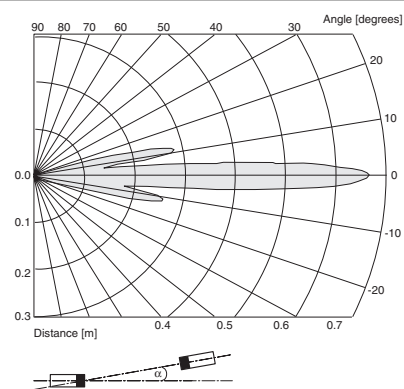
Date of edition 2008-03-20





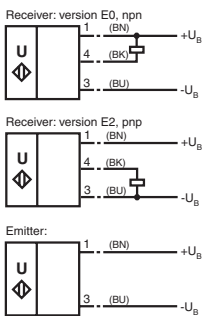
- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Small, compact design

**Characteristic response curve**



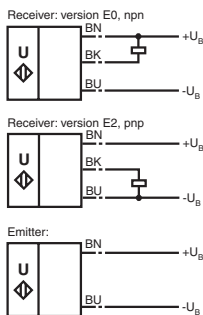
**Electrical connection**

Standard symbol/Connection:

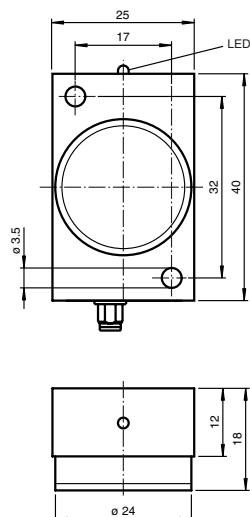


Core colours in accordance with EN 60947-5-2.

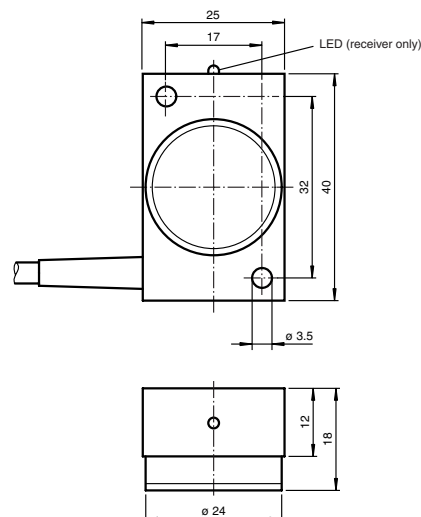
Standard symbol/Connection:



UBE500-F64-SE2-V3  
UBE500-F64-SE0-V3



UBE500-F64-SE2  
UBE500-F64-SE0



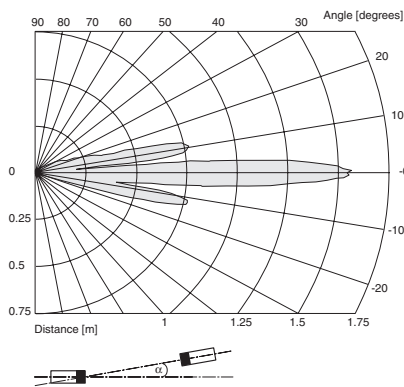
	UBE500-F64-SE0	UBE500-F64-SE0-V3	UBE500-F64-SE2	UBE500-F64-SE2-V3
Sensing range	0 ... 500 mm, distance emitter-receiver 15 mm ... 500 mm			
Transducer frequency	200 kHz			
Operating voltage	18 ... 30 V DC, ripple 10 % <sub>SS</sub>			
No-load supply current	20 mA receiver 12 mA emitter			
Output type	1 switch output E0, npn NO 1 switch output E2, pnp NO			
Rated operational current	200 mA 50 mA			
Switching frequency	100 Hz			
Ambient temperature	0 ... 60 °C (273 ... 333 K)			
Protection degree	IP54			
Connection	V3 connector (M8 x 1), 3 pin 2 m, PVC cable emitter: 2 x 0.34 mm <sup>2</sup> receiver: 3 x 0.34 mm <sup>2</sup>			
Material				
Housing	PA 6.6			
Mass	80 g per device			

Date of edition: 2008-03-20



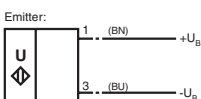
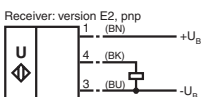
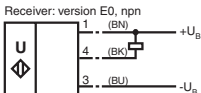
- Reliable detection of transparent materials
- High switching frequency
- Small angle of divergence
- Small, compact design

**Characteristic response curve**



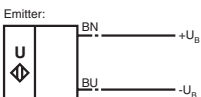
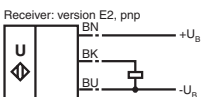
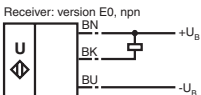
**Electrical connection**

Standard symbol/Connection:

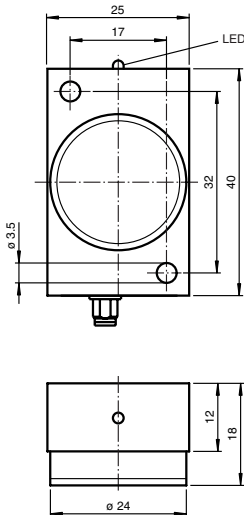


Core colours in accordance with EN 60947-5-2.

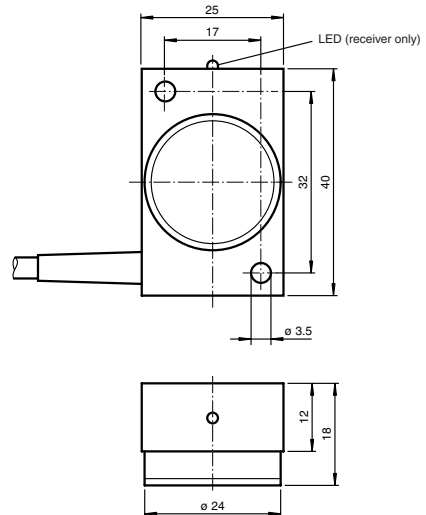
Standard symbol/Connection:



UBE1500-F64-SE2-V3  
UBE1500-F64-SE0-V3



UBE1500-F64-SE2  
UBE1500-F64-SE0

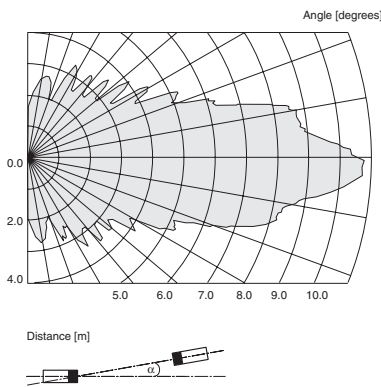


		UBE 1500-F64-SE0	UBE 1500-F64-SE0-V3	UBE 1500-F64-SE2	UBE 1500-F64-SE2-V3
Sensing range	0 ... 1500 mm , distance emitter-receiver 20 mm ... 1500 mm	◆	◆	◆	◆
Transducer frequency	200 kHz	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	20 mA receiver 12 mA emitter	◆	◆	◆	◆
Output type	1 switch output E0, npn NO 1 switch output E2, pnp NO	◆	◆	◆	◆
Rated operational current	200 mA 50 mA	◆	◆	◆	◆
Switching frequency	120 Hz	◆	◆	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆	◆	◆
Protection degree	IP54	◆	◆	◆	◆
Connection	V3 connector (M8 x 1), 3 pin 2 m, PVC cable emitter: 2 x 0.34 mm <sup>2</sup> receiver: 3 x 0.34 mm <sup>2</sup>	◆	◆	◆	◆
Material	Housing	PA 6.6	◆	◆	◆
Mass	80 g per device	◆	◆	◆	◆

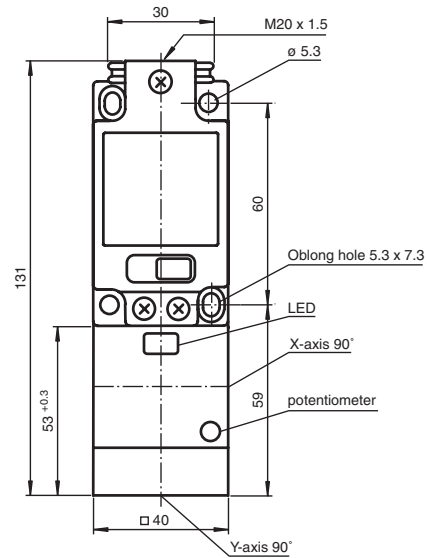
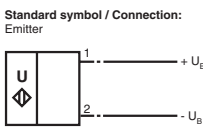
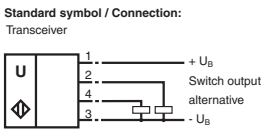


- High switching frequency
- Complementary outputs
- Absolute polarity reversal protection
- Adjustable sensitivity

**Characteristic response curve**



**Electrical connection**



Sensing range	0 ... 6000 mm	◆	UBE6000-U1+SA2
Transducer frequency	approx. 130 kHz	◆	
Operating voltage	20 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	
Power consumption	Emitter: ≤ 1.5 W Receiver: ≤ 1 W	◆	
Output type	Receiver: Complementary output stage 200 mA, Short-circuit/overload protected	◆	
Switching frequency	≤ 30 Hz	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Protection degree	IP65	◆	
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆	
Material			
Housing	PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	180 g each sensor	◆	

Ultrasonic sensors, standard, cube style

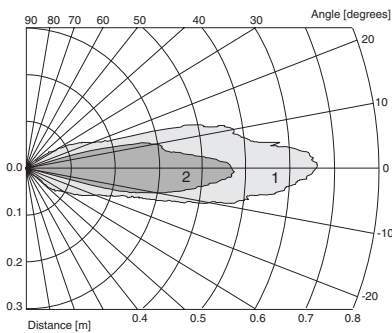
5.2



- Separate evaluation
- With temperature sensor
- Direct detection mode

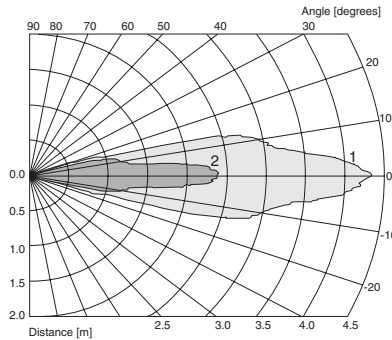
**Characteristic response curves**

**UB500+U9+H3**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

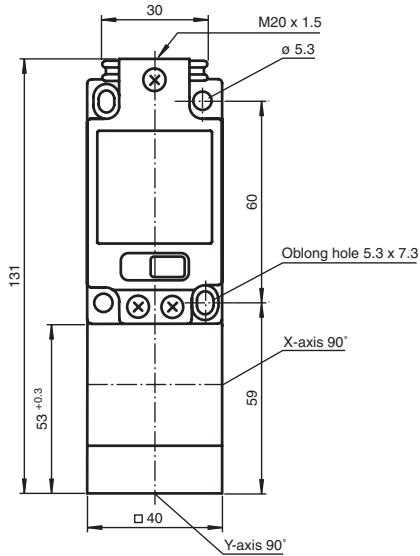
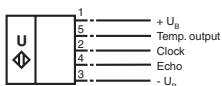
**UB3000+U9+H3**



Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connection:



		UB500+U9+H3	UB3000+U9+H3
Sensing range	300 ... 3000 mm	◆	◆
	60 ... 500 mm	◆	◆
Unusable area	0 ... 300 mm <sup>1)</sup>	◆	◆
	0 ... 60 mm <sup>1)</sup>	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 130 kHz	◆	◆
	approx. 380 kHz	◆	◆
Operating voltage	20 ... 30 V DC, ripple 10 %ss	◆	◆
No-load supply current	≤ 30 mA	◆	◆
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive	◆	◆
Output type	1 pulse output for temperature 1-level: > 4 V (100 µA), 0-level: < 0.5 V (100 µA) 1 pulse output for echo propagation time 1-level: ≥ U <sub>B</sub> - 3 V (< 10 mA), 0-level: ≤ 1 V (100 µA)	◆	◆
Temperature influence	the echo propagation time: ≤ 0.17 % / K	◆	◆
	the echo propagation time: 0.17 % / K	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆	◆
Material			
Housing	PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	180 g	◆	◆

**Description of the sensor functions**

The sensing range is determined in the downstream evaluation electronics (e. g. the PLC). The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

**Temperature compensation**

A temperature pulse is available at the temperature output for external temperature compensation. It is synchronous to the externally applied clock pulse and has the length T<sub>Temp</sub>, calculated as follows:

$$T_{Temp}[\mu s] = T_{Takt}[\mu s] + T[K] \times 10 \mu s / K$$

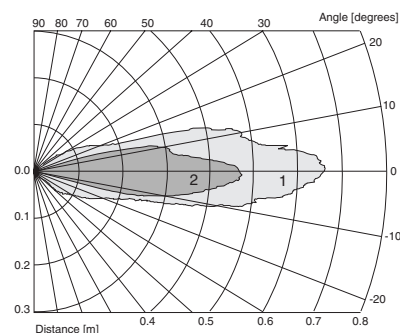
Put into the formula the temperature in Kelvin and the clock time in the unit µs.

- 1) The unusable area (blind range) BR depends on the pulse duration. The unusable area reaches a minimum with the shortest pulse duration.
- 2) The sensors detection range depends on the pulse duration. With pulse duration < typical pulse duration, the sensors detection range may be reduced.



- Serial interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection

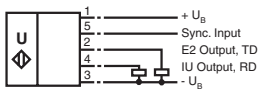
Characteristic response curve



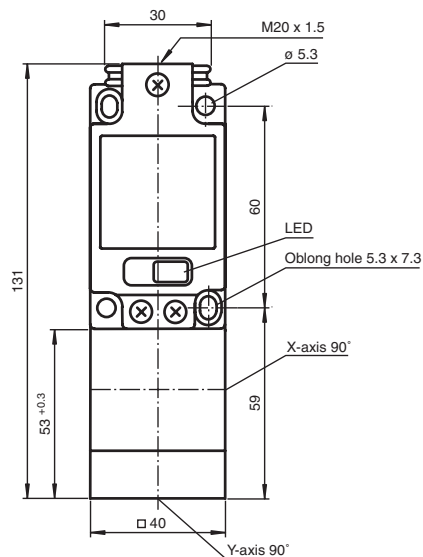
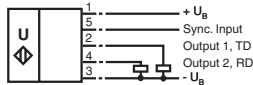
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

Electrical connection

Standard symbol/Connection:  
(Version IUE2, pnp)



Standard symbol/Connection:  
(Version E6, pnp)

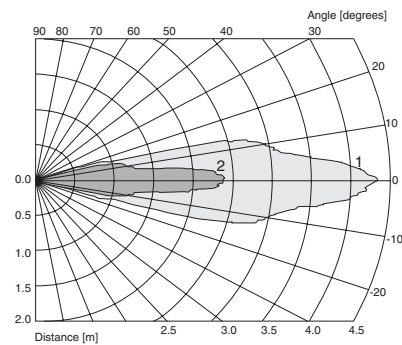


	UC 500+U9+E6+R2	UC 500+U9+IU E2+R2
Sensing range	60 ... 500 mm	◆
Unusable area	0 ... 60 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 380 kHz	◆
Operating voltage	20 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆
No-load supply current	≤ 60 mA	◆
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	◆
	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	◆
Synchronisation	1 synchronous connection, bidirectional 0-level: -U <sub>B</sub> ... (-U <sub>B</sub> + 1 V), 1-level: (-U <sub>B</sub> + 5 V) ... +U <sub>B</sub>	◆
Synchronisation frequency	≤ 80 Hz, with external synchronisation	◆
Output type	1 switch output E5: pnp NO/NC switchable 1 analogue output, load-dependent R <sub>L</sub> ≤ 500 Ohm: current output 4 ... 20 mA R <sub>L</sub> ≥ 1 kOhm: voltage output 2 ... 10 V	◆
	2 switch outputs pnp, NO/NC	◆
Deviation of the characteristic curve	≤ 0.2 % of full-scale value	◆
Resolution	< 1 mm ≥ 0.172 mm	◆
Rated operational current	200 mA, short-circuit/overload protected	◆
Temperature influence	≤ 2 %	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP65	◆
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆
Material		
Housing	PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	180 g	◆



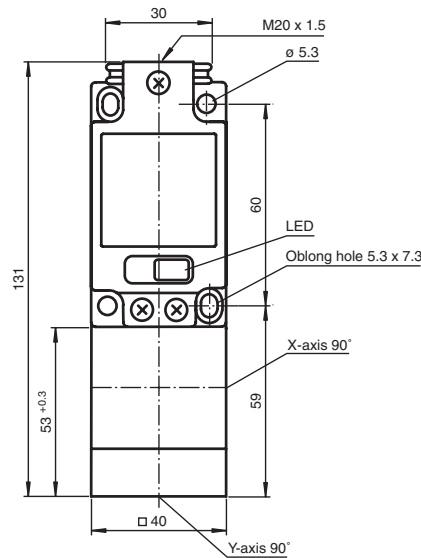
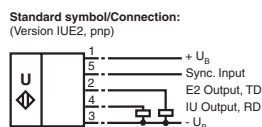
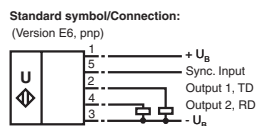
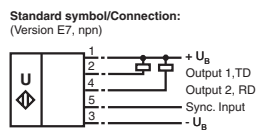
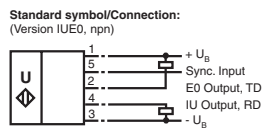
- Serial interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection

**Characteristic response curve**



Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**



		UC3000+U9+E6+R2	UC3000+U9+E7+R2	UC3000+U9+IU E0+R2	UC3000+U9+IU E2+R2
Sensing range	300 ... 3000 mm	◆	◆	◆	◆
Unusable area	0 ... 300 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 130 kHz	◆	◆	◆	◆
Operating voltage	20 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	≤ 60 mA	◆	◆	◆	◆
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)	◆	◆	◆	◆
Synchronisation	1 synchronous connection, bidirectional 0-level: -U <sub>B</sub> ... (-U <sub>B</sub> + 1 V), 1-level: (-U <sub>B</sub> + 5 V) ... +U <sub>B</sub>	◆	◆	◆	◆
Synchronisation frequency	≤ 20 Hz , with external synchronisation ≤ 80 Hz , with external synchronisation	◆	◆	◆	◆
Output type	1 switch output E0, npn, normally open/closed switchable 1 analogue output, load dependent R <sub>L</sub> ≤ 500 Ohm: current output 4 ... 20 mA R <sub>L</sub> ≥ 1 kOhm: voltage output 2 ... 10 V	◆	◆	◆	◆
	1 switch output E5: pnp NO/NC switchable 1 analogue output, load-dependent: R <sub>L</sub> ≤ 500 Ohm: current output 4 ... 20 mA R <sub>L</sub> ≥ 1 kOhm: voltage output 2 ... 10 V			◆	◆
	2 switch outputs npn, normally open/closed 2 switch outputs pnp, NO/NC	◆	◆		
Deviation of the characteristic curve	≤ 0.2 % of full-scale value			◆	◆
Resolution	< 1 mm ≥ 0.172 mm	◆	◆	◆	◆
Rated operational current	200 mA , short circuit/overload protected	◆	◆	◆	◆
Temperature influence	≤ 2 %	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆	◆	◆	◆
Material					
Housing	PBT	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
Mass	180 g	◆	◆	◆	◆

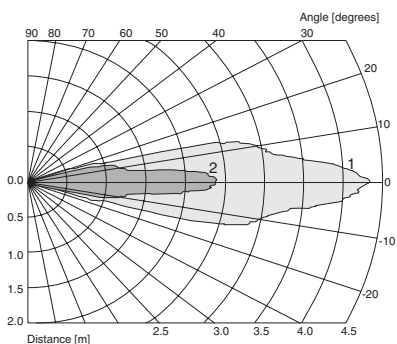
Date of edition 2008-03-20

5.2 Ultrasonic sensors, standard, cube style



- 8 bit output
- Absolute polarity reversal protection
- Test input
- Fault output

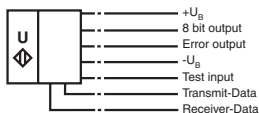
**Characteristic response curve**



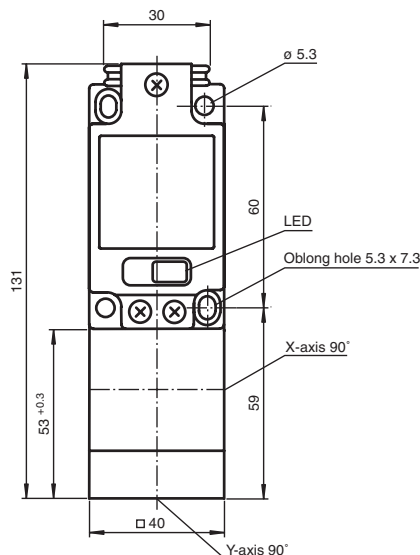
Curve 1: flat plate 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connection:



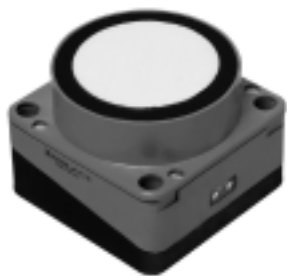
- Legend:**  
 +U<sub>B</sub> = Brown      Test input = Grey/Pink  
 -U<sub>B</sub> = Blue        Error output = Red/Blue
- Interface:**  
 Receiver-Data RD = White/Green  
 Transmit-Data TD = Brown/Green
- 8 bit output:**  
 A1 = White        A2 = Yellow  
 A3 = Pink         A4 = Red  
 A5 = Green        A6 = Grey  
 A7 = Black        A8 = Violet



		UJ3000+U1+8B+RS
Sensing range	300 ... 3000 mm	◆
Unusable area	0 ... 300 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 130 kHz	◆
Operating voltage	20 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆
No-load supply current	≤ 90 mA	◆
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	◆
Input type	1 test input (-U <sub>B</sub> + 5 V) up to +U <sub>B</sub> , ≤ 100 kOhm	◆
Output type	8 bit output for outputting object distance, pnp 1 fault output, pnp NC	◆
Resolution	11 mm, (corresponding to 1 LSB)	◆
Rated operational current	20 mA, short-circuit/overload protected	◆
Temperature influence	0.17 % / K	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆
Protection degree	IP65	◆
Connection	2 m, cable, 14 x 0.14 mm <sup>2</sup> , cast terminal compartment	◆
<b>Material</b>		
Housing	PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	290 g	◆

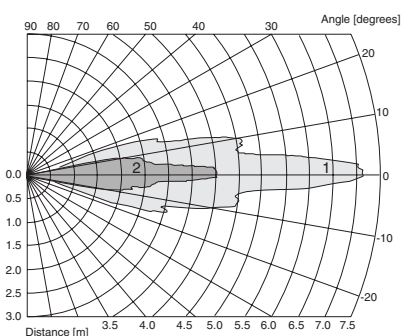
Ultrasonic sensors, standard, cube style

5.2



- Separate evaluation
- With temperature sensor
- Direct detection mode

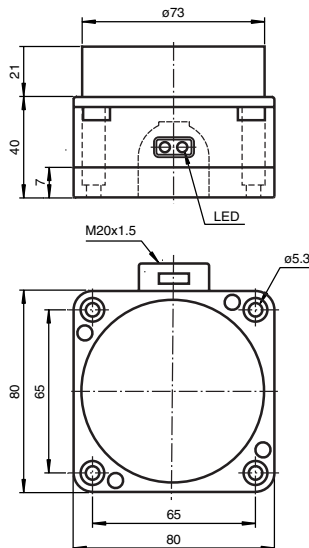
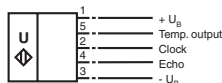
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connection:



		UB6000-FP-H3
Sensing range	800 ... 6000 mm	◆
Unusable area	0 ... 800 mm <sup>1)</sup>	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 65 kHz	◆
Operating voltage	20 ... 30 V DC, ripple 10% <sub>SS</sub>	◆
No-load supply current	≤ 30 mA	◆
Input type	1 pulse input for transmitter pulse, activation through open collector npn < 1 V: emitter active, > 4 V: emitter inactive	◆
Output type	1 pulse output for temperature 1-level: > 4 V (100 µA), 0-level: < 0.5 V (100 µA) 1 pulse output for echo propagation time 1-level: ≥ U <sub>B</sub> -3 V (< 10 mA), 0-level: ≤ 1 V (100 µA)	◆
Temperature influence	the echo propagation time: ≤ 0.17 % / K	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP65	◆
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆
<b>Material</b>		
Housing	PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆
Mass	320 g	◆

**Description of the sensor functions**

The sensing range is determined in the downstream evaluation electronics (e. g. the PLC).  
The sensing range is determined on the basis of the echo time of a transmitted pulse in pulse-echo mode.

**Temperature compensation**

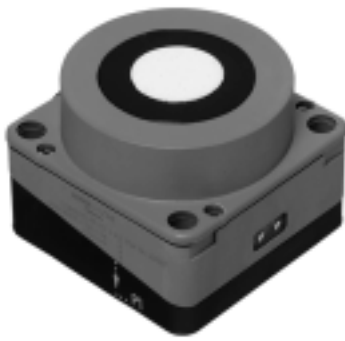
A temperature pulse is available at the temperature output for external temperature compensation. It is synchronous to the externally applied clock pulse and has the length T<sub>Temp</sub>, calculated as follows:

$$T_{Temp} [\mu s] = T_{Akt} [\mu s] + T[K] \times 10 \mu s / K$$

Put into the formula the temperature in Kelvin and the clock time in the unit µs.

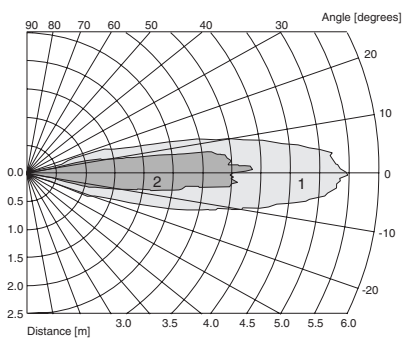
- 1) The unusable area (blind range) BR depends on the pulse duration. The unusable area reaches a minimum with the shortest pulse duration.
- 2) The sensors detection range depends on the pulse duration. With pulse duration < typical pulse duration, the sensors detection range may be reduced.





- Absolute polarity reversal protection
- 1 switch output
- TEACH-IN input
- Reflex sensor function

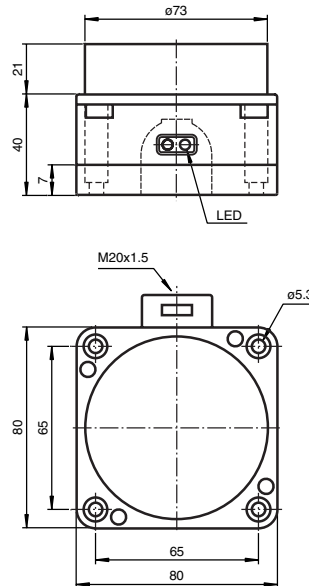
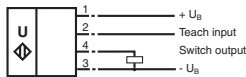
**Characteristic response curve**



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

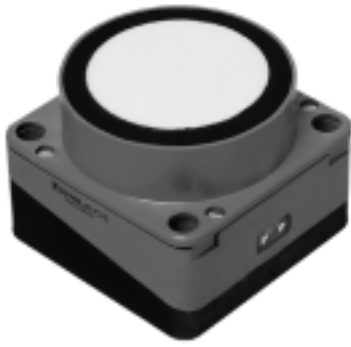
Standard symbol/Connection:



Sensing range	1000 ... 4000 mm	◆	UJ 4000-FP-E2-P1
Standard target plate	100 mm x 100 mm	◆	
Transducer frequency	approx. 85 kHz	◆	
Operating voltage	20 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	
No-load supply current	≤ 90 mA	◆	
Input type	1 TEACH-IN input, operating distance 1: -U <sub>B</sub> ... (-U <sub>B</sub> + 2 V), operating distance 2: (+U <sub>B</sub> - 2 V) ... +U <sub>B</sub>	◆	
Output type	1 switch output, NO pnp	◆	
Rated operational current	200 mA, short-circuit/overload protected	◆	
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	
Protection degree	IP65	◆	
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆	
<b>Material</b>			
Housing	PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	320 g	◆	

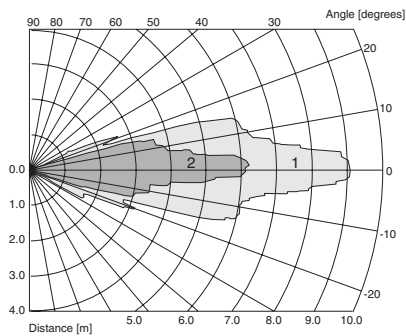
Ultrasonic sensors, standard, cube style

5.2



- Serial interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection

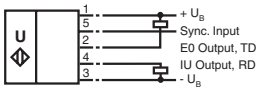
**Characteristic response curve**



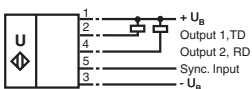
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

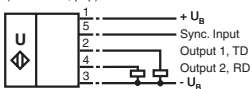
Standard symbol/Connection:  
(Version IUE0, npn)



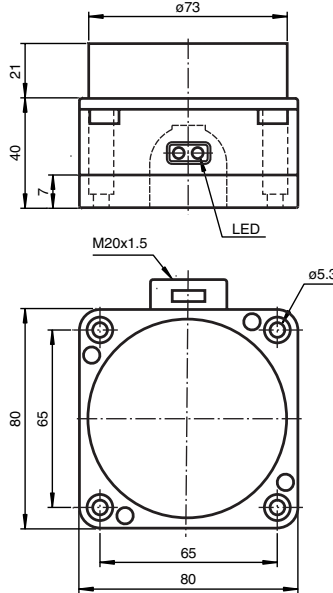
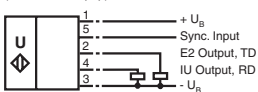
Standard symbol/Connection:  
(Version E7, npn)



Standard symbol/Connection:  
(Version E6, pnp)



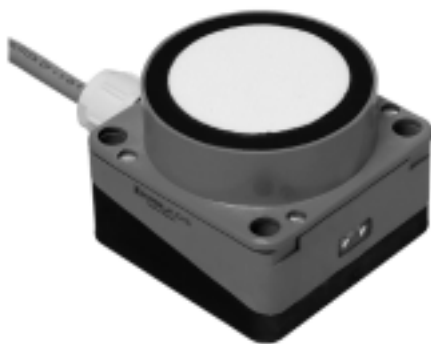
Standard symbol/Connection:  
(Version IUE2, pnp)



		UC 6000-FP-E6-R2-P5	UC 6000-FP-E7-R2-P5	UC 6000-FP-IUE0-R2-P5	UC 6000-FP-IUE2-R2-P5
Sensing range	800 ... 6000 mm	◆	◆	◆	◆
Unusable area	0 ... 800 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 65 kHz	◆	◆	◆	◆
Operating voltage	15 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆		
	20 ... 30 V DC , ripple 10 % <sub>SS</sub>			◆	◆
No-load supply current	≤ 60 mA	◆	◆	◆	◆
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	◆	◆		
	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit (S10 = OFF)			◆	◆
Synchronisation	1 synchronous connection, bidirectional 0-level: -U <sub>B</sub> ... (-U <sub>B</sub> + 1 V), 1-level: (-U <sub>B</sub> + 5 V) ... +U <sub>B</sub>	◆	◆	◆	◆
Synchronisation frequency	≤ 10 Hz , with external synchronisation	◆	◆	◆	◆
Output type	1 switch output E0, npn, normally open/closed switchable 1 analogue output, load dependent R <sub>L</sub> ≤ 500 Ohm: current output 4 ... 20 mA R <sub>L</sub> ≥ 1 kOhm: voltage output 2 ... 10 V			◆	
	1 switch output E5: pnp NO/NC switchable 1 analogue output, load-dependent: R <sub>L</sub> ≤ 500 Ohm: current output 4 ... 20 mA R <sub>L</sub> ≥ 1 kOhm: voltage output 2 ... 10 V				◆
	2 switch outputs npn, normally open/closed		◆		
	2 switch outputs pnp, NO/NC	◆			
Deviation of the characteristic curve	≤ 0.2 %			◆	◆
Resolution	< 1 mm	◆	◆		
	depending on the set evaluation range: 0.172 mm , if evaluation range < 705 mm , evaluation range [mm] / 3296, when evaluation range > 705 mm			◆	◆
Rated operational current	200 mA , short-circuit/overload protected	◆	◆	◆	◆
Temperature influence	≤ 2 %	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	terminal compartment, ≤ 2.5 mm <sup>2</sup> conductor csa	◆	◆	◆	◆
Material					
Housing	PBT	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
Mass	320 g	◆	◆	◆	◆

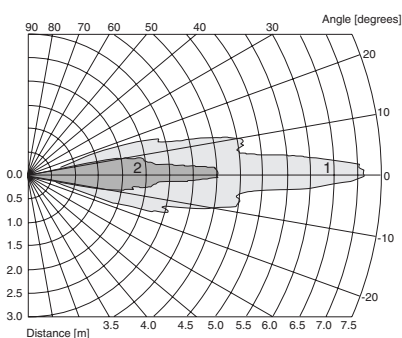
Date of edition 2008-03-20

5.2 Ultrasonic sensors, standard, cube style



- 8 bit output
- Absolute polarity reversal protection
- Test input
- Fault output

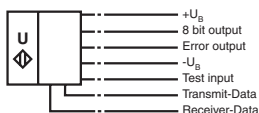
**Characteristic response curve**



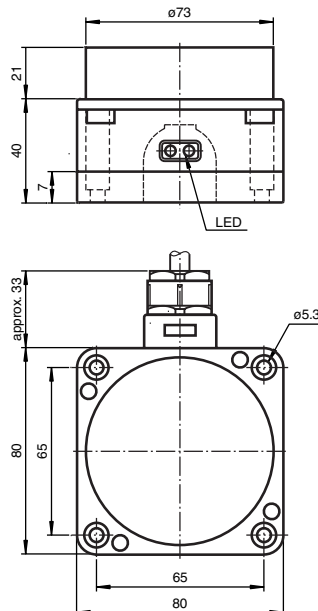
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connection:



- Legend:**  
 +U<sub>B</sub> = Brown      Test input = Grey/Pink  
 -U<sub>B</sub> = Blue        Error output = Red/Blue
- Interface:**  
 Receiver-Data RD = White/Green  
 Transmit-Data TD = Brown/Green
- 8 bit output:**  
 A1 = White        A2 = Yellow  
 A3 = Pink         A4 = Red  
 A5 = Green        A6 = Grey  
 A7 = Black        A8 = Violet



Sensing range	800 ... 6000 mm	◆	UJ6000-FP-8B+RS
Unusable area	0 ... 800 mm	◆	
Standard target plate	100 mm x 100 mm	◆	
Transducer frequency	approx. 65 kHz	◆	
Operating voltage	20 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	
No-load supply current	≤ 90 mA	◆	
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	◆	
Input type	1 test input, (-U <sub>B</sub> + 5 V) up to +U <sub>B</sub> , ≤ 100 kOhm	◆	
Output type	8 bit output for outputting object distance, pnp 1 fault output, pnp NC	◆	
Resolution	21 mm, (corresponding to 1 LSB)	◆	
Rated operational current	20 mA, short-circuit/overload protected	◆	
Temperature influence	0.17 % / K	◆	
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	
Protection degree	IP65	◆	
Connection	2 m, cable, 14 x 0.14 mm <sup>2</sup> , cast terminal compartment	◆	
<b>Material</b>			
Housing	PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
<b>Mass</b>	430 g	◆	

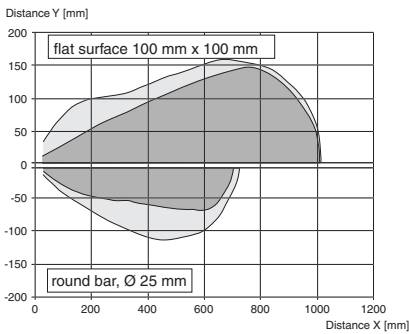
Ultrasonic sensors, standard, cube style

5.2

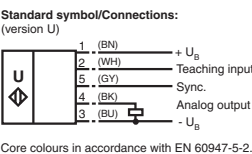
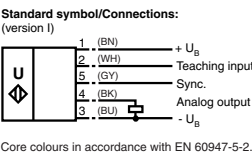
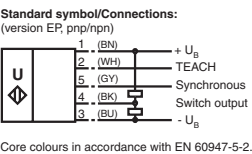
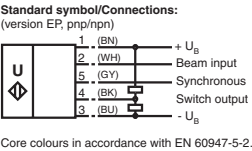


- Selectable sound lobe width
- Synchronisation options
- Very small unusable area
- Temperature compensation

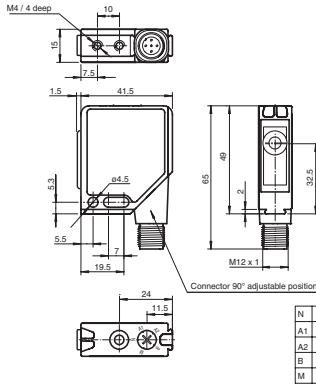
Characteristic response curve



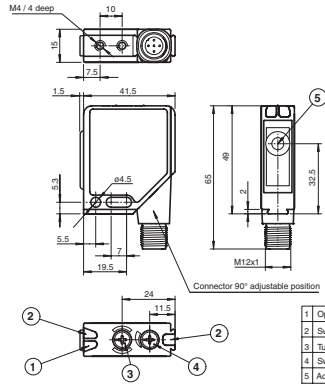
Electrical connection



UB800-F12-EP-V15  
UB800-F12-U-V15  
UB800-F12-U-V15



UB800-F12-EP-V15



N	normal operation
A1	evaluation limit 1
A2	evaluation limit 2
B	light beam characteristics
M	operating mode

1	Operating display green
2	Switch state yellow
3	Turnover switch $\bar{Q}/\bar{D}$
4	Switching point adjuster
5	Acoustic axis transducer



		UB800-F12-EP-V15	UB800-F12-EP-V15	UB800-F12-U-V15	UB800-F12-U-V15
Sensing range	30 ... 800 mm	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 310 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
	10 ... 30 V DC, ripple 10% <sub>SS</sub>	◆			
	12 ... 30 V DC				◆
No-load supply current	≤ 25 mA	◆			
	≤ 30 mA				◆
Synchronisation	1 synchronous connection, bi-directional	◆	◆	◆	◆
	0-level: -U <sub>B</sub> ...+1 V				
	1-level: +4 V...+U <sub>B</sub>				
	input impedance: > 12 kΩ				
	synchronisation pulse: ≥ 100 μs,				
	synchronisation interpulse period: ≥ 2 ms				
Synchronisation frequency	Common mode operation ≤ 45 Hz	◆	◆	◆	◆
	Multiplex operation ≤ 45/n Hz, n = number of sensors	◆	◆	◆	◆
Input type	1 input for sound lobe adjustment	◆			
	small sound beam: -U <sub>B</sub> ...+1 V				
	wide sound beam: +4 V...+U <sub>B</sub> or open input				
	input impedance: > 10 kΩ				
	switching delay: 1 s				
Output type	1 Teach input		◆	◆	◆
	Switching distance 1: -U <sub>B</sub> ...+1 V,				
	Switching distance 2: +3 V...+U <sub>B</sub>				
	Input impedance: > 10 kΩ				
	Push-pull output, short-circuit proof, protected against reverse polarity	◆	◆		
	1 analogue output 0 ... 10 V				◆
	1 analogue output 4 ... 20 mA				◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆		
Switching frequency	max. 4 Hz	◆			
	6 Hz		◆		
Load impedance	≥ 500 Ω hm				◆
	≤ 1000				◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
UL	Power from Class 2 Power Source	◆	◆	◆	◆
	IND.CONTR.EQ 57M3	◆	◆	◆	◆
Ambient temperature	-15 ... 70 °C (258 ... 343 K)	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	Frame: die-cast zinc, nickel-plated	◆	◆	◆	◆
	Laterals: plastic PC, glass-fiber reinforced	◆	◆	◆	◆
Transducer	epoxy resin/high glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆
Mass	60 g	◆	◆	◆	◆

Date of edition 2008-03-20

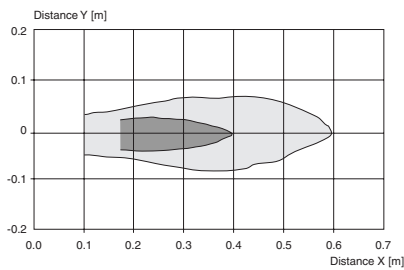
Ultrasonic sensors, standard, cube style

5.2



- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)

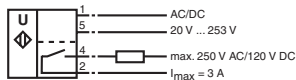
**Characteristic response curve**



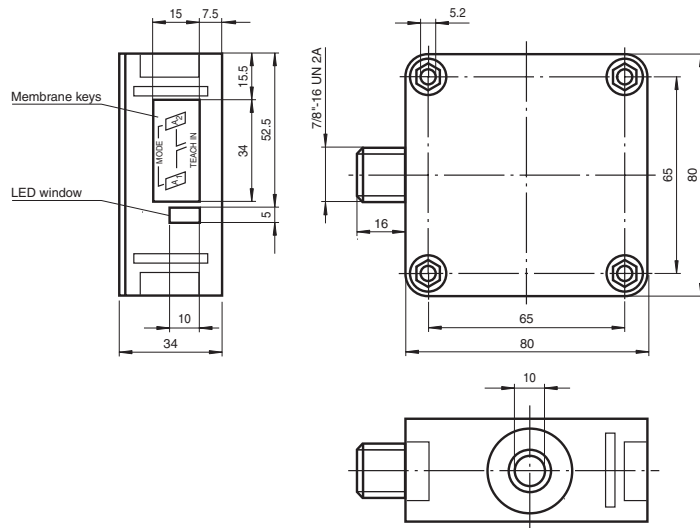
- Flat surface 100 mm x 100 mm
- Round bar, Ø 25 mm

**Electrical connection**

Standard symbol/Connections:  
(version UK)



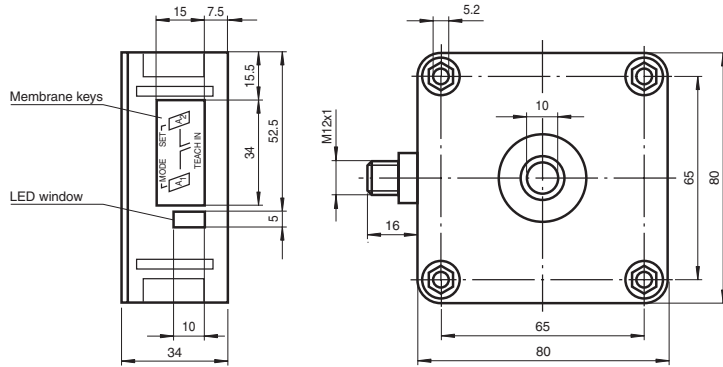
UB400-F42SUK-V95



		UB400-F42-UK-V95	UB400-F42S-UK-V95
Sensing range	40 ... 400 mm	◆	◆
Unusable area	0 ... 40 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 390 kHz	◆	◆
Operating voltage	20 ... V DC ... 253 V AC	◆	◆
No-load supply current	≤ 60 mA	◆	◆
Output type	1 relay output	◆	◆
Rated operational current	3 A	◆	◆
Switching frequency	≤ 8 Hz	◆	◆
Temperature influence	± 1 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	Connector V95 (7/8"-16 UN 2A), 5-pin	◆	◆
Material			
Housing	PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆
Mass	260 g	◆	◆

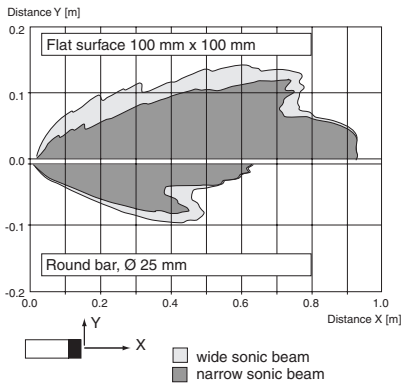
Ultrasonic sensors, standard, cube style

5.2



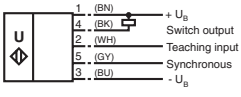
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

**Characteristic response curve**



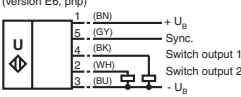
**Electrical connection**

Standard symbol/Connections: (version E4, npn)



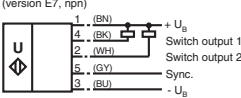
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, pnp)



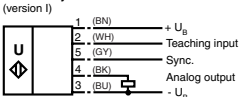
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



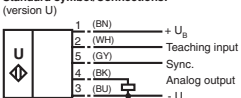
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



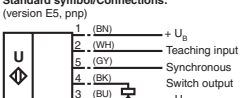
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)



Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, pnp)



Core colours in accordance with EN 60947-5-2.

		UB500-F42-E4-V15	UB500-F42-E5-V15	UB500-F42-E6-V15	UB500-F42-E7-V15	UB500-F42-I-V15	UB500-F42-U-V15
Sensing range	30 ... 500 mm	◆	◆	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 390 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>						◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency							
Common mode operation	≤ 95 Hz	◆	◆	◆	◆	◆	◆
Multiplex operation	≤ 95/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type							
	1 analogue output 0 ... 10 V						◆
	1 analogue output 4 ... 20 mA						◆
	1 switch output E4, npn NO/NC, parameterisable	◆					
	1 switch output E5, pnp NO/NC, parameterisable		◆				
	2 switch outputs npn, normally open/close selectable					◆	
	2 switch outputs pnp, normally open/close selectable				◆		
Deviation of the characteristic curve	± 1 % of full-scale value					◆	◆
Resolution	0.2 mm at max. sensing range 0.2 mm for max. detection range						◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 8 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kΩ 0 ... 300 Ω						◆
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	140 g	◆	◆	◆	◆	◆	◆

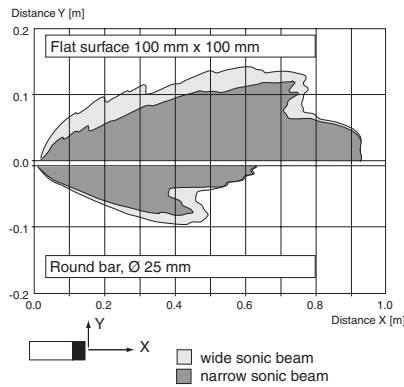
5.2 Ultrasonic sensors, standard, cube style

Date of edition 2008-03-20



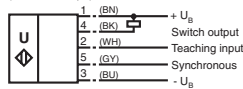
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

**Characteristic response curve**



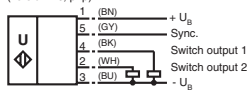
**Electrical connection**

Standard symbol/Connections: (version E4, npn)



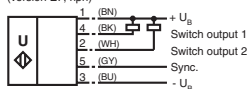
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, pnp)



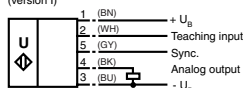
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



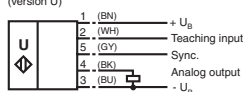
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)



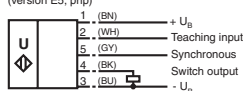
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)

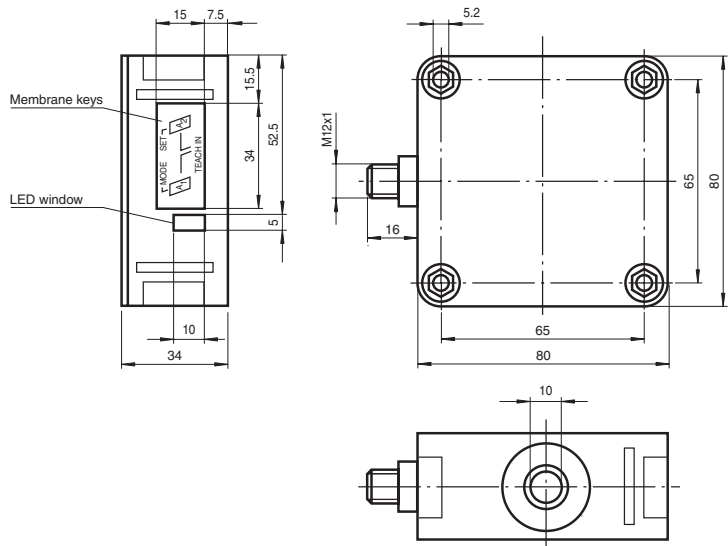


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, pnp)



Core colours in accordance with EN 60947-5-2.



		UB500-F42S-E4-V15	UB500-F42S-E5-V15	UB500-F42S-E6-V15	UB500-F42S-E7-V15	UB500-F42S-I-V15	UB500-F42S-U-V15
Sensing range	30 ... 500 mm	◆	◆	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 390 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kOhm synchronisation pulse: ≥ 100 μs, synchronisation interpulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 95 Hz Multiplex operation ≤ 95/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable 2 switch outputs npn, normally open/close selectable 2 switch outputs pnp, normally open/close selectable	◆	◆	◆	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Resolution	0.2 mm at max. sensing range 0.2 mm for max. detection range	◆	◆	◆	◆	◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 8 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kOhm 0 ... 300 Ohm	◆	◆	◆	◆	◆	◆
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	140 g	◆	◆	◆	◆	◆	◆

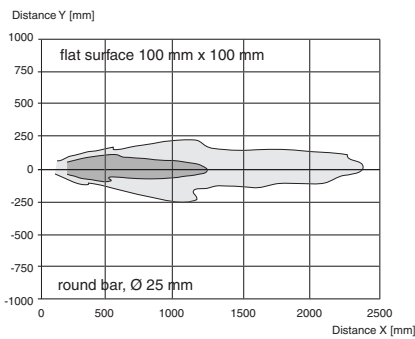
Ultrasonic sensors, standard, cube style

5.2

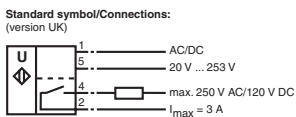


- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)

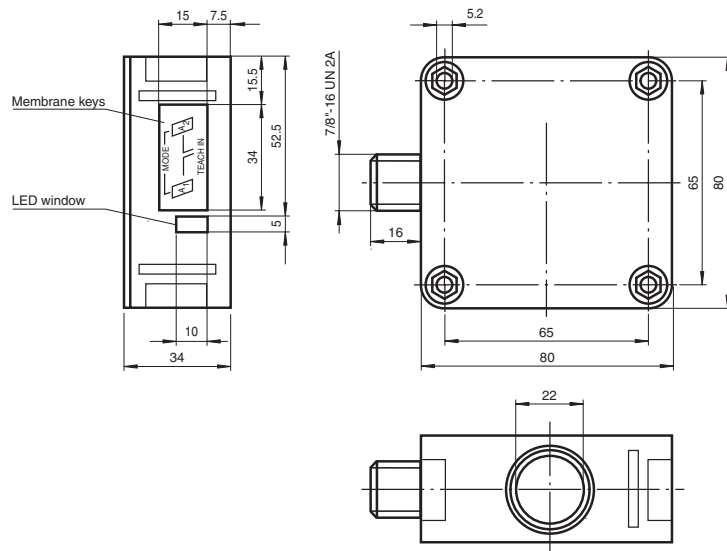
**Characteristic response curve**



**Electrical connection**



UB1500-F42SUK-V95



		UB1500-F42-UK-V95	UB1500-F42S-UK-V95
Sensing range	70 ... 1500 mm	◆	◆
Unusable area	0 ... 70 mm	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆
Operating voltage	20 ... V DC ... 253 V AC	◆	◆
No-load supply current	≤ 60 mA	◆	◆
Output type	1 relay output	◆	◆
Rated operational current	3 A	◆	◆
Switching frequency	≤ 3 Hz	◆	◆
Temperature influence	± 1 % of full-scale value	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Protection degree	IP65	◆	◆
Connection	Connector V95 (7/8"-16 UN 2A), 5-pin	◆	◆
Material			
Housing	PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆
Mass	260 g	◆	◆

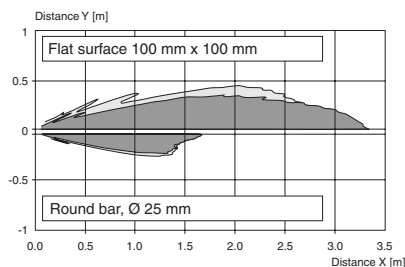
5.2 Ultrasonic sensors, standard, cube style





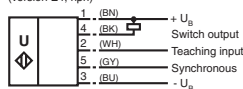
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

Characteristic response curve



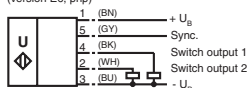
Electrical connection

Standard symbol/Connections: (version E4, npn)



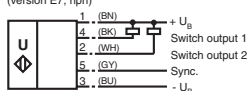
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, pnp)



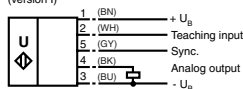
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



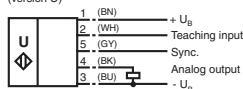
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



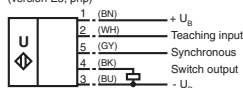
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)

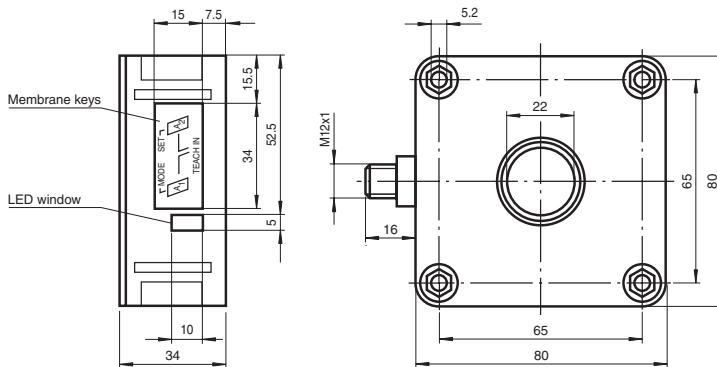


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, pnp)

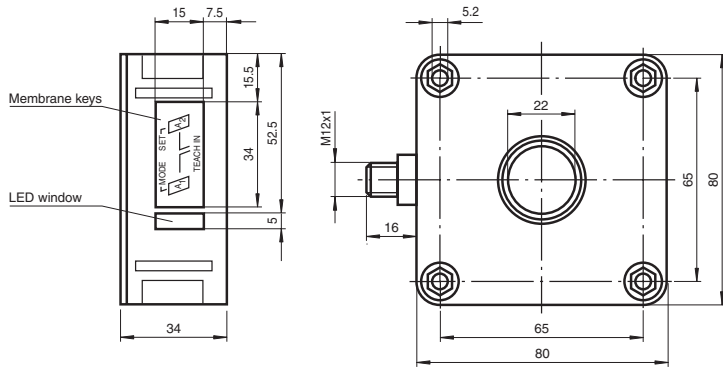


Core colours in accordance with EN 60947-5-2.



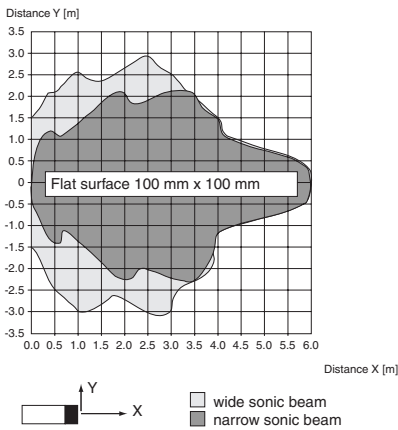
		UB2000-F42-E-4-V15	UB2000-F42-E-5-V15	UB2000-F42-E-6-V15	UB2000-F42-E-7-V15	UB2000-F42-I-V15	UB2000-F42-U-V15
Sensing range	60 ... 2000 mm	◆	◆	◆	◆	◆	◆
Unusable area	0 ... 60 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>						◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 30 Hz Multiplex operation ≤ 30/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable 2 switch outputs npn, normally open/close selectable 2 switch outputs pnp, normally open/close selectable	◆	◆	◆	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value					◆	◆
Resolution	0.7 mm					◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 2.7 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kOhm 0 ... 300 Ohm					◆	◆
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	140 g	◆	◆	◆	◆	◆	◆

Date of edition 2008-03-20



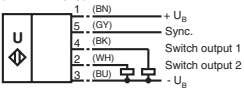
- Very wide sound lobe
- 2 independent switch outputs
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)

**Characteristic response curve**



**Electrical connection**

Standard symbol/Connections:  
(version E6, prnp)



Core colours in accordance with EN 60947-5-2.



		<b>UB2000W-F42-E6-V15</b>
Sensing range	200 ... 2000 mm	◆
Unusable area	0 ... 200 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 40 kHz	◆
Operating voltage	10 ... 30 V DC PELV (protection class 3 in acc. with VDE 0106/IEC 364-4-41), ripple 10 % <sub>SS</sub>	◆
No-load supply current	≤ 50 mA	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KΩm synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆
Synchronisation frequency		
Common mode operation	≤ 13 Hz	◆
Multiplex operation	≤ 13/n Hz, n = number of sensors	◆
Output type	2 switch outputs pnp, normally open/close selectable	◆
Rate operational current	200 mA, short-circuit/overload protected	◆
Switching frequency	≤ 1.2 Hz	◆
Temperature influence	± 1 % of full-scale value	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP65	◆
Connection	connector V15 (M12 x 1), 5 pin	◆
Material		
Housing	ABS	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆
Mass	140 g	◆

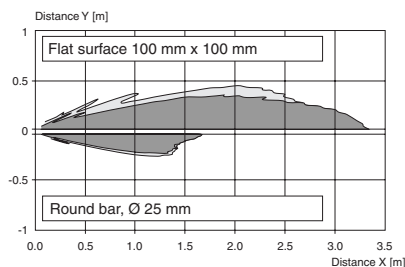
Ultrasonic sensors, standard, cube style

5.2



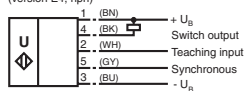
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

Characteristic response curve



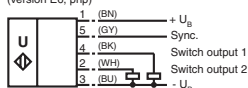
Electrical connection

Standard symbol/Connections: (version E4, npn)



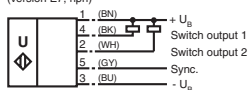
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, pnp)



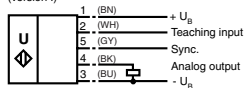
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



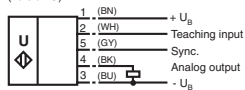
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



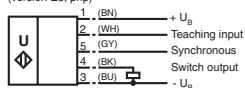
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)

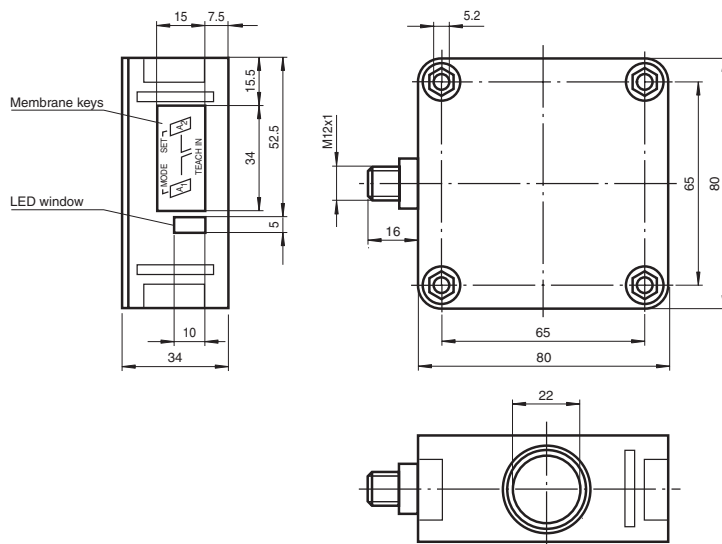


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, pnp)



Core colours in accordance with EN 60947-5-2.



Sensing range	60 ... 2000 mm	UB 2000-F42S-E4-V15	UB 2000-F42S-E5-V15	UB 2000-F42S-E6-V15	UB 2000-F42S-E7-V15	UB 2000-F42S-I-V15	UB 2000-F42S-U-V15
Unusable area	0 ... 60 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>						◆
No-load supply current	≤ 50 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 μs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency							
Common mode operation	≤ 30 Hz	◆	◆	◆	◆	◆	◆
Multiplex operation	≤ 30/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA						◆
	1 switch output E4, npn NO/NC, parameterisable	◆					
	1 switch output E5, pnp NO/NC, parameterisable		◆				
	2 switch outputs npn, normally open/close selectable			◆			
	2 switch outputs pnp, normally open/close selectable				◆		
Deviation of the characteristic curve	± 1 % of full-scale value					◆	◆
Resolution	0.7 mm					◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 2.7 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kOhm						◆
	0 ... 300 Ohm					◆	
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	140 g	◆	◆	◆	◆	◆	◆

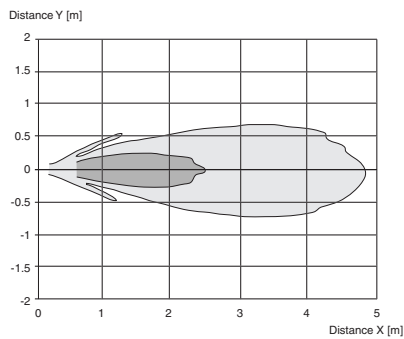
Ultrasonic sensors, standard, cube style

5.2

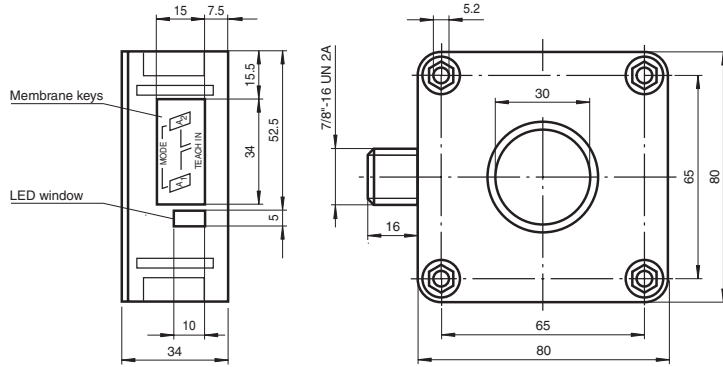
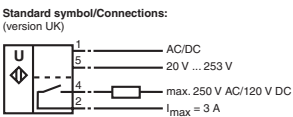


- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)

**Characteristic response curve**



**Electrical connection**



Sensing range	200 ... 3000 mm	◆
Unusable area	0 ... 200 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 85 kHz	◆
Operating voltage	20 ... V DC ... 253 V AC	◆
No-load supply current	≤ 60 mA	◆
Output type	1 relay output	◆
Rated operational current	3 A	◆
Switching frequency	≤ 1.5 Hz	◆
Temperature influence	± 1 % of full-scale value	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP65	◆
Connection	Connector V95 (7/8"-16 UN 2A), 5-pin	◆
<b>Material</b>		
Housing	PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆
Mass	260 g	◆

UB3000-F42-UK-V95

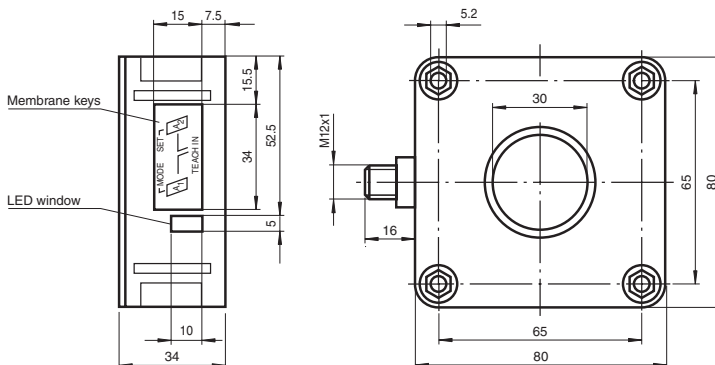
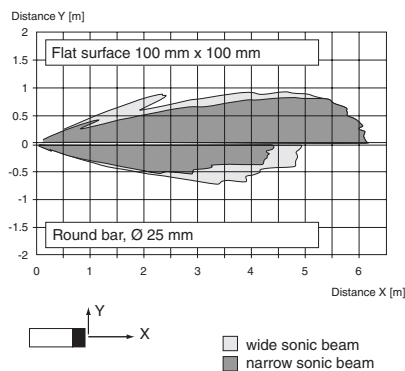
Ultrasonic sensors, standard, cube style

5.2

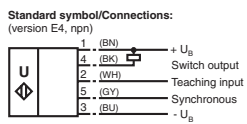


- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

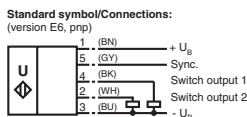
Characteristic response curve



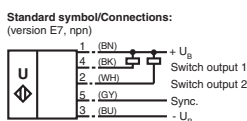
Electrical connection



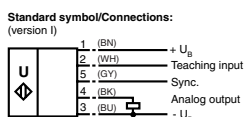
Core colours in accordance with EN 60947-5-2.



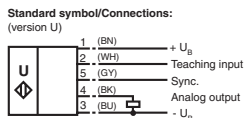
Core colours in accordance with EN 60947-5-2.



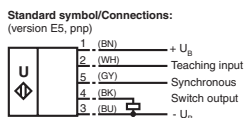
Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.

Sensing range	200 ... 4000 mm	UB4000-F42-E4-V15	UB4000-F42-E5-V15	UB4000-F42-E6-V15	UB4000-F42-E7-V15	UB4000-F42-I-V15	UB4000-F42-U-V15
Unusable area	0 ... 200 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 85 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>						◆
No-load supply current	≤ 60 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 KOhm synchronisation pulse: ≥ 100 µs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 13 Hz Multiplex operation ≤ 13/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable 2 switch outputs npn, normally open/close selectable 2 switch outputs pnp, normally open/close selectable	◆	◆	◆	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value					◆	◆
Resolution	0.7 mm					◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 1.2 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kOhm 0 ... 300 Ohm						◆
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS	◆	◆	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	150 g	◆	◆	◆	◆	◆	◆

Ultrasonic sensors, standard, cube style

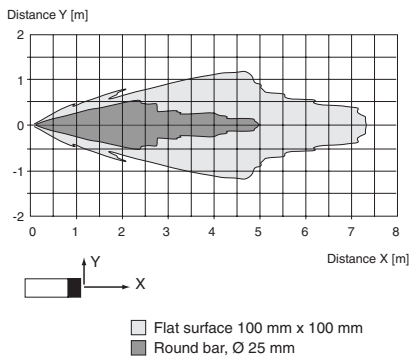
5.2

Date of edition 2008-03-20

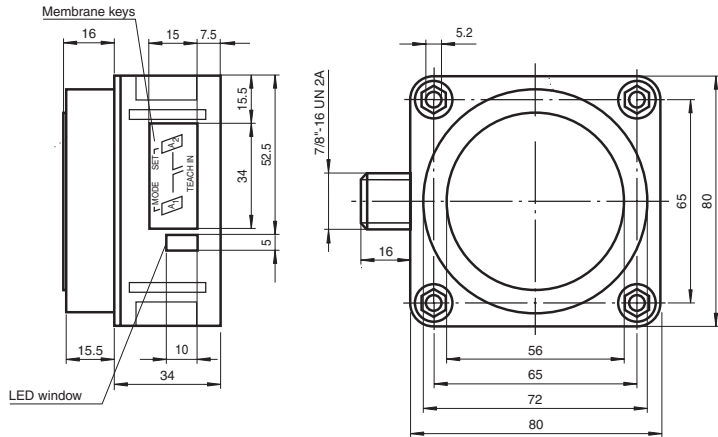
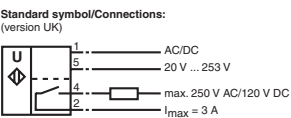


- Relay output for high power
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)

**Characteristic response curve**



**Electrical connection**



		<b>UB 5000-F42-UK-V95</b>
Sensing range	350 ... 5000 mm	◆
Unusable area	0 ... 350 mm	◆
Standard target plate	100 mm x 100 mm	◆
Transducer frequency	approx. 65 kHz	◆
Operating voltage	20 ... V DC ... 253 V AC	◆
No-load supply current	≤ 60 mA	◆
Output type	1 relay output	◆
Rated operational current	3 A	◆
Switching frequency	≤ 0.6 Hz	◆
Temperature influence	± 1 % of full-scale value	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆
Protection degree	IP65	◆
Connection	Connector V95 (7/8"-16 UN 2A), 5-pin	◆
<b>Material</b>		
Housing	PBT	◆
Transducer	epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆
Mass	370 g	◆

Ultrasonic sensors, standard, cube style

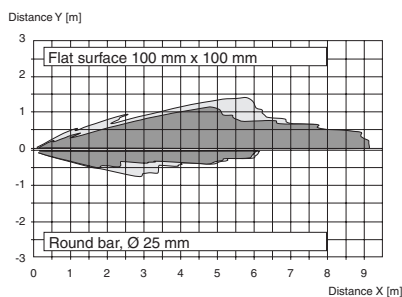
5.2

Date of edition 2008-03-20



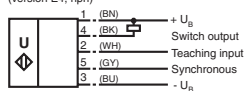
- Extremely small unusable area
- TEACH-IN
- Interference suppression (adjustable width of sound cone in close range)
- Temperature compensation

Characteristic response curve



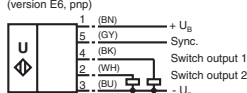
Electrical connection

Standard symbol/Connections: (version E4, npn)



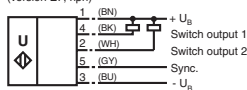
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E6, pnp)



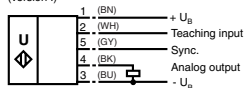
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E7, npn)



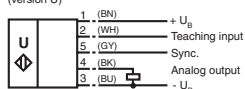
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



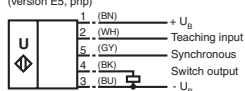
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)

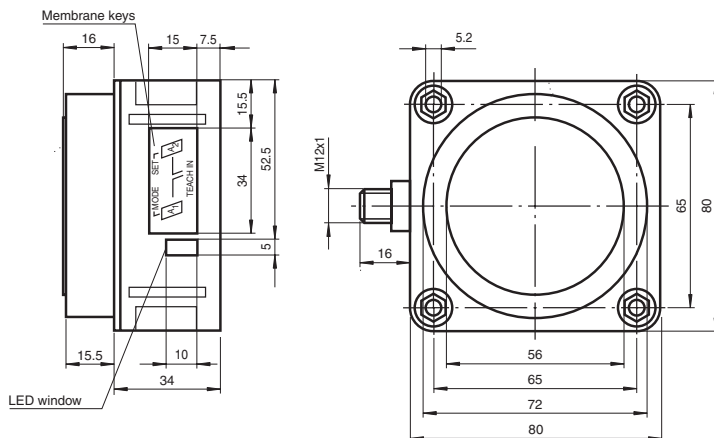


Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version E5, pnp)



Core colours in accordance with EN 60947-5-2.



Sensing range	350 ... 6000 mm	UB6000-F42-E-4-V15	UB6000-F42-E-5-V15	UB6000-F42-E-6-V15	UB6000-F42-E-7-V15	UB6000-F42-I-V15	UB6000-F42-U-V15
Unusable area	0 ... 350 mm	◆	◆	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆	◆	◆
Transducer frequency	approx. 65 kHz	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆	◆	◆
	17 ... 30 V DC, ripple 10 % <sub>SS</sub>						◆
No-load supply current	≤ 60 mA	◆	◆	◆	◆	◆	◆
Synchronisation	bi-directional 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kOhm synchronisation pulse: ≥ 100 µs, synchronisation inter-pulse period: ≥ 2 ms	◆	◆	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 7 Hz Multiplex operation ≤ 7/n Hz, n = number of sensors	◆	◆	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC, parameterisable 1 switch output E5, pnp NO/NC, parameterisable 2 switch outputs npn, normally open/close selectable 2 switch outputs pnp, normally open/close selectable	◆	◆	◆	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value					◆	◆
Resolution	0.7 mm					◆	◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 0.6 Hz	◆	◆	◆	◆	◆	◆
Load impedance	> 1 kOhm 0 ... 300 Ohm					◆	◆
Temperature influence	± 1 % of full-scale value	◆	◆	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆	◆	◆
Material	Housing ABS Transducer epoxy resin/hollow glass sphere mixture; foam polyurethane, cover PBT	◆	◆	◆	◆	◆	◆
Mass	210 g	◆	◆	◆	◆	◆	◆

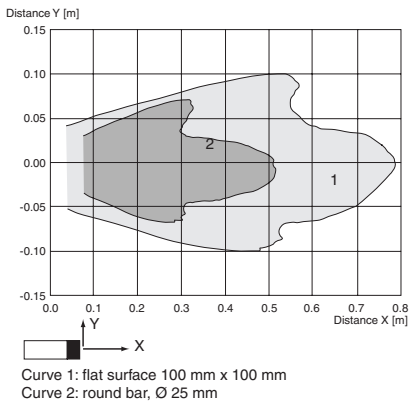
Date of edition 2008-03-20



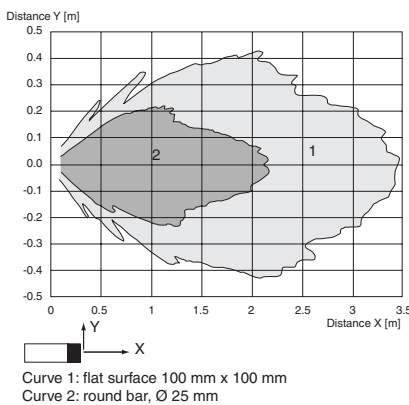
- Current output 4 mA ... 20 mA
- 2 relay outputs
- Serial interface
- Temperature compensation

**Characteristic response curve**

UC300-F43-3KIR2-V17

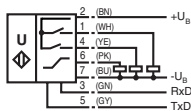


UC2000-F43-3KIR2-V17



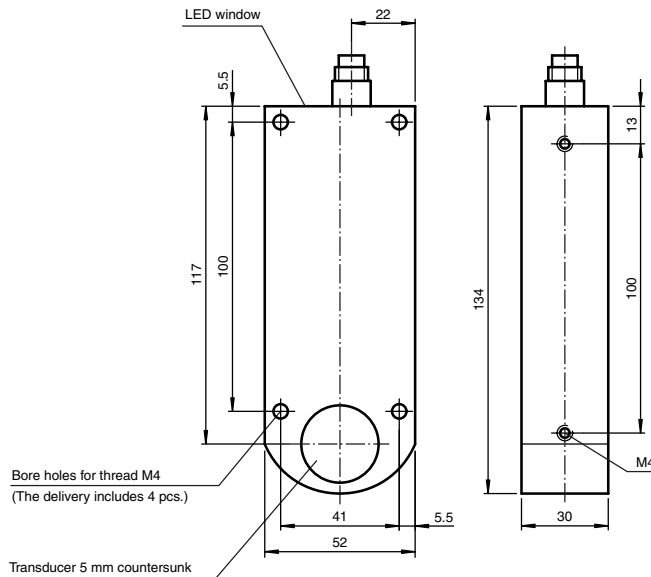
**Electrical connection**

Standard symbol/Connection:



Core colours in accordance with EN 60947-5-2.

UC2000-F43-2KIR2-V17



		UC300-F43-3KIR2-V17	UC2000-F43-2KIR2-V17
Sensing range	0 ... 300 mm	◆	◆
	80 ... 2000 mm		◆
Unusable area	0 ... 80 mm		◆
	0 mm	◆	
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆
	approx. 390 kHz	◆	
Operating voltage	10 ... 30 V DC	◆	◆
	ripple ± 10 %ss		
Power consumption	≤ 2 W (all relays pulled-in, current output 20 mA)	◆	◆
	no-load power consumption ≤ 0.7 W		
Interface type	RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit	◆	◆
Output type	2 relay outputs, 1 analogue output 4 ... 20 mA	◆	◆
Deviation of the characteristic curve	< 0.2 % of full-scale value	◆	◆
Resolution	0.2 mm	◆	
	0.6 mm		◆
Contact loading	60 V DC / 1 A (max. 24 W DC), ohmic	◆	◆
	60 V DC / 1 A (max. 24 W DC), ohmic	◆	
Lifetime	electrical: 3 x 10 <sup>8</sup> switching cycles at resistive load (1 A / 24 V DC)	◆	◆
	mechanical: 10 <sup>7</sup> switching cycles		
Load impedance	current output:	◆	◆
	≤ 500 Ω at U <sub>B</sub> ≥ 17V		
	≤ 200 Ω at U <sub>B</sub> < 17V		
Temperature influence	≤ 2 % of full-scale value	◆	◆
Ambient temperature	0 ... 70 °C (273 ... 343 K)	◆	◆
	-25 ... 70 °C (248 ... 343 K)		◆
Protection degree	IP65	◆	◆
Connection	8-pin round connector, Lumberg type RSF 8	◆	◆
Material			
Housing	PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	290 g	◆	◆

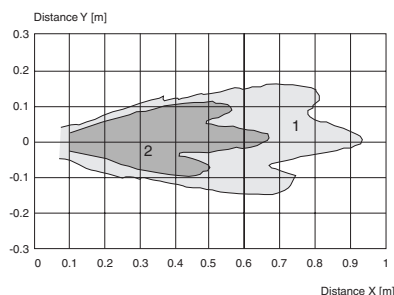




- Separate evaluation
- Direct detection mode

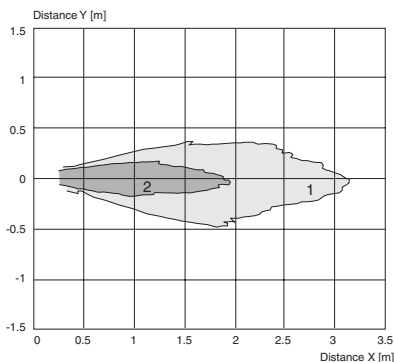
**Characteristic response curve**

UB500-F54-H3-V1



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

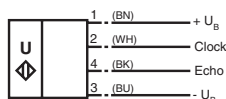
UB2000-F54-H3-V1



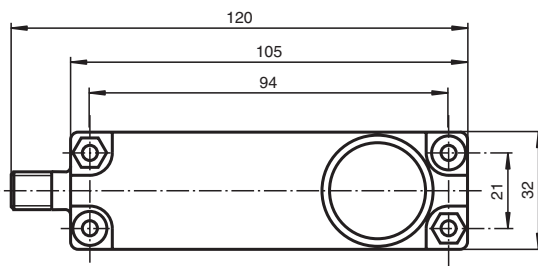
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

**Electrical connection**

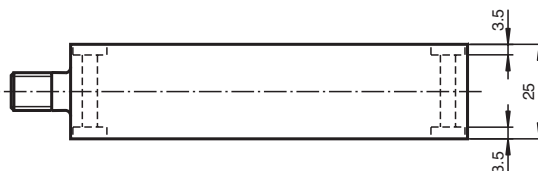
Standard symbol/Connection:



2 = Emitter pulse input  
4 = Echo propagation time output  
Core colours in accordance with EN 60947-5-2.



Bore hole and countersinking for screws/hexagon M4



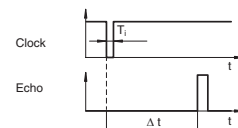
**Function**

		UB500-F54-H3-V1	UB2000-F54-H3-V1
Sensing range	30 ... 500 mm	◆	◆
Unusable area	80 ... 2000 mm	◆	◆
	0 ... 30 mm <sup>1)</sup>	◆	◆
	0 ... 80 mm <sup>1)</sup>	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆
	approx. 380 kHz	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 %SS	◆	◆
No-load supply current	≤ 30 mA	◆	◆
Input type	1 pulse input for transmitter pulse (clock) 0-level (active): < 5 V (U <sub>B</sub> > 15 V) 1-level (inactive): > 10 V ... +U <sub>B</sub> (U <sub>B</sub> > 15 V) 0-level (active): < 1/3 U <sub>B</sub> (10 V < U <sub>B</sub> < 15 V) 1-level (inactive): > 2/3 U <sub>B</sub> ... +U <sub>B</sub> (10 V < U <sub>B</sub> < 15 V)	◆	◆
Output type	1 pulse output for echo run time, short-circuit proof open collector pnp with pulldown resistor = 22 kOhm level 0 (no echo): -U <sub>B</sub> level 1 (echo detected): ≥ (+U <sub>B</sub> -2 V)	◆	◆
Rated operational current	15 mA, short-circuit/overload protected	◆	◆
Temperature influence	the echo propagation time: 0.17 % / K	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	V1 connector (M12 x 1), 4-pin	◆	◆
Material			
Housing	ABS	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	110 g	◆	◆

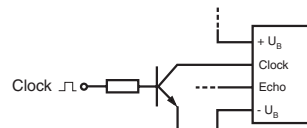
**Function**

The sensing range is determined in the downstream evaluation electronics such as PLC modules or other existing evaluation units.

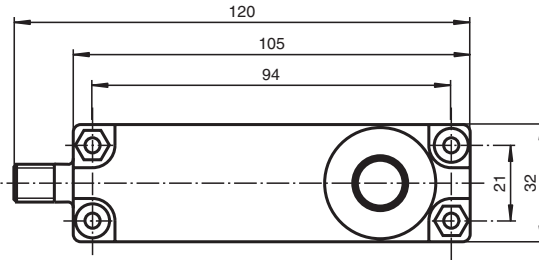
The object distance in pulse-echo mode is obtained from the echo time Δt. The emission of an ultrasonic pulse starts simultaneously with the falling slope of the clock input signal.



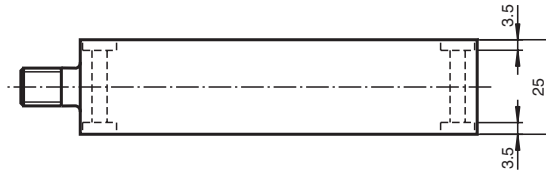
We recommend the usage of a npn-transistor to trigger the sensors clock input. The sensor's clock input is connected to the +U<sub>B</sub> potential internally by means of a pull up resistor.



<sup>1)</sup> The unusable area (blind range) BR depends on the pulse duration T<sub>1</sub>. The unusable area reaches a minimum with the shortest pulse duration.

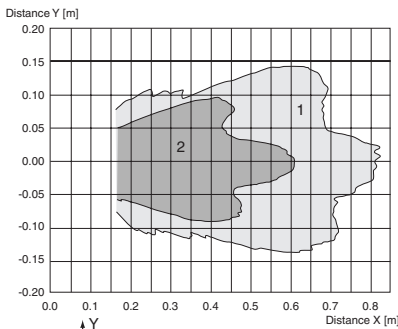


Bore hole and countersinking for screws/hexagon M4



- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation

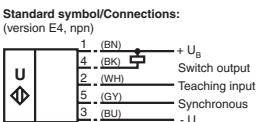
Characteristic response curve



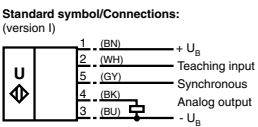
Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm



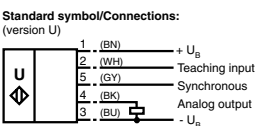
Electrical connection



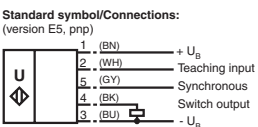
Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.



Core colours in accordance with EN 60947-5-2.

		UB500-F54-E4-V15	UB500-F54-E5-V15	UB500-F54-I-V15	UB500-F54-U-V15
Sensing range	30 ... 500 mm	◆	◆	◆	◆
Unusable area	0 ... 30 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 380 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	≤ 55 mA	◆	◆	◆	◆
Synchronisation	1 synchronous input 0 level: -U <sub>B</sub> ...+1 V 1 level: +4 V...+U <sub>B</sub> input impedance: > 12 kΩ synchronisation pulse: 0.1 ... 8 ms	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 100 Hz Multiplex operation ≤ 100 / n Hz, n = number of sensors	◆	◆	◆	◆
Input type	1 TEACH-IN input, switching point A1: -U <sub>B</sub> ... +1 V, switching point A2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, TEACH-IN pulse: ≥ 1 s	◆	◆	◆	◆
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V ... +U <sub>B</sub> input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s	◆	◆	◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC 1 switch output E5, pnp NO/NC	◆	◆	◆	◆
Deviation of the characteristic curve	± 1 % of full-scale value	◆	◆	◆	◆
Resolution	0.11 mm 0.13 mm	◆	◆	◆	◆
Rated operational current	200 mA, short circuit/overload protected	◆	◆	◆	◆
Switching frequency	max. 10 Hz	◆	◆	◆	◆
Load impedance	≥ 1 kΩ 0 ... 300 Ω	◆	◆	◆	◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material		◆	◆	◆	◆
Housing	ABS	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆

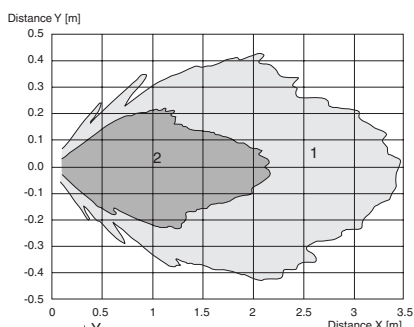
Date of edition 2008-03-20

5.2 Ultrasonic sensors, standard, cube style



- TEACH-IN input
- Synchronisation options
- Deactivation option
- Temperature compensation

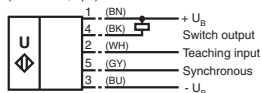
Characteristic response curve



Curve 1: flat surface 100 mm x 100 mm  
Curve 2: round bar, Ø 25 mm

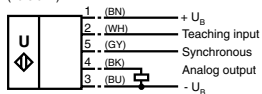
Electrical connection

Standard symbol/Connections: (version E4, npn)



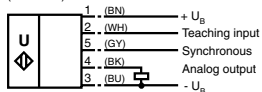
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version I)



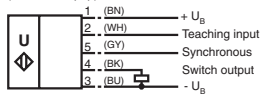
Core colours in accordance with EN 60947-5-2.

Standard symbol/Connections: (version U)

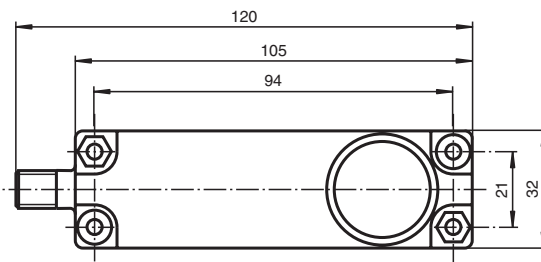


Core colours in accordance with EN 60947-5-2.

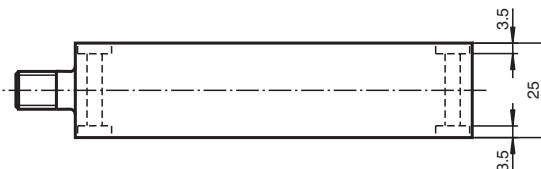
Standard symbol/Connections: (version E5, pnp)



Core colours in accordance with EN 60947-5-2.



Bore hole and countersinking for screws/hexagon M4



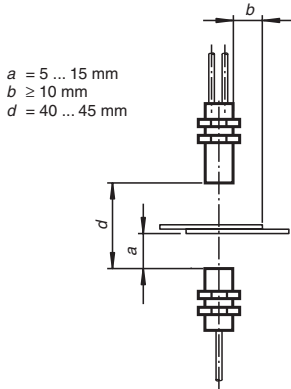
Sensing range	80 ... 2000 mm	UB2000-F54-E 4-V 15	UB2000-F54-E 5-V 15	UB2000-F54-I-V 15	UB2000-F54-U-V 15
Unusable area	0 ... 80 mm	◆	◆	◆	◆
Standard target plate	100 mm x 100 mm	◆	◆	◆	◆
Transducer frequency	approx. 175 kHz	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC, ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
	15 ... 30 V DC, ripple 10 % <sub>SS</sub>				◆
No-load supply current	≤ 55 mA	◆	◆	◆	◆
Synchronisation	1 synchronous input 0-level: -U <sub>B</sub> ...+1 V 1-level: +4 V...+U <sub>B</sub> input impedance: > 12 kOhm synchronisation pulse: 0,1 ... 28 ms	◆	◆	◆	◆
Synchronisation frequency	Common mode operation ≤ 33 Hz Multiplex operation ≤ 33 / n Hz, n = number of sensors	◆	◆	◆	◆
Input type	1 TEACH-IN input, switching point A1: -U <sub>B</sub> ... +1 V, switching point A2: +4 V...+U <sub>B</sub> input impedance: > 4.7 kΩ, TEACH-IN pulse: ≥ 1 s	◆	◆		
	1 TEACH-IN input lower evaluation limit A1: -U <sub>B</sub> ... +1 V, upper evaluation limit A2: +4 V... +U <sub>B</sub> input impedance: > 4.7 kΩ, pulse duration: ≥ 1 s			◆	◆
Output type	1 analogue output 0 ... 10 V 1 analogue output 4 ... 20 mA 1 switch output E4, npn NO/NC 1 switch output E5, pnp NO/NC		◆		◆
Deviation of the characteristic curve	± 1 % of full-scale value			◆	◆
Resolution	0.47 mm 0.5 mm				◆
Rated operational current	200 mA, short-circuit/overload protected	◆	◆		
Switching frequency	max. 3 Hz	◆	◆		
Load impedance	≥ 1 kOhm 0 ... 300 Ohm				◆
Temperature influence	± 1.5 % of full-scale value	◆	◆	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆	◆	◆
Protection degree	IP65	◆	◆	◆	◆
Connection	connector V15 (M12 x 1), 5 pin	◆	◆	◆	◆
Material					
Housing	ABS	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
Mass	100 g	◆	◆	◆	◆



- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- No TEACH-IN required
- Function indicators visible from all directions
- Insensitive to printing, colours and shining surfaces

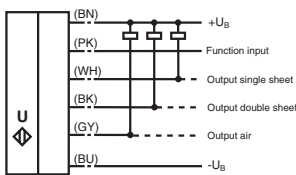
Montage/Ausrichtung

Recommended distances

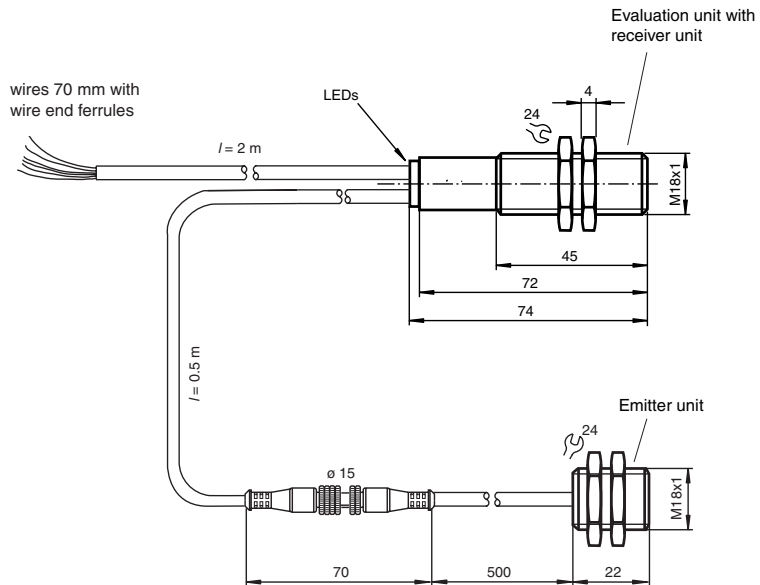
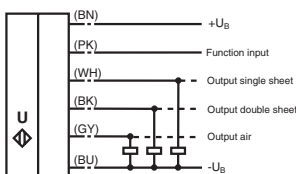


Electrical connection

Standard symbol/Connection:  
Double sheet control



Standard symbol/Connection:  
Double sheet control



		UDC-18GM-400-3E1	UDC-18GM-400-3E2	UDC-18GM-400-3E3
Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	◆	◆
Transducer frequency	395 kHz	◆	◆	◆
Operating voltage	18 ... 30 V DC , ripple 10% <sub>SS</sub>	◆	◆	◆
No-load supply current	< 80 mA	◆	◆	◆
Input type	Function input 0-level: -U <sub>B</sub> ... -U <sub>B</sub> + 1V 1-level: +U <sub>B</sub> - 1V ... +U <sub>B</sub>	◆	◆	◆
Impedance	≥ 4 kΩ	◆	◆	◆
Pulse length	≥ 100 ms	◆	◆	◆
Output type	3 switch outputs npn, NC 3 Switch outputs pnp, normally-closed 3 switch outputs pnp, NO	◆	◆	◆
Rated operational current	3 x 100 mA , short-circuit/overload protected	◆	◆	◆
Voltage drop	≤ 2 V	◆	◆	◆
Switch-on delay	approx. 15 ms (shorter response time on request)	◆	◆	◆
Switch-off delay	approx. 15 ms (shorter response time on request)	◆	◆	◆
Pulse extension	min. 120 ms parameterisable	◆	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆	◆
Protection degree	IP67	◆	◆	◆
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	◆	◆
<b>Material</b>				
Housing	brass, nickel-plated, plastic components PBT	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆
Mass	150 g	◆	◆	◆

Ultrasonic sensors, double material monitors

5.3

Date of edition 2008-03-20

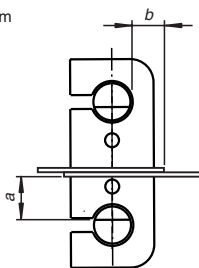


- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- No TEACH-IN required
- Function indicators visible from all directions
- Insensitive to printing, colours and shining surfaces

**Montage/Ausrichtung**

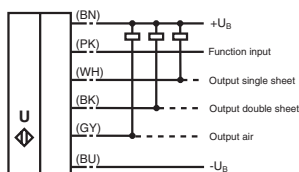
Recommended distances

$a = 5 \dots 15 \text{ mm}$   
 $b \geq 10 \text{ mm}$

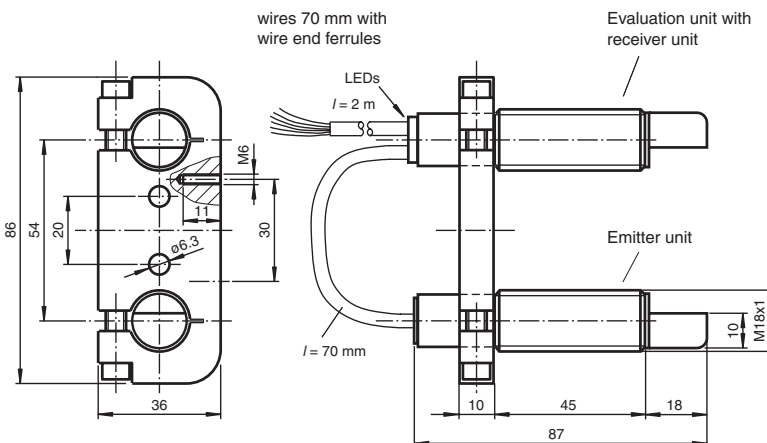
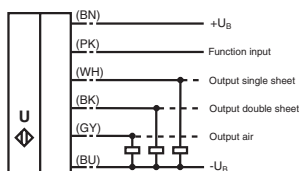


**Electrical connection**

Standard symbol/Connection:  
 Double sheet control



Standard symbol/Connection:  
 Double sheet control



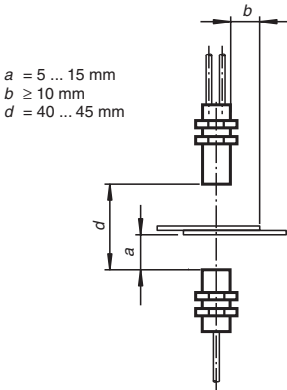
		UDC-18GMA-400-3E1	UDC-18GMA-400-3E3
Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	◆
Transducer frequency	395 kHz	◆	◆
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆
No-load supply current	< 80 mA	◆	◆
Input type	Function input 0-level: -U <sub>B</sub> ... -U <sub>B</sub> + 1 V 1-level: +U <sub>B</sub> - 1 V ... +U <sub>B</sub>	◆	◆
Impedance	≥ 4 kΩ	◆	◆
Pulse length	≥ 100 ms	◆	◆
Output type	3 switch outputs npn, NC 3 Switch outputs pnp, normally-closed	◆	◆
Rated operational current	3 x 100 mA , short circuit overload protected	◆	◆
Voltage drop	≤ 3 V	◆	◆
Switch-on delay	approx. 15 ms (shorter response time on request)	◆	◆
Switch-off delay	approx. 15 ms (shorter response time on request)	◆	◆
Pulse extension	min. 120 ms parameterisable	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	◆
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆
Mass	150 g	◆	◆



- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- Short version
- No TEACH-IN required
- Function indicators visible from all directions

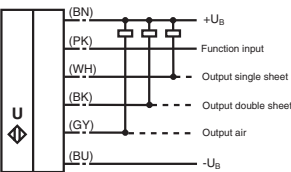
**Montage/Ausrichtung**

Recommended distances

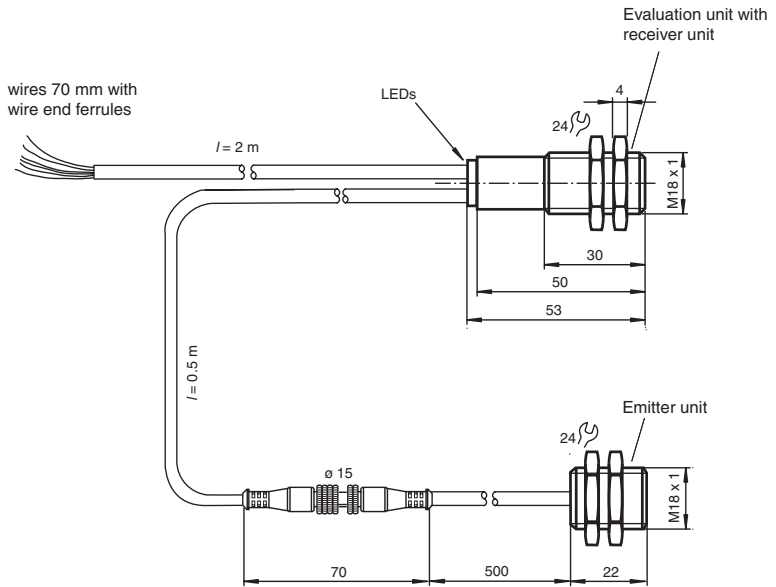
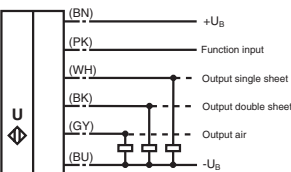


**Electrical connection**

Standard symbol/Connection:  
Double sheet control



Standard symbol/Connection:  
Double sheet control



		UDC-18GM50-400-3E0	UDC-18GM50-400-3E1	UDC-18GM50-400-3E2	UDC-18GM50-400-3E3
Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	◆	◆	◆
Transducer frequency	395 kHz	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	◆	◆	◆
No-load supply current	< 50 mA	◆	◆	◆	◆
Input type	Function input 0-level: -U <sub>B</sub> ... -U <sub>B</sub> + 1 V 1-level: +U <sub>B</sub> - 1 V ... +U <sub>B</sub>	◆	◆	◆	◆
Impedance	≥ 4 kΩ	◆	◆	◆	◆
Pulse length	≥ 100 ms	◆	◆	◆	◆
Output type	3 switch outputs npn, NC 3 switching outputs npn, NO 3 Switch outputs pnp, normally-closed 3 switch outputs pnp, NO	◆	◆	◆	◆
Rated operational current	3 x 100 mA , short-circuit/overload protected	◆	◆	◆	◆
Voltage drop	≤ 3 V	◆	◆	◆	◆
Switch-on delay	approx. 15 ms (shorter response time on request)	◆	◆	◆	◆
Switch-off delay	approx. 15 ms (shorter response time on request)	◆	◆	◆	◆
Pulse extension	min. 120 ms parameterisable	◆	◆	◆	◆
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	◆	◆	◆
Material					
Housing	brass, nickel-plated, plastic components PBT	◆	◆	◆	◆
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	◆	◆	◆
Mass	135 g	◆	◆	◆	◆

5.3 Ultrasonic sensors, double material monitors

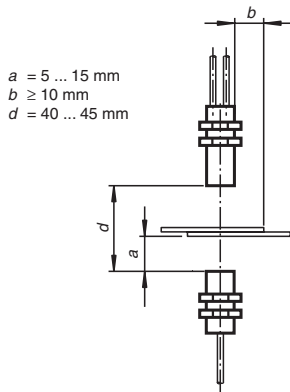
Date of edition 2008-03-20



- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- Short version
- No TEACH-IN required
- Function indicators visible from all directions

**Montage/Ausrichtung**

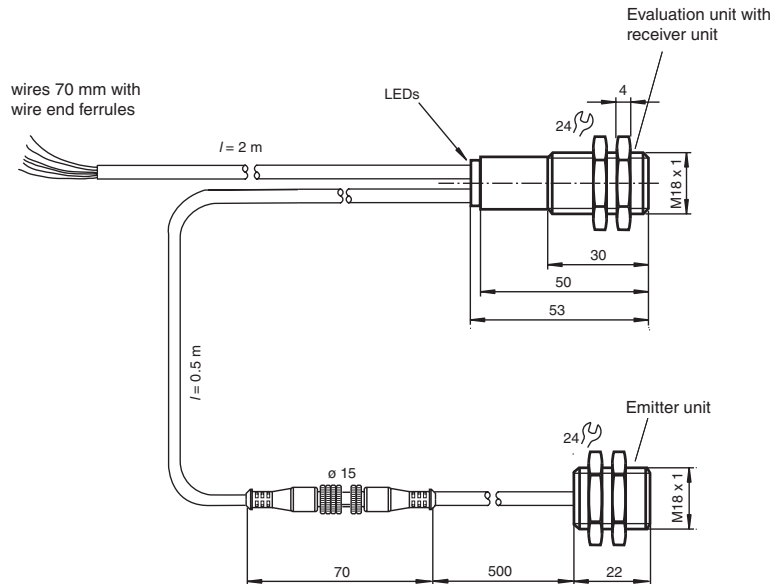
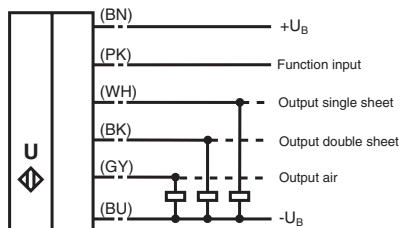
Recommended distances



**Electrical connection**

Standard symbol/Connection:

Double sheet control



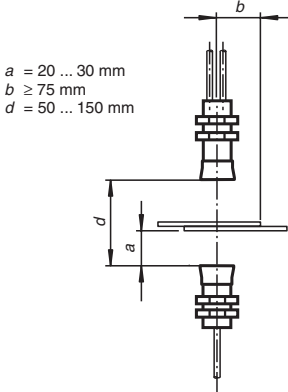
Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	UDC-18GM50-255-3E3
Transducer frequency	255 kHz	◆	
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	
No-load supply current	< 50 mA	◆	
Input type	Function input 0-level: $-U_B \dots -U_B + 1 \text{ V}$ 1-level: $+U_B - 1 \text{ V} \dots +U_B$	◆	
Impedance	$\geq 4 \text{ k}\Omega$	◆	
Pulse length	$\geq 100 \text{ ms}$	◆	
Output type	3 Switch outputs pnp, normally-closed	◆	
Rated operational current	$3 \times 100 \text{ mA}$ , short circuit/overload protected	◆	
Voltage drop	$\leq 2 \text{ V}$	◆	
Switch-on delay	approx. 15 ms (shorter response time on request)	◆	
Switch-off delay	approx. 15 ms (shorter response time on request)	◆	
Pulse extension	min. 120 ms parameterisable	◆	
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	
Protection degree	IP67	◆	
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	
<b>Material</b>			
Housing	brass, nickel-plated, plastic components PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	135 g	◆	



- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials
- No TEACH-IN required
- Insensitive to printing, colours and shining surfaces

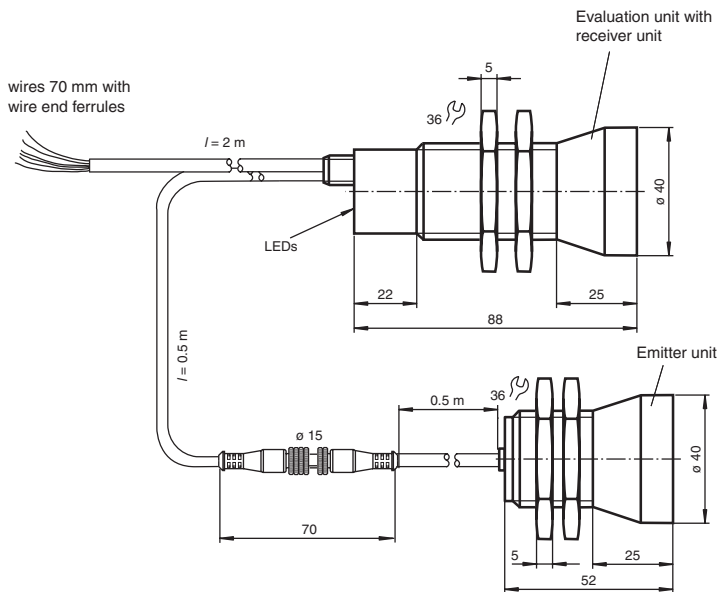
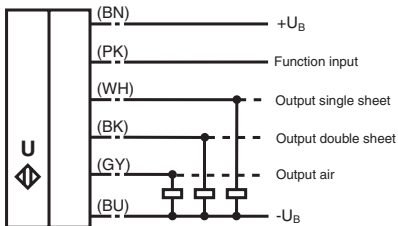
**Montage/Ausrichtung**

Recommended distances



**Electrical connection**

Standard symbol/Connection:  
Double sheet control



Sensing range	50 ... 150 mm , optimal distance: 80 mm	◆	UDC-30GM-085-3E3
Transducer frequency	85 kHz	◆	
Operating voltage	18 ... 30 V DC , ripple 10% <sub>SS</sub>	◆	
No-load supply current	< 200 mA	◆	
Input type	Function input 0 level: -UB ... -UB + 1 V	◆	
Function	in normal operation mode, the function input has to be connected with UB+ or UB-	◆	
Impedance	≥ 4 kΩ	◆	
Pulse length	≥ 100 ms	◆	
Output type	3 Switch outputs pnp, normally -closed	◆	
Rated operational current	3 x 100 mA , short-circuit/overload protected	◆	
Voltage drop	≤ 3 V	◆	
Switch-on delay	approx. 30 ms	◆	
Switch-off delay	approx. 30 ms	◆	
Pulse extension	min. 120 ms parameterisable	◆	
Ambient temperature	0 ... 50 °C (273 ... 323 K)	◆	
Protection degree	IP65	◆	
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	300 g	◆	

5.3 Ultrasonic sensors, double material monitors

5.3

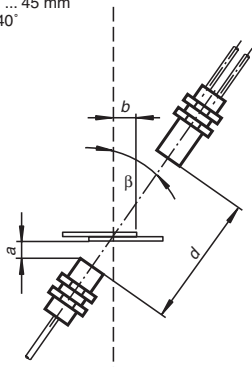




- Ultrasonic system for detection of labels and carrier materials.
- Short version
- Insensitive to printing, colours and shining surfaces
- Automatic compensation of the operating point in the case of slowly changing ambient conditions.

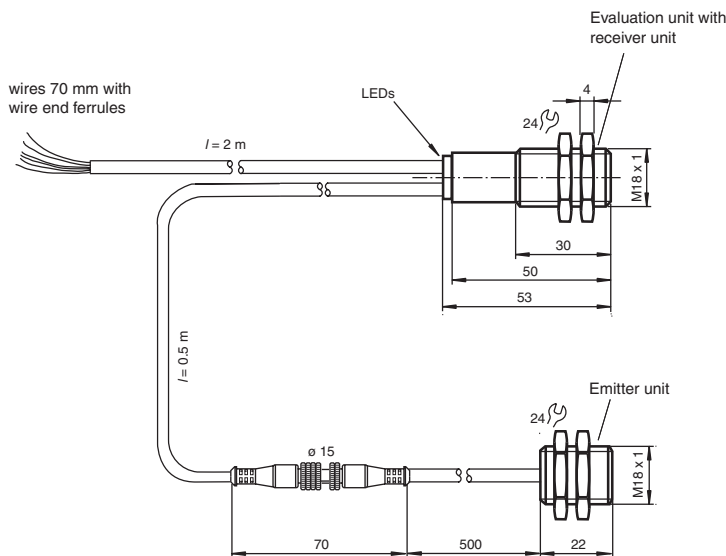
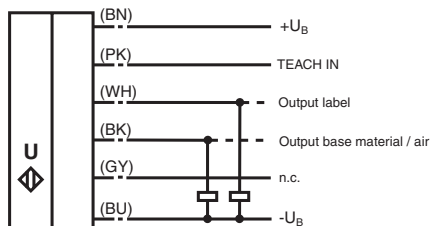
**Montage/Ausrichtung**

Suggestions:  
 a = 5 mm ... 15 mm  
 b ≥ 10 mm  
 d = 40 mm ... 45 mm  
 β = 20° ... 40°



**Electrical connection**

Standard symbol/Connection:  
 Label monitor



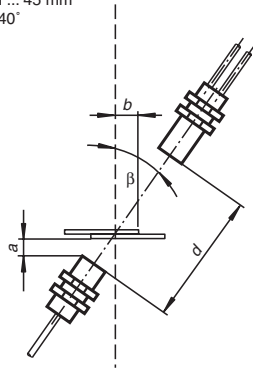
Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	ULB-18GM50-255-2E3
Transducer frequency	255 kHz	◆	
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	
No-load supply current	< 60 mA	◆	
Input type	Teach-In input 0-level: -U <sub>B</sub> ... -U <sub>B</sub> + 1 V 1-level: +U <sub>B</sub> - 1 V ... +U <sub>B</sub>	◆	
Impedance	≥ 10 kΩ	◆	
Pulse length	≥ 500 ms	◆	
Output type	2 switch outputs pnp, NC	◆	
Rated operational current	2 x 100 mA , short circuit overload protected	◆	
Voltage drop	≤ 3 V	◆	
Switch-on delay	≤ 600 μs	◆	
Switch-off delay	≤ 600 μs	◆	
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	
Protection degree	IP67	◆	
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	
Material	Housing: brass, nickel-plated, plastic components PBT Transducer: epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	150 g	◆	



- Ultrasonic system for splice detection
- Short version
- Insensitive to printing, colours and shining surfaces
- Very high processing speeds are possible.

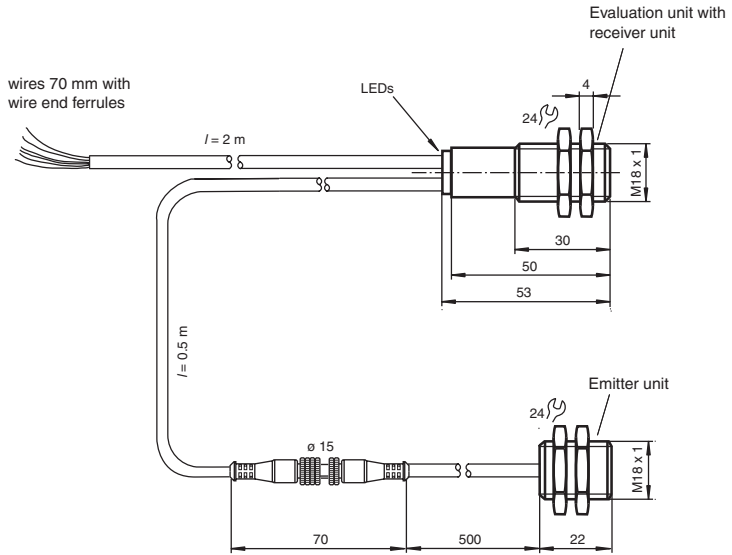
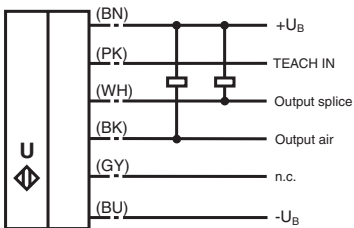
**Montage/Ausrichtung**

Suggestions:  
 a = 5 mm ... 15 mm  
 b ≥ 10 mm  
 d = 40 mm ... 45 mm  
 β = 20° ... 40°



**Electrical connection**

Standard symbol/Connection:  
 Splice control



Sensing range	20 ... 60 mm , optimal distance: 45 mm	◆	UGB-18GM50-255-2E1
Transducer frequency	255 kHz	◆	
Operating voltage	18 ... 30 V DC , ripple 10 % <sub>SS</sub>	◆	
No-load supply current	< 60 mA	◆	
Input type	Teach-In input 0-level: -U <sub>B</sub> ... -U <sub>B</sub> + 1V 1-level: +U <sub>B</sub> - 1V ... +U <sub>B</sub>	◆	
Impedance	≥ 10 kΩ	◆	
Pulse length	≥ 500 ms	◆	
Output type	2 switch outputs npn, NC	◆	
Rated operational current	2 x 100 mA , short-circuit/overload protected	◆	
Voltage drop	≤ 3 V	◆	
Switch-on delay	≤ 600 μs	◆	
Switch-off delay	≤ 600 μs	◆	
Pulse extension	≥ 120 ms parameterisable	◆	
Ambient temperature	0 ... 60 °C (273 ... 333 K)	◆	
Protection degree	IP67	◆	
Connection	2 m, PVC cable 0.14 mm <sup>2</sup>	◆	
Material			
Housing	brass, nickel-plated, plastic components PBT	◆	
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam	◆	
Mass	150 g	◆	

5.3 Ultrasonic sensors, double material monitors

# Rotary encoders

<b>Content</b>	<b>Page</b>
<b>Engineering and function principle</b>	<b>554</b>
Types of encoders	554
Encoder design	555
Mounting instructions	557
Installation instructions	558
Safety instructions	559
Operating instructions for incremental rotary encoders	560
Operating instructions for sine/cosine rotary encoders	562
Operating instructions for absolute value rotary encoders	563
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<b>Overview of rotary encoders</b>	<b>565</b>
Incremental rotary encoders	565
Absolute rotary encoders	566
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Incremental rotary encoders	568
Absolute rotary encoders	579
Intrinsically safe devices	592
<b>Accessories for rotary encoders (see chapter 9.8)</b>	<b>709</b>

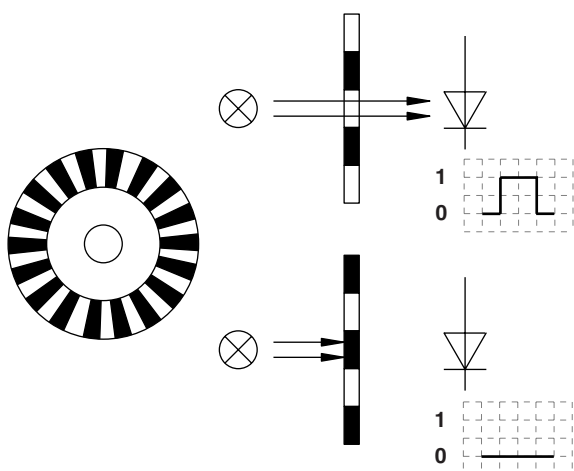
## Engineering and function principle

In automation technology rotary encoders are used as sensors for angle, position, speed, and acceleration. By using spindles, gear racks, measuring wheels, or cable pulls, linear movements can also be monitored by a rotary encoder.

Rotary encoders convert a mechanical rotation value into an electrical signal that can be processed by counters, tachometers, logic controllers, and industrial PCs.

Rotary encoders use a glass or plastic disc with alternating transparent and opaque fields, with a light source on one side and a light-sensitive sensor on the other.

As the disc rotates, the light source is alternately blocked and revealed to the sensor. Whenever the light source hits the sensor, the encoder transmits an electric pulse that can be interpreted by a controller. The pulse ends when an opaque field on the disc blocks the light source. Rotation of the disc results in a square-wave pulse output. Most rotary encoders use an infrared light-emitting diode as a light source, and photodiodes or phototransistors as receivers.



If no other functions are added to the encoder, the only output is a square wave that indicates that the disc is rotating. The direction of rotation and absolute position cannot be determined from a square wave output alone.

Therefore, additional components are added to many rotary encoders to provide additional data about the rotation.



## 1 Types of encoders

### 1.1 Incremental rotary encoders

Incremental rotary encoders supply a certain number of pulses for each shaft revolution.

Measuring the cycle duration, or counting the number of pulses during a pre-determined unit of time determines rotational speed. If the pulses are measured after a reference point is added, the calculated value represents a parameter for a scanned angle or the distance covered. Two-channel encoders (those with a phase shift of  $90^\circ$ ) enable the controller to determine the direction of rotation and can enable bi-directional positioning.

Three-channel incremental encoders provide a “zero signal” for each revolution, giving a fixed point of reference.

For more information, please refer to the section titled “Operating Instructions for Incremental Rotary Encoders.”

### 1.2 Absolute rotary encoders

Absolute encoders provide a uniquely coded numerical value for each shaft position.

Absolute rotary encoders eliminate the need for expensive input components in a positioning application because they have built-in reference data. In addition, reference runs after a power failure or when the machine is switched off are not required because the encoder provides the current position value immediately.

Single-turn absolute encoders divide the shaft into a defined number of steps. The maximum resolution is 16 bits, which means that up to 65,536 positions can be defined.

By using a multi-step gear, multi-turn absolute encoders not only provide the angular position within a revolution, but also the number of revolutions. Multi-turn encoders have a 14-bit resolution to indicate the number of turns, which means that up to 16,384 revolutions can be identified. In Overall resolution is 30 bits (16 bits per turn + 14 bits for the number of turns) or 1,073,741,824 measuring steps.

Parallel absolute encoders transmit the position value to external analyzing electronics through multiple wires, one for each bit.

In serial absolute encoders, the output data can be transmitted by means of standardized interfaces and protocols. In the past, point-to-point wiring was used for serial data; today, fieldbus systems are becoming increasingly popular.

For more information, please refer to the section titled “Operating Instructions for Absolute Rotary Encoders.”

## 2 Encoder design

### 2.1 Solid shaft encoders

Solid shaft encoders feature a solid drive shaft that must use an additional coupling to link the encoder shaft to the application's drive shaft. The spring-based coupling compensates for misalignment.

Belts, pinions, measuring wheels and cable pulls can also be mounted to the solid drive shaft.

Depending on the type of coupling used, it is important to observe the maximum shaft load, since excessively high radial or axial forces can damage the encoder.



Advantages of solid shaft encoders:

- simple construction
- higher protection class possible
- can be mechanically and electronically disengaged from the application, depending on coupling

Disadvantages of solid shaft encoders:

- many component parts at mounting of encoder: encoder, mounting bracket, coupling

### 2.2 Hollow shaft encoders

Hollow shaft encoders use a continuous borehole or a blind hole (recessed hollow shaft encoder) which houses the drive shaft.

Integrated hub and shaft connections make linking the encoder and the drive simple and easy.

Built-in torque rests compensate for axial misalignment of the encoder and drive, making a compensating coupling unnecessary.



Advantages of hollow shaft encoders:

- simple mounting
- quick installation

Disadvantages of hollow shaft encoders:

- complex internal construction

### 2.3 Mounting

#### Clamping flange

Allows you to mount the encoder:

- using the clamping flange which ensures that the rotational axis is centered
- using the threaded holes on the encoder face.



#### Servo flange (synchro flange)

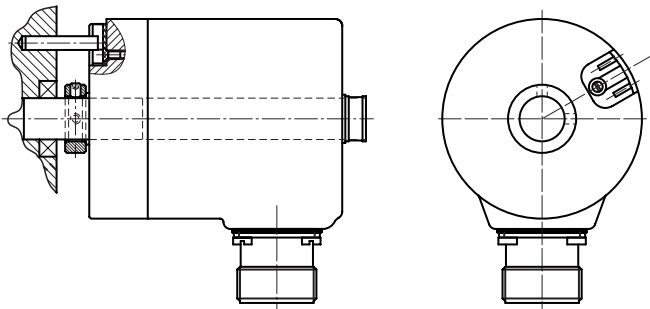
Allows you to mount the encoder:

- using the synchro groove with mounting components
- using the threaded holes on the encoder face
- using a mounting bracket.



**Hollow shaft encoders**

Hollow shaft encoders have been provided with a thru borehole which picks up the drive shaft.

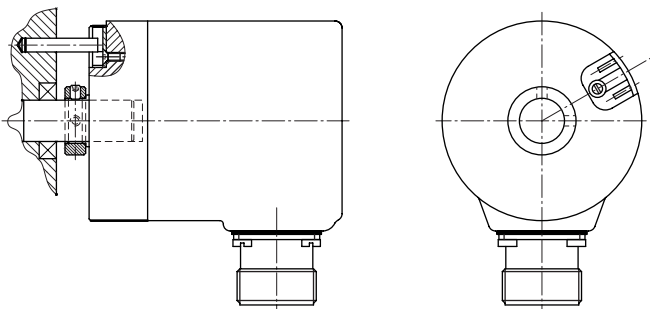


With hollow shaft encoders, the shaft and hub connection is already integrated, but it is vital to mount the encoder so that the correct torque is transmitted to the drive shaft and not to the body of the encoder.

Typically, hollow shaft encoders are mounted in such a way that the weight of the encoder is placed on the drive shaft, while a pin securing the body of the encoder prevents it from rotating around the drive shaft as torque is applied. Encoder motion should not be restricted in any other way, as it could affect the accuracy of the encoder.

**Recessed hollow shaft encoders**

Recessed hollow shaft encoders are identical in all ways to standard hollow shaft encoders except that the hole is bored only partly through the encoder housing. Mounting techniques for recessed encoders are also the same.

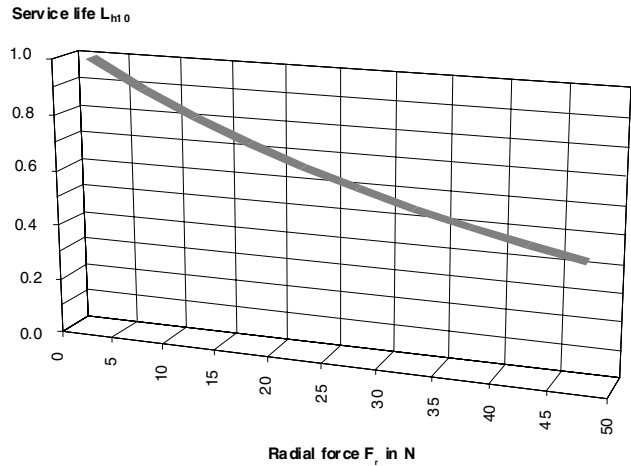


**2.4 Shaft load**

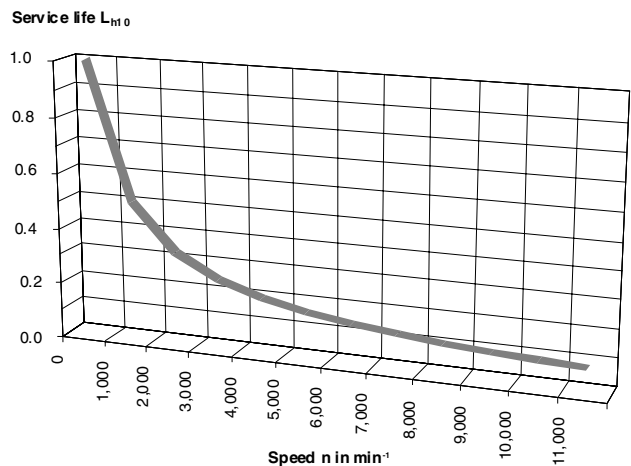
The shaft of a rotary encoder is mounted using two ball bearings.

Because of the system's design, the permissible radial force ( $F_r$ ) is always greater than the axial force ( $F_a$ ). The expected service life of the bearings depend mainly on three parameters: axial force, radial force, and speed.

The diagram below illustrates the expected service life  $L_{h10}$  dependent on the radial force ( $F_r$ ).



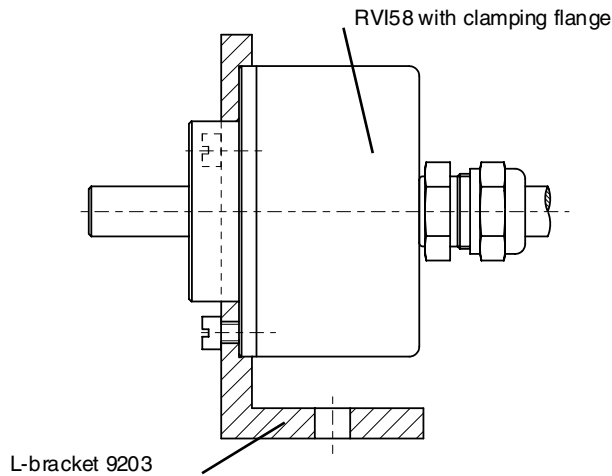
The relationship between service life and speed is illustrated in the following diagram. The maximum permissible speeds is specified in the encoder data sheets. Please note that this is the maximum permitted mechanical speed. The electrically permitted speed depends on the interface used.



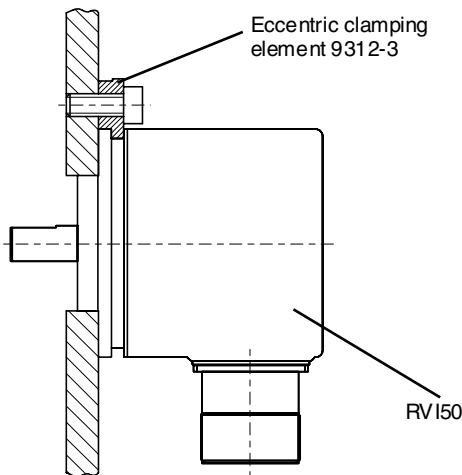
### 3 Mounting instructions

#### 3.1 Mounting encoders

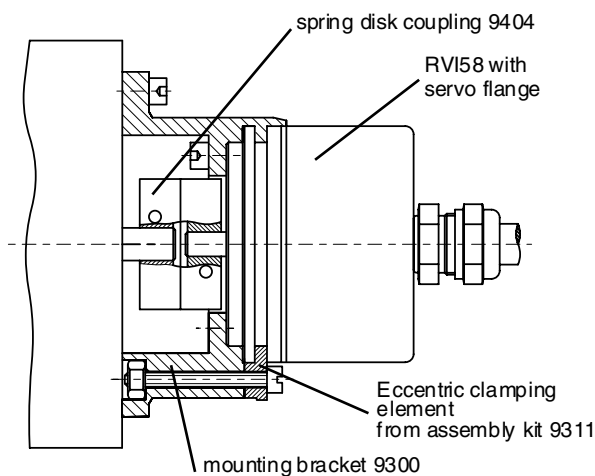
Mounting a solid shaft encoder using an L-bracket



Mounting a solid shaft encoder using an eccentric clamp



Mounting a solid shaft encoder with a mounting bracket



#### 3.2. Use of couplings

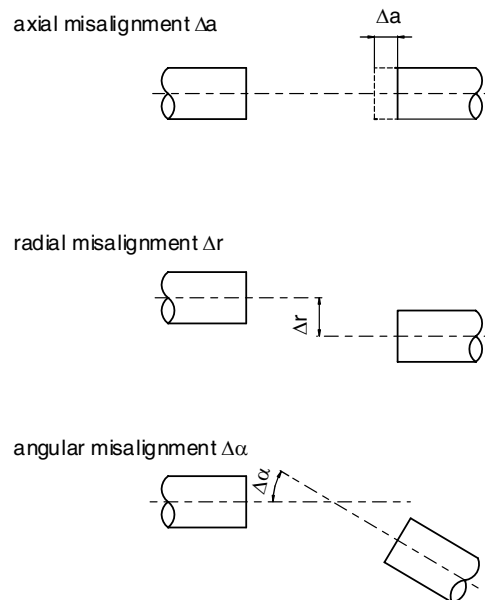
To prevent excessive loads on the encoder bearings, the encoder and drive shaft must be linked with a flexible coupling.

Without a flexible coupling, slight misalignment of the encoder and drive shaft or changes in alignment due to temperature fluctuation can generate excessive axial or radial forces. In a rigidly mounted system, this can destroy the encoder. However, a coupling with high torsional rigidity will reduce the torsional error between the encoder and drive shaft.

The higher the torsional rigidity of the coupling, the lower is the torsional error between encoder and drive.

The restoring forces of the coupling are in direct correlation with the compensatory movement of the coupling. These forces must not exceed the permissible axial and radial forces.

For data on maximum radial, axial, or angular misalignment, please refer to the encoder data sheets.



## 4 Installation instructions

### 4.1 Anti-interference measures

Because of the sensitive nature of today's electronics, a consistently applied anti-interference and wiring protocol should be designed into any encoder system.

The following procedures should be followed whenever mounting an encoder in a normal industrial environment (please note that no two environments are the same - if you have questions, please contact your local P+F representative for a detailed analysis of your application).

- Terminate the serial line with a  $120\ \Omega$  resistor (at the controller and the last encoder in the loop. The resistor should be installed between the Receive/Transmit terminals.)
- Keep encoder wiring away from power cables and conduit. If crossing power cables is necessary, make sure the wires are perpendicular, not parallel.
- Make sure your cable's shield has a cross section of at least  $4\ \text{mm}^2$  (12 AWG).
- Make sure your cable's wire has a cross section of at least  $0.14\ \text{mm}^2$  (26 AWG).
- The wiring of the shield and 0 V should be star-shaped where possible.
- Do not kink or bend cables.
- Do not exceed the minimum bending radius as shown on the cable data sheet. Avoid tensile and shearing loads on the cable.

### 4.2 Operating instructions

Every encoder manufactured by Pepperl+Fuchs is tested before leaving the factory. To ensure continued operation, please observe the following precautions:

- Do not strike or hammer on the encoder housing or shaft.
- Do not overload the encoder shaft, either axially or radially.
- The accuracy and service life of the encoder are only guaranteed if a suitable coupling is used.
- Power to the encoder and controller must be applied at the same time.
- Do not service wiring with power applied to the system. Do not exceed maximum operating voltage.

### 4.3. Notes on electrical shielding

The interference-resistance of a system depends on the correct shielding. This is where installation errors are frequently made. Often the shield is connected to one side and then to the ground terminal with a soldered wire. This is valid in NF technology. For EMC, however, the rules of HF technology apply.

A basic goal of HF engineering is to direct the HF energy to ground at a low as possible impedance. Otherwise, it discharges into the cable. A low impedance is achieved by a large area connection to metal surfaces.

The following precautions must be observed:

- Apply shielding on both sides to a common ground.
- The shield has to be installed behind the insulation and must be clamped to a large surface below the strain relief.
- With screw-type cable connections, the strain relief must be grounded.
- Use only metallic plugs (such as sub-D plugs with metallic housings).



## 5 Safety instructions



### Warning

Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device must be shut down and secured against accidental operation.

If failures cannot be remedied, the device must be shut down and secured against accidental operation.

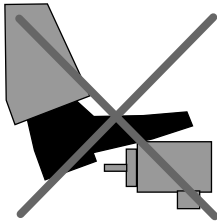
Entry into and modifications of the device are not permitted.



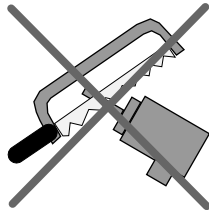
### Caution

Tighten the clamping ring only, if a shaft has been fitted in the area of the clamping ring (hollow shaft encoders).

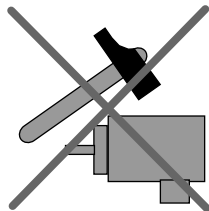
Tighten all screws and plug connectors prior to operating the encoder.



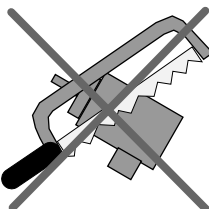
Do not stand on the rotary encoder!



Do not remachine the drive shaft!



Avoid impacts!



Do not remachine the housing!

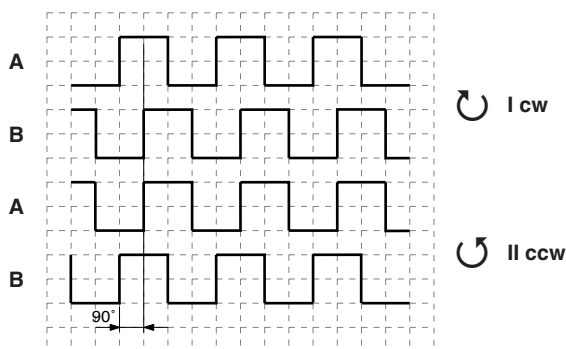
Incremental rotary encoders emit pulses as the shaft is rotated, and the number of pulses is used to calculate angular position. The resolution (Z) of an incremental encoder is the number of pulses per revolution. The signal frequency is used to determine the angular speed ( $\omega$ ) and the change in position for a given period of time is used to calculate the angular acceleration ( $\alpha$ ).

### 1 Rotational direction monitoring in incremental rotary encoders

In order to determine the direction of rotation of a movement, the scanning principle is used on both channel A and channel B. The direction of rotation can be determined by evaluating the two signals, which are phase-shifted by 90 degrees.

In the first figure below (I cw), channel A precedes channel B. This indicates clockwise rotation. II ccw shows counterclockwise rotation. The direction of rotation is determined by viewing the encoder shaft head-on.

Depending on the type of incremental rotary encoder, channel A or channel B is the leading channel. For more information, refer to the encoder data sheet.

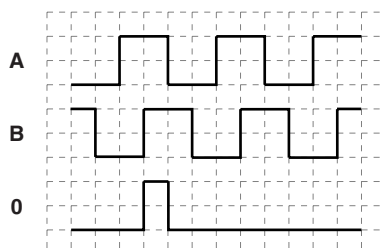


### 2 Zero signal

Determining the frequency of the pulses is the job of the controller, PLC or tachometer. The zero signal is a pulse that occurs once per revolution at a fixed point and is transmitted using a third channel (often called channel 0 or Z).

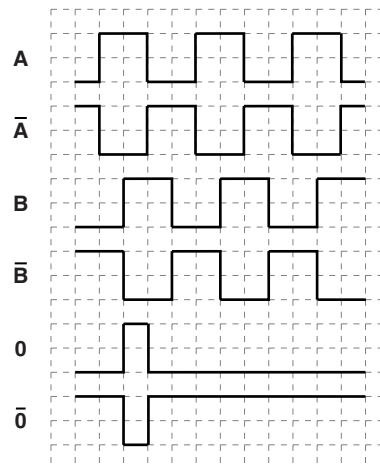
This signal (third channel) is called zero signal or channel N or track N. The zero signal is usually used as a reference signal for positioning.

The diagram below illustrates the output of a 3-channel incremental rotary encoder.

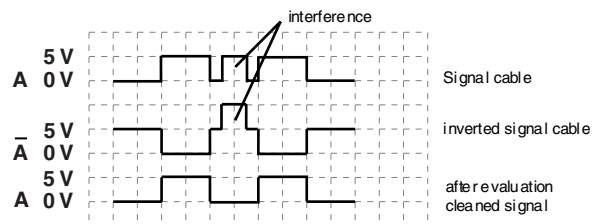


### 3 Inverted channels

Inverted signals are transmitted in addition to channels A, B and Z to improve signal quality. Inverted signals are a standard feature in RS-422 interfaces and are optional on push-pull outputs.



The advantage of normal and inverted signal transmissions is that filtering of unwanted signals is possible. If a noise pulse occurs, it will be induced equally on all channels. Subtracting the normal and inverted encoder signals from each other eliminates the noise pulse. The figure below illustrates how this is done.



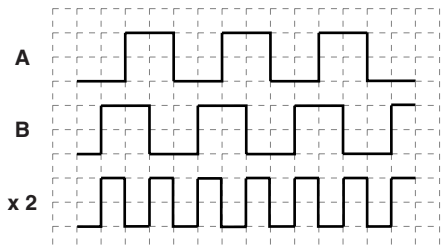
### 4 Pulse multiplication

Pulse multiplication is used to increase the measuring steps or to reduce the output frequency of an incremental rotary encoder. The signals of an incremental rotary encoder can be doubled or quadrupled by linking channels A and B (see the following figures).

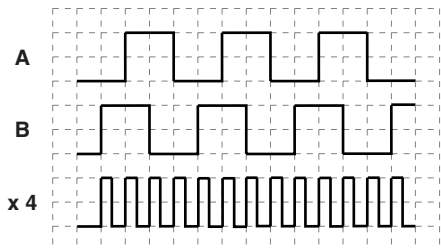
#### Example:

An application may need 20,000 measuring steps for each revolution at a speed of 3000 RPM. If the control unit (PLC, counter or tachometer) provides the option to quadruple the signal, then an inexpensive rotary encoder with 5000 pulses can be used. In addition, the output frequency of the incremental rotary encoder is reduced.

- Without quadrupling: 1 MHz (This frequency is too high for most control units)
- With quadrupling multiplication: 250 kHz



Signal doubling



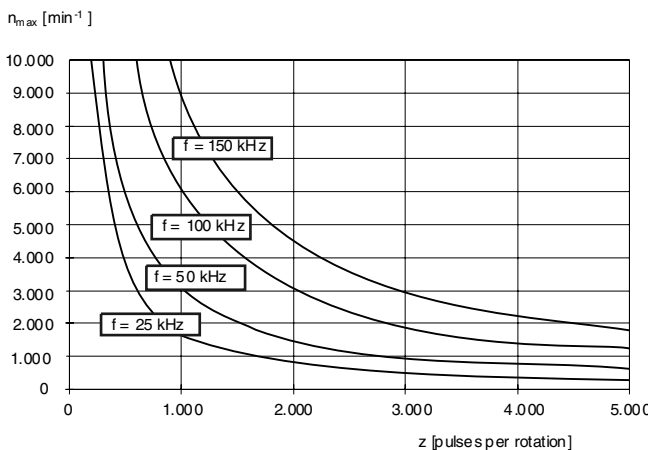
Signal quadrupling

NOTE: By linking channels A and B, rotation direction data is lost.

### 5 Relationship between speed and output frequency

$$f = \frac{n}{60 \text{ s}} \times Z \quad n \text{ in } \text{min}^{-1}$$

$$n_{\text{max}} = \frac{f_{\text{max}} \times 60 \text{ s}}{Z} \quad f_{\text{max}} \text{ in Hz, } n_{\text{max}} \text{ in } \text{min}^{-1}$$

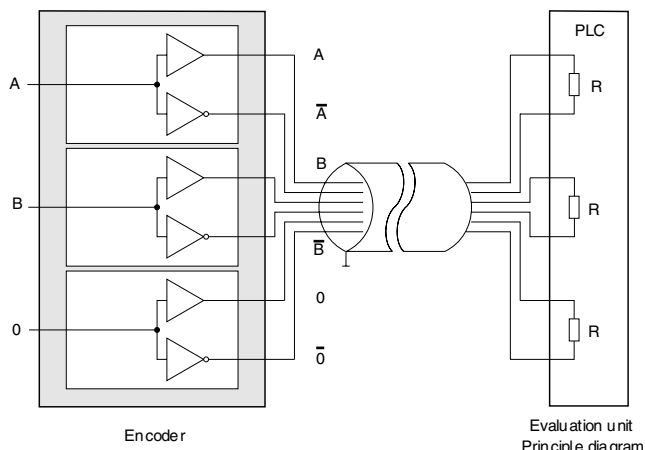


## 6 Interfaces

### Line Driver (RS 422)

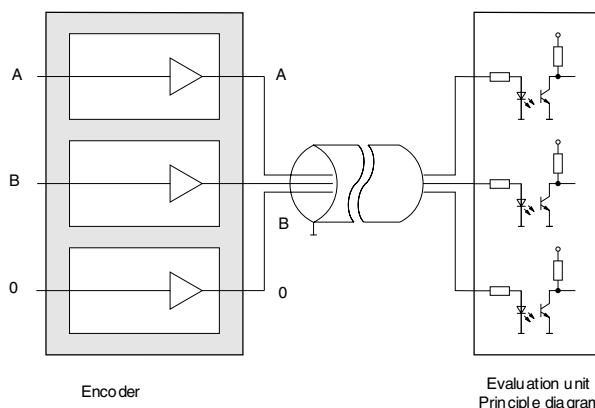
This symmetrical interface is recommended for use whenever a longer cable length is required. The corresponding core pairs must be twisted for maximum interference resistance.

This interface can also be used as a replacement for the TTL interface. In this case, the inverted outputs are not used.



### Push-pull output

The push-pull output is a combination of NPN and PNP outputs. Compared to open collector outputs, the push-pull output features an improved square wave. In addition, interference resistance is improved. No external wiring is required as in NPN or PNP outputs. Push-pull also offers inverted channels. The main applications of push-pull are within the range of median switching frequencies. The open collector outputs can be replaced by push-pull by using only the non-inverted outputs.



Sine/cosine rotary encoders are incremental rotary encoders that provide analog output signals instead of square wave signals. The output voltages of the channels A and B have a sinusoidal curve. Sinusoidal and cosinusoidal signals have some benefits when compared to the digital signals of an incremental rotary encoder when evaluated by the control unit.

The angular position can be calculated from the number of periods per rotation and the measured signal periods. The rotational speed ( $\omega$ ) is determined from the signal frequency. Also, the rotational acceleration can be calculated from the change in period over time.

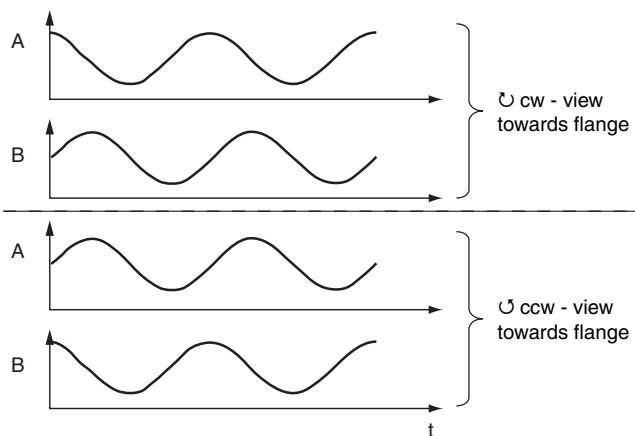
### 1 Rotational direction monitoring in sine/cosine rotary encoders

These two sinusoidal incremental signals are phase-shifted by 90°. As with incremental rotary encoders with square wave output, the direction of rotation can be determined by evaluating the two signals.

In the first figure below (I cw), channel A precedes channel B. This indicates clockwise rotation. II ccw shows counterclockwise rotation. The direction of rotation is determined by viewing the encoder shaft head-on.

The actual measurement, or rather the evaluation (counting) of the signal periods, takes place in an additional evaluation unit on the controller. This could be a counter, control device (PLC), or speedometer.

Depending on the type of incremental rotary encoder, channel A or channel B is the leading channel. For more information, refer to the encoder data sheet.

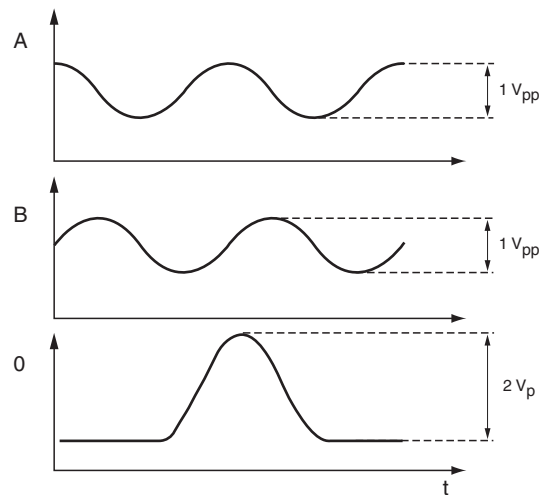


### 2 Zero signal

The zero signal is a pulse that occurs once per revolution at a fixed point and is transmitted using a third channel (often called channel 0 or Z). The zero signal is usually used as a reference signal for positioning.

The zero position reference is provided in analog form. It approximates a 90° curve.

The diagram below illustrates the output of a 3 channel sine/cosine rotary encoder.



### 3 Pulse multiplication

Pulse multiplication is used to increase the number of measuring steps or to reduce the output frequency of an incremental rotary encoder. The analog signals of a sine/cosine rotary encoder can be increased by almost any number on the controller by linking channels A and B.

### 4 Relationship between speed and output frequency

See the operating instructions for incremental rotary encoders.

### 5 Characteristics of sine/cosine rotary encoders

Because of the relatively flat sinusoidal output curve of a sine/cosine rotary encoder, there are some beneficial features compared to incremental rotary encoders with pulse outputs. These are:

- longer cable runs,
- good filtering possibilities compared to cablecoupled interference signals,
- very good suitability for frequency multiplication without losing rotational direction information,
- very low phase jitter,
- well suited for monitoring extremely slow movements.

Absolute encoders do not generate pulses, but entire data strings.

The sampling unit in an absolute encoder reads the code disk to determine the shaft position and the data is transmitted by parallel or serial interface.

### 1 Single-turn

In single-turn absolute rotary encoders, each revolution of the encoder (360°) is divided into a maximum of 65,536 measuring steps (16 bit). After each complete revolution, the count begins again at the initial value. A single turn absolute rotary encoder does not count the number of revolutions.

### 2 Multi-turn

In addition to the coded disk in a single-turn encoder, a multi-turn encoder adds a gear that counts up to 16,384 revolutions (14 bit). Overall resolution amounts to 16 bit (single-turn resolution) plus 14 bit (multi-turn resolution) for a total of 30 bits of resolution. The resulting 1,073,741,824 measuring steps can be used to divide very long linear distances into small measuring steps.

### 3 Interfaces

The Pepperl+Fuchs encoder line includes the industry's largest range of interfaces for absolute encoders:

#### Parallel interface

With a parallel interface, data is sent directly from the Graycoded encoder measurement. A parallel interface's primary advantage is data transfer speed.

#### SSI interface

The Synchronous Serial Interface (SSI) has been developed to transfer output data to a controller. The controller sends a bundle of timer pulses and the absolute encoder responds with the position value.

#### AS interface

AS-Interface uses a multi-slave solution to provide real-time encoder data transfer.

#### CAN

Pepperl+Fuchs offers encoders with a recessed hollow shaft and solid shaft design in single- and multi-turn versions. Each model is in accordance with the CAN standard DSP406 (Class 1 and Class 2).

#### DeviceNet

Encoders are available with fully integrated DeviceNet interfaces that support all DeviceNet functions.

#### PROFIBUS

PROFIBUS operation is supported in accordance with Class 1 and Class 2, and satisfies the PROFIBUS profile for encoders.

#### Ethernet

These encoders are available with Ethernet TCP/IP interface. The Ethernet interface is programmable via any web browser.

## 4 Code types

### Binary code

Binary code is a dual number system, consisting of the numbers 0 and 1. When using binary code, it is important to note that several bits may change at the same time from step to step. For example, counting from seven to eight, the bits 0, 1, 2 and 3 change. In order to ensure high transmission integrity, P+F recommends using a code which changes only one bit at each step. The evaluating control can then be used to determine whether the data string is accurate.

2 <sup>4</sup>																				
2 <sup>3</sup>																				
2 <sup>2</sup>																				
2 <sup>1</sup>																				
2 <sup>0</sup>																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

### Gray code

Gray code is a unit-distance code; only one bit changes from step to step. To use this code for distance calculation, it must be converted to a binary code. Gray code is recommended for encoders because the data can be transmitted by a serial interface. To check the unit-distance, every code change has to be detected by the test logic.

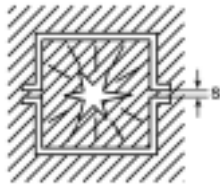
2 <sup>4</sup>																				
2 <sup>3</sup>																				
2 <sup>2</sup>																				
2 <sup>1</sup>																				
2 <sup>0</sup>																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

### Gray excess code

The Gray excess code is extracted from the complete Gray code. In the process, clipping takes place symmetrically, permitting the use of even sections only. The idea is that a different number of measuring steps other than those given by a power of 2 can be used. Frequently it is necessary to reduce a 9-bit value (512 measuring steps) to 360 measuring steps. The unit distance remains unaffected.

## Intrinsic safety devices

### Ignition protection class "Flameproof enclosure" (EEx d) DIN EN 50016/VDE/0170/0171 part 5



"Ignition protection class in which the components that might ignite in an explosive atmosphere are enclosed in a housing capable of withstanding the pressure of an explosion inside and prevents the explosion from spreading to the hazardous environment outside the housing."

The housings are not constructed gas-tight, but have a gap serving as a pressure relief aperture. Escaping gases are cooled down sufficiently so that they cannot ignite the explosive atmosphere outside the housing. An ignition is prevented if the minimum ignition temperature and the minimum ignition energy of the surrounding explosive atmosphere are not reached. For this reason, devices in this ignition protection class are approved for the explosion groups I, IIA, IIB, IIC with different minimum gap lengths and maximum gap widths (see table 1 and 2 of EN 50018) depending on the type of gap.

The most important aspect of the ignition protection type EEx d is the relief aperture that may neither be enlarged (e.g. removal of rust) or reduced (e.g., lubrication with resinous oils or greases).

If devices with pressurized enclosures are used, the electrical connections must comply with the ignition protection class "Increased safety."

Series 14 and series 74 rotary encoders are designed in accordance with ignition protection class "Pressurized enclosure" and have ATEX approval ZELM 02 ATEX 0078.

### Ignition protection class "Intrinsic safety" (EEx i) DIN EN 50020

By using the latest technology, it is possible to incorporate a binary switching behavior in the sensor (with simultaneous switch condition change on the sensor and amplifier), while retaining the standardized voltage and current values. The characteristic values of voltage and current are kept so low that a NAMUR<sup>1</sup> sensor can be used in an explosive area (ignition protection class "Intrinsic safety").

The RVI84 series is designed with this application in mind.









NAMUR sensors are mounted to external amplifiers which convert the current changes into a binary output signal. P+F offers a large number of amplifiers for intrinsic safety applications.

#### NAMUR sensors, two-wire

NAMUR sensors in accordance with IEC 60947-5-6 are two-wire sensors.

1) NAMUR: Normenarbeitsgemeinschaft für Mess- und Regelungs-technik der chemischen Industrie (Standards Working Group for Control and Instrumentation in the Chemical Industry).















Incremental rotary encoders

	Series	mechanical design						electrical design					Sine/cosine	Page	
		Housing Ø [mm]	Solid shaft	Hollow shaft	Recessed hollow shaft	Die-cast zinc housing	Aluminum housing	Plastic housing	Pulses per revolution	Cable version	Connector version	Push-pull output			RS 422 output
	RVI25	67	•			•			5.000	•	•	•	•		568
	RVI50	50	•				•		2.500	•	•	•	•		569
	RVI58	58	•				•	10.000 <sup>1)</sup>	•	•	•	•		570	
	RSI58			•			•	10.000 <sup>1)</sup>	•	•	•	•		571	
	RHI58		•				•	10.000 <sup>1)</sup>	•	•	•	•		572	
	RHS58		•				•	2.048	•				•	573	
	RVI78	78	•				•	5.000	•	•	•			574	
	RHI90	90		•			•	2.500	•	•	•	•		575	
	TVI40	40	•					1.024	•	• <sup>2)</sup>	•	•		576	
	TSI40			•			•								
	THI40			•			•								
	TVI50	50	•				•	1.024	•		•	•		577	
	TVI58	58	•				•	1.500	•		•	•		578	
	THI58				•		•								

<sup>1)</sup> upon request up to 400,000 pulses  
<sup>2)</sup> upon request

Date of issue 04.04.2008

Absolute rotary encoders

	Interface	Series	mechanical design					electrical design						Page				
			Housing Ø [mm]	Solid shaft	Recessed hollow shaft	Hollow shaft	Aluminum housing	Stainless steel housing	Single-turn encoder	Multi-turn encoder	Resolution [bit]	Cable version	Connector version		Terminal compartment	Programmable operating mode	Preset function	Preset key
	Synchronous Serial Interface 	AVS58	58	●			●	●	●	16	●	●		●	●	●	579	
		ASS58			●			●	●	●	16	●	●		●	●	●	582
		AHS58				●			●	●	16	●	●		●	●	●	581
		AVM58		●				●	●	●	30	●	●		●	●	●	579
		ASM58			●			●	●	●	30	●	●		●	●	●	582
		AHM58				●		●		●	30	●	●		●	●		581
	Parallel 	FVS58	58	●			●	●	●	13	●	●		●	●		584	
		FSS58			●			●	●	●	13	●	●		●	●		585
		FVM58		●				●	●	●	25	●	●		●	●		584
		FSM58			●			●	●	●	25	●	●		●	●		585
	AS-Interface 	BVS58	58	●			●	●	●	13	●	●		●	●		586	
		BSS58			●			●	●	●	13	●	●		●	●		
		BVM58		●				●	●	●	25	●	●		●	●		
		BSM58			●			●	●	●	25	●	●		●	●		
	CANopen 	CVS58	58	●			●	●	●	16				●	●	●	587	
		CSS58			●			●	●	●	16				●	●		●
		CVM58		●				●	●	●	30				●	●		●
		CSM58			●			●	●	●	30				●	●		●
	DeviceNet 	DVS58	58	●			●	●	●	16				●	●	●	588	
		DSS58			●			●	●	●	16				●	●		●
		DVM58		●				●	●	●	30				●	●		●
		DSM58			●			●	●	●	30				●	●		●
	PROFIBUS 	PVS58	58	●			●	●	●	16				●	●	●	589	
		PSS58			●			●	●	●	16				●	●		●
		PVM58		●				●	●	●	30				●	●		●
		PSM58			●			●	●	●	30				●	●		●
	Ethernet <sup>1)</sup> 	EVS58	58	●			●	●	●	16		●		●	●	●	590	
		ESS58			●			●	●	●	16		●		●	●	●	591
		EVM58		●				●	●	●	30		●		●	●	●	590
		ESM58			●			●	●	●	30		●		●	●	●	591

<sup>1)</sup> with the protocols TCP/IP, Powerlink and Profinet



Intrinsically safe devices



Incremental rotary encoders

	Series	Ignition protection type	mechanical design						electrical design					Page				
			Housing Ø [mm]	Solid shaft	Hollow shaft	Recessed hollow shaft	Die-cast zinc housing	Aluminum housing	Plastic housing	Pulses per revolution	Cable version	Connector version	NAMUR interface		Push-pull output	RS 422 output		
	14-14361 14-14366 14-1436x	EEx d	116	●				●				5.000	●			●		592
	RVI58X RSI58X	EEx nA	58	●			●		●			5.000	●			●	●	594
	RVI84	EEx ia	78	●					●		●		25	●				593

Absolute rotary encoders

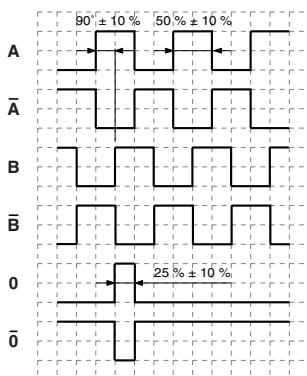
	Interface	Series	Ignition protection type	mechanical design					electrical design							Page			
				Housing Ø [mm]	Solid shaft	Recessed hollow shaft	Aluminum housing	Stainless steel housing	Single-turn encoder	Multi-turn encoder	Resolution [bit]	Cable version	Connector version	Terminal compartment	Programmable operating mode		Preset function	Preset key	Limit switch function
	Synchronous Serial Interfac 	AVS14 AVM14	EEx d	116	●		●			●		12 24	● ●			● ●			595
	PROFIBUS 	PVS14 PVM14	EEx d	116	●		●			●		13 25	● ●			● ●	● ●	● ●	597
	CANopen 	CVM14	EEx d	116	●		●			●		25	●			●	●	●	595
	DeviceNet 	DVM14	EEx d	116	●		●			●		25	●			●	●	●	597
	Profibus 	PVS58X PVM58X PSS58X PSM58X	EEx nA	58	●		●			●		16 30 16 30				● ● ● ●	● ● ● ●	● ● ● ●	596

Date of issue 04.04.2008



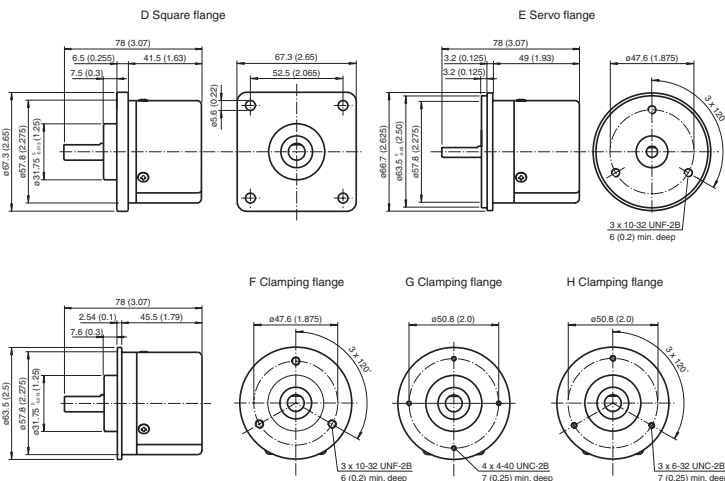
- Industrial standard housing Ø2.5"
- Up to 5000 ppr
- Servo flange or square flange
- 10 V ... 30 V with RS 422 interface  
RVI25\*-\*\*\*\*\*X
- 10 V ... 30 V with short-circuit proof push-pull output  
RVI25\*-\*\*\*\*\*1
- 5 V with RS 422 interface  
RVI25\*-\*\*\*\*\*6

Signal outputs

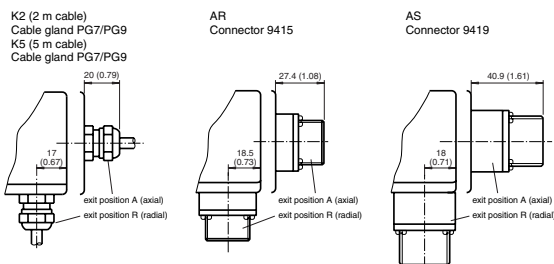


↺ ccw - with view onto the shaft

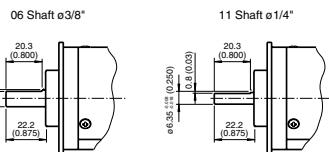
Flange  
Dimensions in mm (inch)



Connections  
Dimensions in mm (inch)



Shafts  
Dimensions in mm (inch)



		RVI25*-*****1	RVI25*-*****6	RVI25*-*****X
Pulse count (ppr)	max. 5000	◆	◆	◆
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %	◆	◆	◆
No-load supply current	max. 50 mA max. 60 mA max. 70 mA	◆	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ) max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected max. per channel 40 mA, short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected	◆	◆	◆
Output frequency	max. 100 kHz	◆	◆	◆
Connection:				
Connector	type 9415, 7-pin type 9419, 10-pin	◆	◆	◆
Cable	Ø7.8 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 2 m or 5 m	◆	◆	◆
Protection degree	DIN EN 60529, IP 54 (without shaft seal)/IP65 (with shaft seal)	◆	◆	◆
Operation temperature				
Glass disk	-20 ... 80 °C (253 ... 353 K)	◆	◆	◆
Plastic disk	-20 ... 60 °C (253 ... 333 K)	◆	◆	◆
Material				
Housing	diecast zinc, not laquered or coated	◆	◆	◆
Flange	aluminium 3.1645	◆	◆	◆
Shaft	stainless steel 1.4305	◆	◆	◆
Mass	approx. 397 g	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆
Moment of inertia	≤ 25 gcm <sup>2</sup>	◆	◆	◆
Starting torque	≤ 1.5 Ncm (with shaft seal) ≤ 1 Ncm (without shaft seal)	◆	◆	◆
Shaft load				
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>	◆	◆	◆
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>	◆	◆	◆

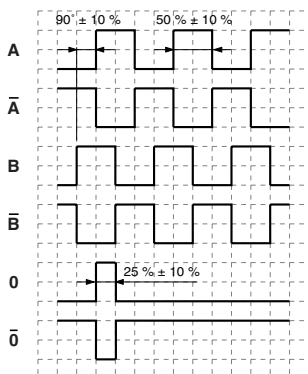
Date of edition 2008-03-20

Rotary encoders, incremental  
6.1

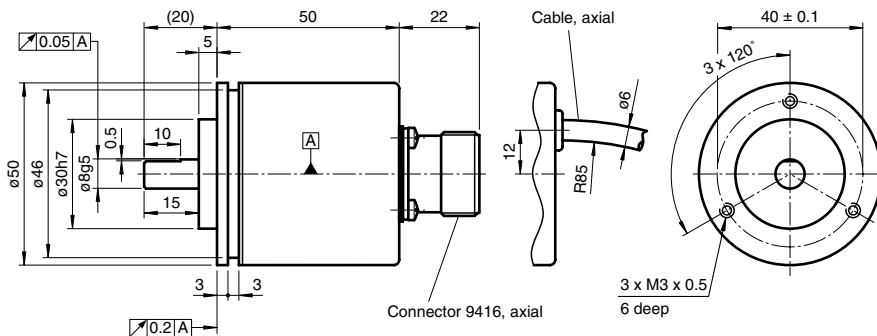


- **Sturdy and compact design**
- **Up to 2500 ppr**
- **4.75 V ... 30 V with short-circuit proof push-pull output**  
RVI50N-09B\*\*A\*T
- **5 V with RS 422 interface**  
RVI50N-09B\*\*A\*6

**Signal outputs**



↻ cw - with view onto the shaft



Clamping flange

		RVI50N-09B**A*6	RVI50N-09B**A*T
Pulse count (ppr)	max. 2500	◆	◆
Operating voltage	4.75 ... 30 V DC	◆	◆
No-load supply current	5 V DC ± 5 % max. 150 mA max. 80 mA	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof max. per channel 40 mA, short-circuit proof	◆	◆
Output frequency	max. 160 kHz	◆	◆
Connection:			
Connector	type 9416, 12-pin	◆	◆
Cable	Ø6 mm, 5 x 0.38 mm <sup>2</sup> , 0.5 m	◆	◆
Protection degree	DIN EN 60529, IP50	◆	◆
Operation temperature			
Glass disk	-20 ... 70 °C (253 ... 343 K)	◆	◆
Plastic disk	-20 ... 60 °C (253 ... 333 K)	◆	◆
Material			
Housing	aluminium, powder coated	◆	◆
Flange	aluminium 3.1645	◆	◆
Shaft	stainless steel 1.4305	◆	◆
Mass	approx. 220 g	◆	◆
Rotational speed	max. 10000 min <sup>-1</sup>	◆	◆
Moment of inertia	≤ 5 gcm <sup>2</sup>	◆	◆
Starting torque	≤ 1.5 Ncm	◆	◆
Shaft load			
Axial	30 N	◆	◆
Radial	50 N	◆	◆

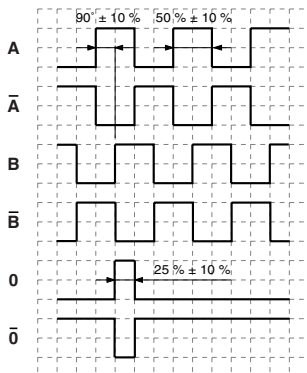
Rotary encoders, incremental

6.1

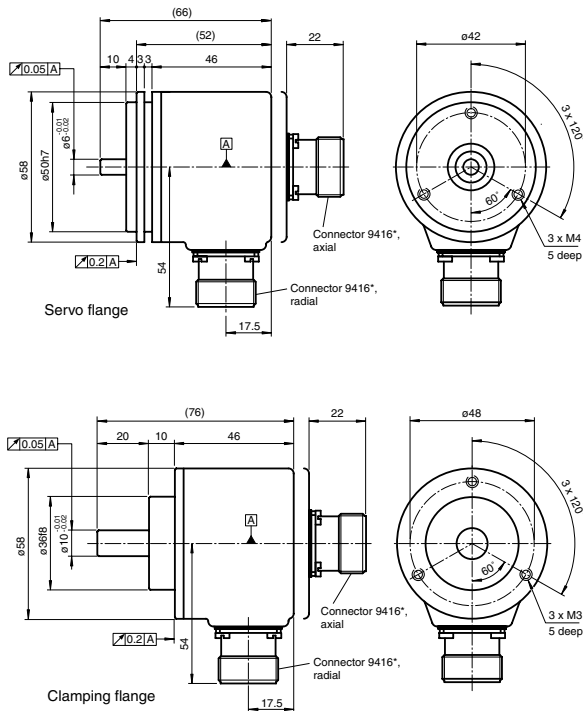


- Industrial standard housing Ø58 mm
- Up to 5000 ppr
- Servo or clamping flange
- 10 V ... 30 V with RS 422 interface  
RV158N-\*\*\*\*\*X
- 10 V ... 30 V with short-circuit proof push-pull output  
RV158N-\*\*\*\*\*1
- 5 V with RS 422 interface  
RV158N-\*\*\*\*\*6

Signal outputs



↻ cw - with view onto the shaft

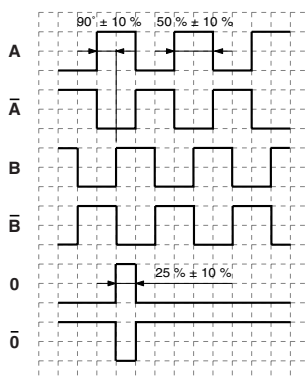


		RV158N-*****1	RV158N-*****6	RV158N-*****X
Pulse count (ppr)	max. 5000	◆	◆	◆
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %	◆	◆	◆
No-load supply current	max. 50 mA max. 60 mA max. 70 mA	◆	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ) max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected max. per channel 40 mA, short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected	◆	◆	◆
Output frequency	max. 200 kHz	◆	◆	◆
Connection				
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆	◆
Cable	Ø7.8 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆
Protection degree	DIN EN 60529, IP 65	◆	◆	◆
Operation temperature				
Glass disk	-5 ... 80 °C (268 ... 353 K), movable cable -20 ... 80 °C (253 ... 353 K), fixed cable	◆	◆	◆
Plastic disk	-5 ... 60 °C (268 ... 333 K), movable cable -20 ... 60 °C (253 ... 333 K), fixed cable	◆	◆	◆
Material				
Housing	aluminium, powder coated	◆	◆	◆
Flange	aluminium 3.1645	◆	◆	◆
Shaft	stainless steel 1.4305	◆	◆	◆
Mass	approx. 350 g	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆
Moment of inertia	≤ 25 gcm <sup>2</sup>	◆	◆	◆
Starting torque	≤ 1.5 Ncm	◆	◆	◆
Shaft load				
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>	◆	◆	◆
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>	◆	◆	◆

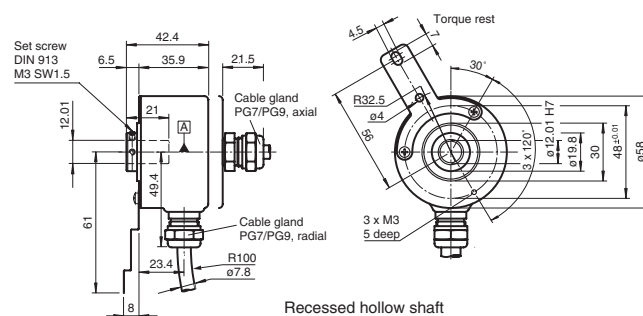
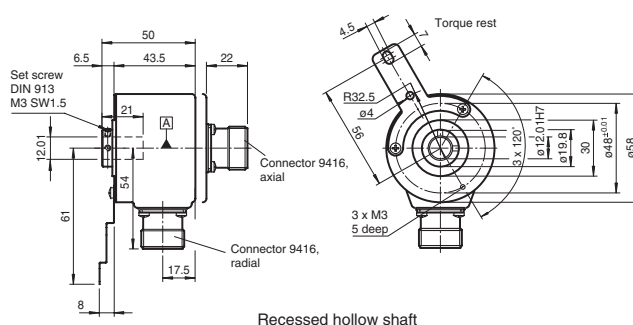


- Industrial standard housing Ø58 mm
- Up to 5000 ppr
- Recessed hollow shaft
- 10 V ... 30 V with RS 422 interface  
RSI58N-\*\*\*\*\*X
- 10 V ... 30 V with short-circuit proof push-pull output  
RSI58N-\*\*\*\*\*1
- 5 V with RS 422 interface  
RSI58N-\*\*\*\*\*6

Signal outputs



↺ cw - with view onto the shaft



		RSI58N-*****1	RSI58N-*****6	RSI58N-*****X
Pulse count (ppr)	max. 5000	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆
	5 V DC ± 5 %			
No-load supply current	max. 50 mA			◆
	max. 60 mA	◆		
	max. 70 mA		◆	
Output type	push-pull, incremental	◆		
	RS 422, incremental		◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> )		◆	
	max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected			◆
	max. per channel 40 mA, short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected	◆		
Output frequency	max. 200 kHz	◆	◆	◆
Connection				
Connector	type 9416, 12-pin	◆	◆	◆
Cable	Ø7.8 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆
Protection degree	DIN EN 60529, IP54	◆	◆	◆
Operation temperature				
Glass disk	-5 ... 80 °C (268 ... 353 K), movable cable	◆	◆	◆
	-20 ... 80 °C (253 ... 353 K), fixed cable			
Plastic disk	-5 ... 60 °C (268 ... 333 K), movable cable	◆	◆	◆
	-20 ... 60 °C (253 ... 333 K), fixed cable			
Material				
Housing	aluminum, powder coated	◆	◆	◆
Flange	aluminum 3.1645	◆	◆	◆
Shaft	stainless steel 1.4305	◆	◆	◆
Mass	approx. 280 g	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆
Moment of inertia	≤ 35 gcm <sup>2</sup>	◆	◆	◆
Starting torque	≤ 1 Nm	◆	◆	◆
Shaft load				
Angle offset	1 °	◆	◆	◆
Axial offset	max. 1 mm	◆	◆	◆

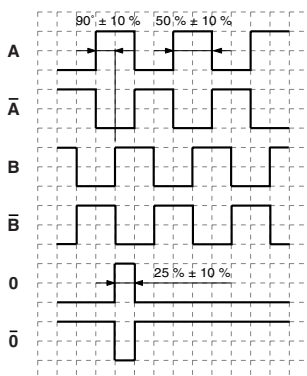
Rotary encoders, incremental

6.1

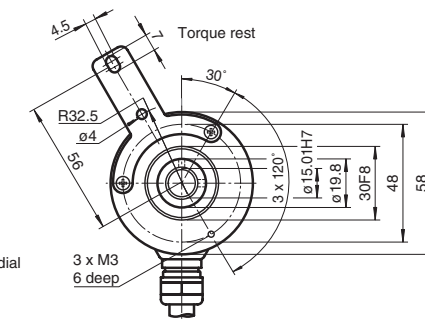
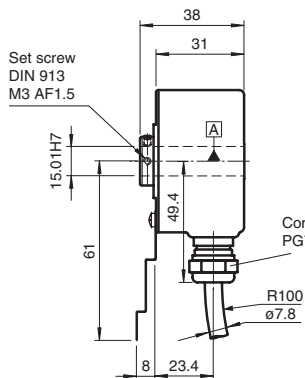


- Industrial standard housing Ø58 mm
- Up to 5000 ppr
- Hollow shaft
- 10 V ... 30 V with RS 422 interface  
RH158N-\*\*\*\*\*X
- 5 V with RS 422 interface  
RH158N-\*\*\*\*\*6
- 10 V ... 30 V with short-circuit proof push-pull output  
RH158N-\*\*\*\*\*1

Signal outputs



↻ cw - with view onto the shaft



Hollow shaft

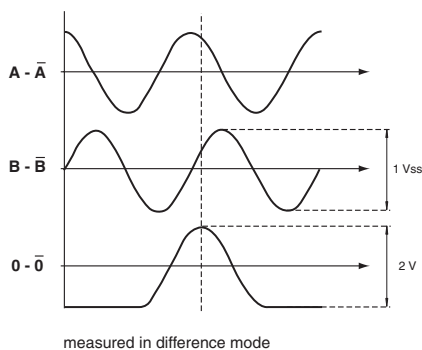
		RH158N-*****1	RH158N-*****6	RH158N-*****X
Pulse count (ppr)	max. 5000	◆	◆	◆
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %	◆	◆	◆
No-load supply current	max. 50 mA max. 60 mA max. 70 mA	◆	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆	◆
Operating current	max. per channel 20 mA , conditionally short-circuit proof (not with U <sub>b</sub> ) max. per channel 20 mA , conditionally short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected max. per channel 40 mA , short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected	◆	◆	◆
Output frequency	max. 200 kHz	◆	◆	◆
Connection	Cable Ø7.8 mm , 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆
Protection degree	DIN EN 60529, IP 54	◆	◆	◆
Operating temperature	-5 ... 80 °C (268 ... 353 K) , movable cable -20 ... 80 °C (253 ... 353 K) , fixed cable	◆	◆	◆
Material	Housing aluminium, powder coated Flange aluminium 3.1645 Shaft stainless steel 1.4305	◆	◆	◆
Mass	approx. 290 g	◆	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆	◆
Moment of inertia	≤ 40 gc m <sup>2</sup>	◆	◆	◆
Starting torque	≤ 1.5 Ncm	◆	◆	◆
Shaft load	Angle offset 1 ° Axial offset max. 1 mm	◆	◆	◆

Rotary encoders, incremental  
6.1

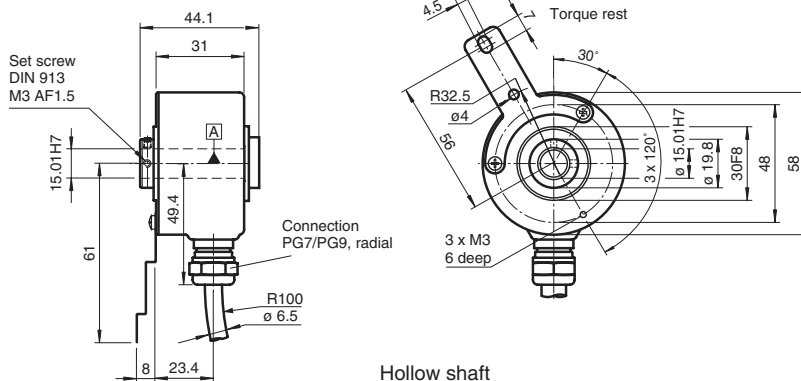


- Incremental encoder with sin/cos interface
- 1024 or 2048 signal periods
- Industrial standard housing Ø58 mm
- Hollow shaft up to 15 mm
- Temperature compensated, interpolatable voltage signals

**Signal outputs**



↻ cw - flange view



Pulse count (ppr)	max. 2048	◆	RHS58N-...Z
Operating voltage	5 V DC ± 5 % , Reverse polarity protection	◆	
No-load supply current	max. 70 mA	◆	
Output type	sinus / cosinus	◆	
Operating current	max. per channel 20 mA , short-circuit proof, reverse polarity protected	◆	
Output frequency	max. 200 kHz (3 dB limit)	◆	
Connection			
Cable	Ø6.5 mm, 4 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	
Protection degree	DIN EN 60529, IP54	◆	
Operating temperature	-5 ... 80 °C (268 ... 353 K) , movable cable -20 ... 80 °C (253 ... 353 K), fixed cable	◆	
Material			
Housing	aluminium, powder coated	◆	
Flange	aluminium 3.1645	◆	
Shaft	stainless steel 1.4305	◆	
Mass	approx. 290 g	◆	
Rotational speed	max. 6000 min <sup>-1</sup>	◆	
Moment of inertia	≤ 40 gcm <sup>2</sup>	◆	
Starting torque	≤ 2.5 Ncm	◆	
Shaft load			
Angle offset	1 °	◆	
Axial offset	max. 1 mm	◆	

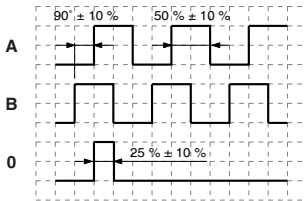
Rotary encoders, incremental

6.1

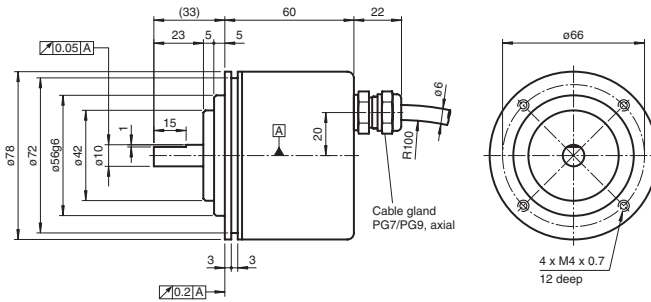
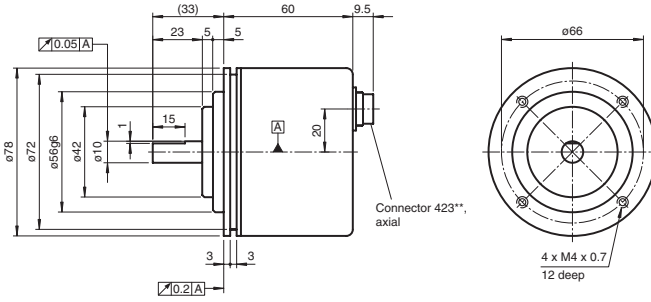


- Sturdy design
- Up to 5000 ppr
- 10 V ... 30 V with short-circuit proof push-pull output

Signal outputs



cw - with view onto the shaft



Pulse count (ppr)	max. 5000	◆	RV178
Operating voltage	10 ... 30 V DC	◆	
No-load supply current	max. 80 mA	◆	
Output type	push-pull, incremental	◆	
Operating current	max. per channel 40 mA, short-circuit proof, reverse polarity protected	◆	
Output frequency	max. 100 kHz	◆	
Connection			
Connector	type 42306, 6-pin	◆	
Cable	Ø6 mm, 5 x 0.38 mm <sup>2</sup> , 2 m	◆	
Protection degree	DIN EN 60529, IP 65	◆	
Operation temperature			
Glass disk	-20 ... 70 °C (253 ... 343 K)	◆	
Plastic disk	-20 ... 60 °C (253 ... 333 K)	◆	
Material			
Housing	aluminium, powder coated	◆	
Flange	aluminium 3.1645	◆	
Shaft	stainless steel 1.4305	◆	
Mass	approx. 630 g	◆	
Rotational speed	max. 6000 min <sup>-1</sup>	◆	
Moment of inertia	100 gcm <sup>2</sup>	◆	
Starting torque	≤ 1.5 Ncm	◆	
Shaft load			
Axial	50 N	◆	
Radial	100 N	◆	

Rotary encoders, incremental

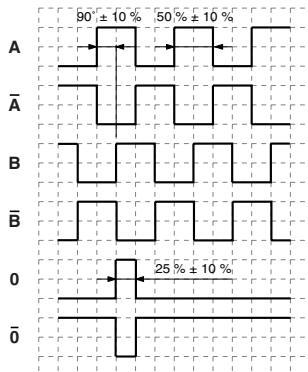
6.1



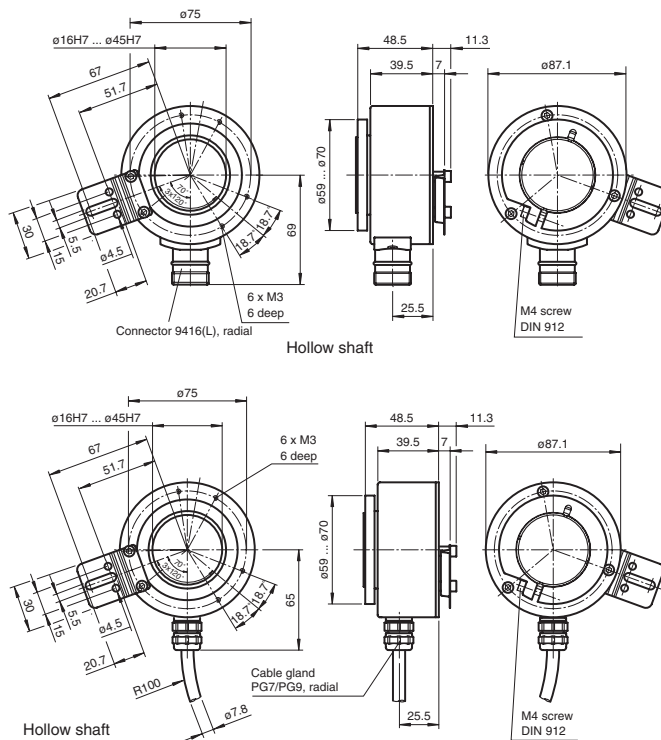


- Compact design housing Ø90 mm
- Variable hollow shaft from Ø16 mm ... Ø45 mm
- Up to 2500 ppr
- Carefully shaft clamping
- Loadable metal disk
- 5 V with RS 422 interface  
RHI90N-\*\*\*\*\*6
- 10 V ... 30 V with short-circuit proof push-pull output  
RHI90N-\*\*\*\*\*1

**Signal outputs**



↻ cw - with view onto the shaft clamping ring



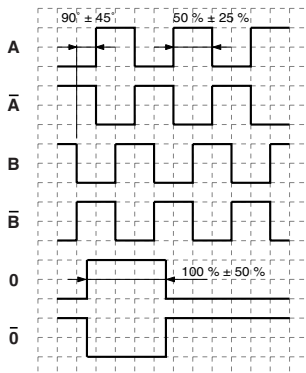
Pulse count (ppr)	max. 2500	◆	RHI90N-*****1	◆	RHI90N-*****6
Operating voltage	10 ... 30 V DC	◆		◆	
No-load supply current	5 V DC ± 5 %	◆		◆	
Output type	max. 70 mA	◆		◆	
Output type	push-pull, incremental	◆		◆	
Operating current	RS 422, incremental	◆		◆	
Operating current	max. per channel 20 mA , short-circuit proof	◆		◆	
Output frequency	max. per channel 40 mA , short-circuit proof, reverse polarity protected	◆		◆	
Output frequency	max. 120 kHz	◆		◆	
Connection		◆		◆	
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆		◆	
Cable	Ø7.8 mm, 4 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆		◆	
Protection degree	DIN EN 60529, IP65	◆		◆	
Operating temperature	-20 ... 70 °C (253 ... 343 K)	◆		◆	
Material		◆		◆	
Housing	aluminium, blank	◆		◆	
Flange	aluminium 3.1645	◆		◆	
Shaft	stainless steel 1.4305	◆		◆	
Mass	approx. 900 g	◆		◆	
Rotational speed	max. 3500 min <sup>-1</sup>	◆		◆	
Starting torque	≤ 6 Ncm	◆		◆	
Shaft load		◆		◆	
Angle offset	1 °	◆		◆	
Axial offset	max. 1 mm	◆		◆	



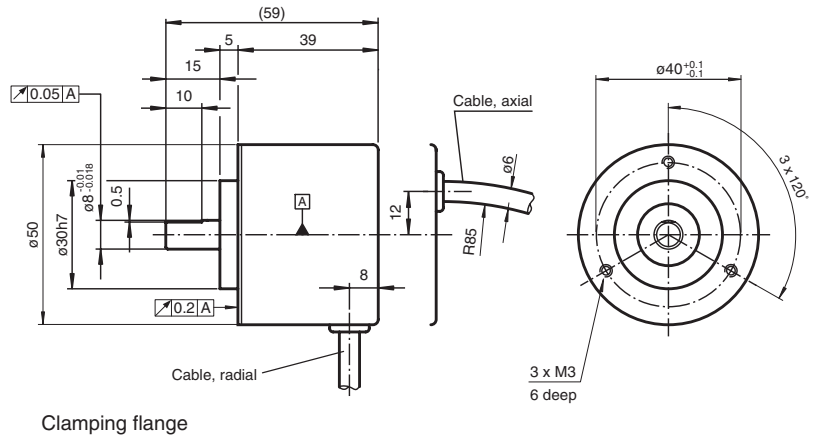


- Sturdy and compact design
- Up to 1024 ppr
- 4.75 V ... 30 V with short-circuit proof push-pull output
- RS 422 functionality at 5 V operation
- Loadable metal disk

Signal outputs



↻ cw - with view onto the shaft



Clamping flange

		TVI50N-09BK0..T
Pulse count (ppr)	max. 1024	◆
Operating voltage	4.75 ... 30 V DC	◆
	5 V DC for RS 422	◆
No-load supply current	max. 55 mA	◆
Output type	push-pull, incremental (RS 422, incremental)	◆
Operating current	max. per channel 30 mA, short-circuit proof (max. per channel 20 mA, conditionally short-circuit proof)	◆
Output frequency	max. 100 kHz (max. 100 kHz)	◆
Connection		
Cable	Ø6 mm, 8 x 0.128 mm <sup>2</sup> , 0.5 m	◆
Protection degree	DIN EN 60529, IP40, IP54	◆
Operation temperature	-10 ... 70 °C (263 ... 343 K)	◆
Material		
Housing	aluminium, blank	◆
Flange	aluminium 3.1645	◆
Shaft	stainless steel 1.4305	◆
Mass	approx. 220 g	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆
Moment of inertia	≤ 5 gcm <sup>2</sup>	◆
Starting torque	≤ 0.5 Ncm	◆
Shaft load		
Axial	20 N	◆
Radial	40 N	◆

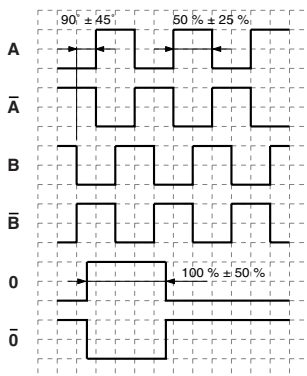
Rotary encoders, incremental

6.1



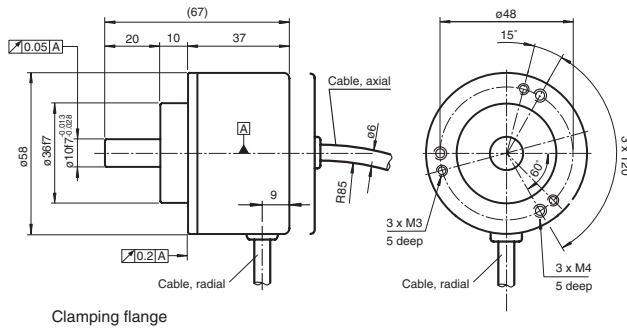
- Sturdy and compact design
  - Up to 1500 ppr
  - 4.75 V ... 30 V with short-circuit proof push-pull output
  - RS 422 functionality at 5 V operation
  - Loadable metal disk
  - Hollow shaft
- THI58N

Signal outputs



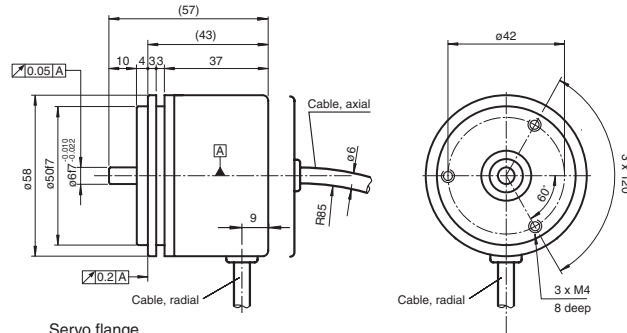
↺ cw - with view onto the shaft

TVI58N



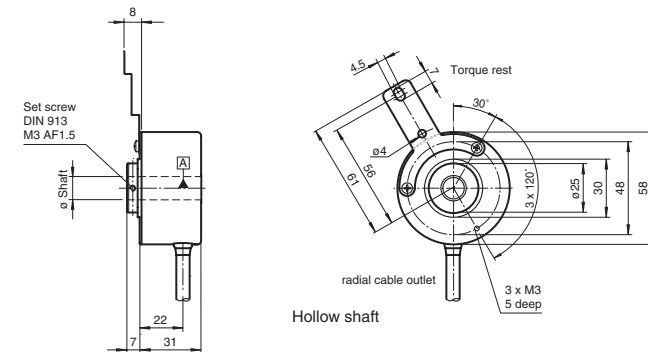
Clamping flange

TVI58N



Servo flange

TVI58N



Hollow shaft

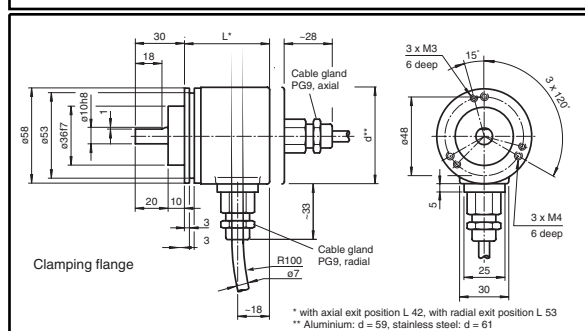
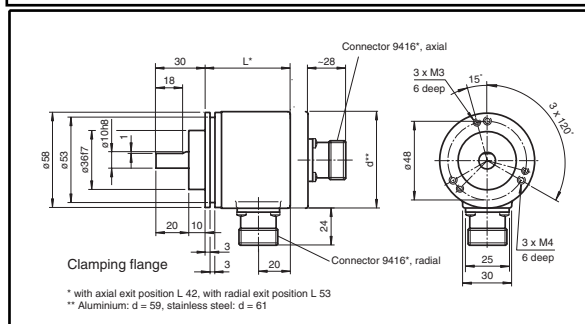
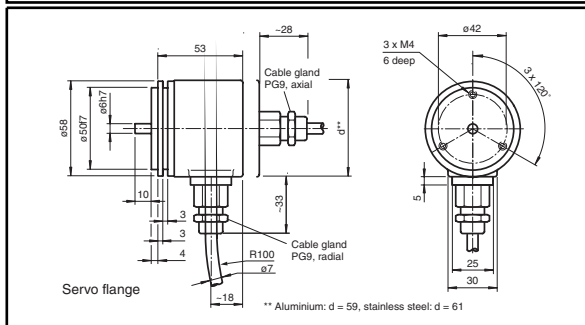
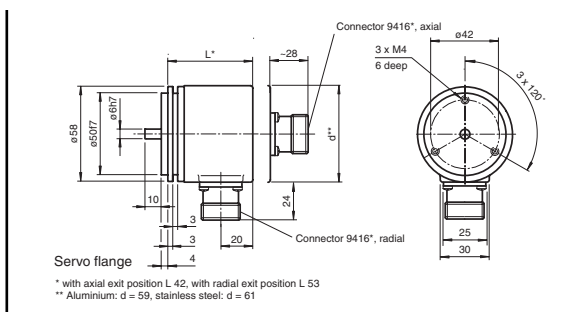
		TVI58N	THI58N
Pulse count (ppr)	max. 1500	◆	◆
Operating voltage	4.75 ... 30 V DC 5 V DC for RS 422	◆	◆
No-load supply current	max. 55 mA	◆	◆
Output type	push-pull, incremental (RS 422, incremental)	◆	◆
Operating current	max. per channel 30 mA, short-circuit proof (max. per channel 20 mA, conditionally short-circuit proof)	◆	◆
Output frequency	max. 100 kHz (max. 100 kHz)	◆	◆
Connection			
Cable	Ø6 mm, 8 x 0.14 mm <sup>2</sup> , 0.5 m, UL-Style 2571	◆	◆
Protection degree	DIN EN 60529, IP 54	◆	◆
Operation temperature	-10 ... 70 °C (263 ... 343 K)	◆	◆
Material			
Housing	aluminium, blank	◆	◆
Flange	aluminium 3.1645	◆	◆
Shaft	stainless steel 1.4305	◆	◆
Mass	approx. 220 g approx. 290 g	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆
Moment of inertia	≤ 20 gc m <sup>2</sup> ≤ 40 gc m <sup>2</sup>	◆	◆
Starting torque	≤ 0.5 Nc m ≤ 2.5 Nc m	◆	◆
Shaft load			
Axial	20 N	◆	◆
Radial	40 N	◆	◆
Angle offset	1 °	◆	◆
Axial offset	max. 1 mm	◆	◆

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Rotary encoders, incremental  
6.1



- Industrial standard housing Ø58 mm
- Data transmission up to 2 MBaud
- Optically isolated RS 422 interface
- Servo or clamping flange
- 30 Bit multiturn  
AVM58-0  
AVM58-H
- 16 Bit singleturn  
AVS58-0  
AVS58-H
- Hardware encoder  
AVS58-H  
AVM58-H
- Zero-set function  
AVS58-0  
AVM58-0



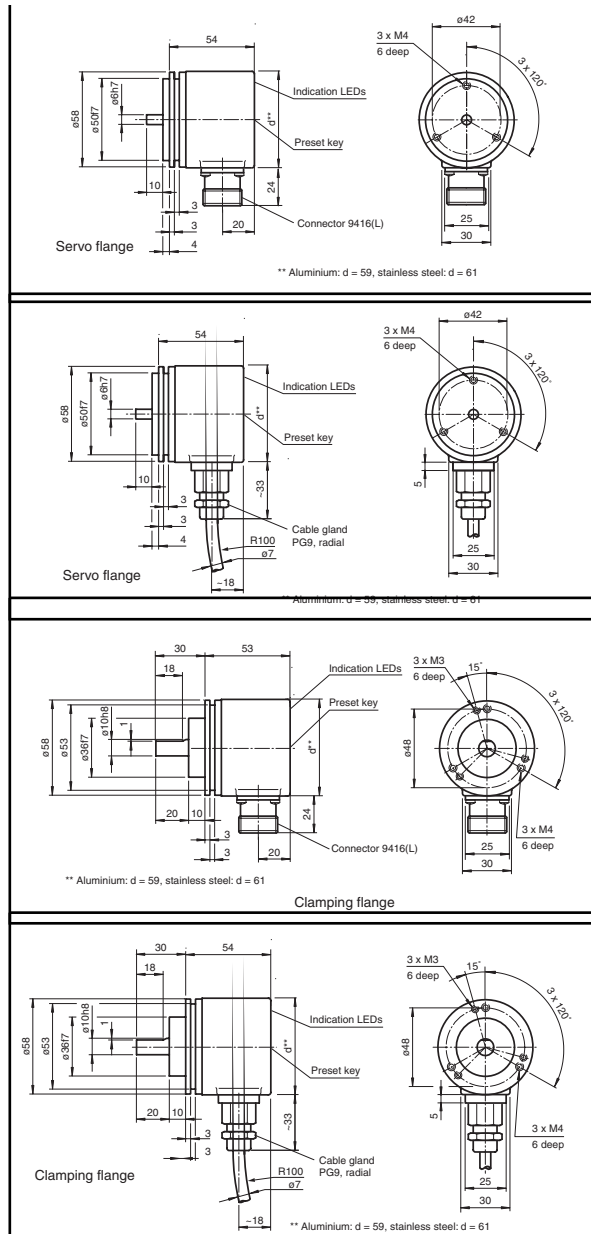
Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		AVS58-0	AVS58-H	AVM58-0	AVM58-H
Resolution					
Singleturn	up to 16 Bit	◆	◆	◆	◆
Multiturn	14 Bit			◆	◆
Overall resolution	up to 16 Bit	◆	◆		
	up to 30 Bit			◆	◆
Interface type	SSI	◆	◆	◆	◆
Transferrate	0.1 ... 2 MBit/s	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	max. 180 mA	◆	◆	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆	◆	◆
Output code	Gray code, binary code	◆	◆	◆	◆
Input type	selection of counting direction (V/R)	◆	◆	◆	◆
Input type	zero-set (PRESET 1)	◆	◆	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆
Connection					
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆	◆	◆
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP65	◆	◆	◆	◆
Material					
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆	◆	◆
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)	◆	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆	◆

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- Industrial standard housing Ø58 mm
- Data transmission up to 2 MBaud
- Optically isolated RS 422 interface
- Servo or clamping flange
- Zero-set function electrically and by preset key
- 30 Bit multiturn  
AVM58-K
- 16 Bit singleturn  
AVS58-K



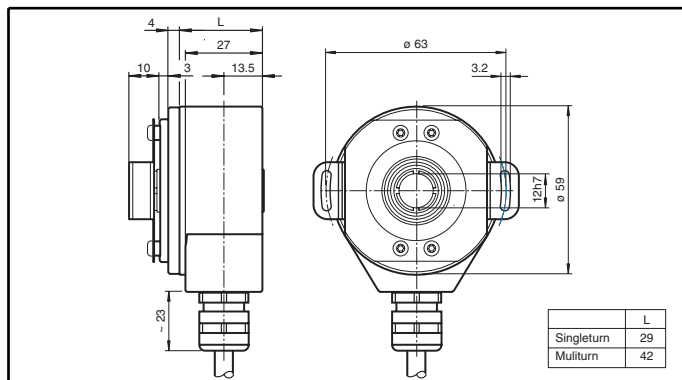
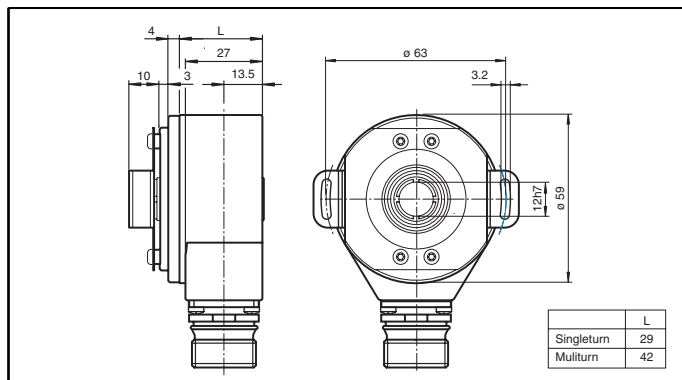
Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		AVS58-K	AVM58-K
Resolution			
Singleturn	up to 16 Bit	◆	◆
Multiturn	14 Bit		◆
Overall resolution	up to 16 Bit up to 30 Bit	◆	◆
Interface type	SSI	◆	◆
Transfer rate	0.1 ... 2 MBit/s	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
Power consumption	≤ 1 W	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0.5 LSB at 12 Bit	◆	◆
Output code	Gray code, binary code	◆	◆
Operating elements	preset key	◆	◆
LED green	supply voltage/preset key pressed	◆	◆
LED red	internal diagnostic test failed	◆	◆
Input type	selection of counting direction (V/R)	◆	◆
Input type	zero-set (PRESET 1)	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆
Connection			
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆
Protection degree	DIN EN 60529, IP 65	◆	◆
Material			
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆

Date of edition 2008-03-20



- Industrial standard housing Ø58 mm
- Data transmission up to 2 MBaud
- Optically isolated RS 422 interface
- Hollow shaft
- 30 Bit multiturn  
AHM58-0  
AHM58-H
- 16 Bit singleturn  
AHS58-0  
AHS58-H
- Hardware encoder  
AHS58-H  
AHM58-H
- Zero-set function  
AHS58-0  
AHM58-0



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

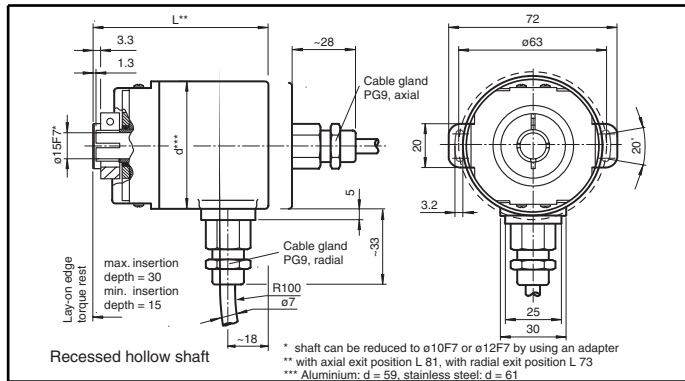
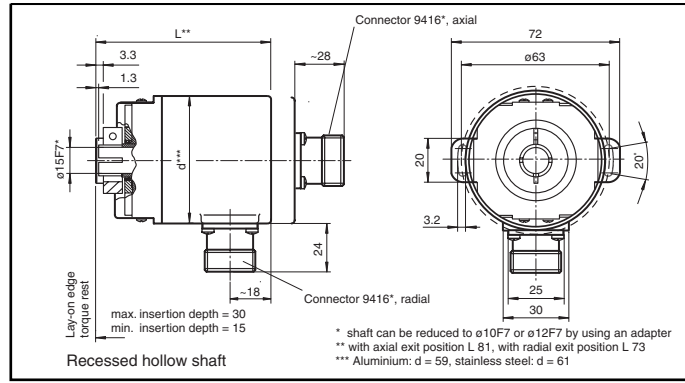
		AHS58-0	AHS58-H	AHM58-0	AHM58-H
Resolution					
Singleturn	up to 16 Bit	◆	◆	◆	◆
Multiturn	14 Bit	◆	◆	◆	◆
Overall resolution	up to 16 Bit	◆	◆	◆	◆
	up to 30 Bit			◆	◆
Interface type	SSI	◆	◆	◆	◆
Transferrate	0.1 ... 2 MBit/s	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	max. 180 mA	◆	◆	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆	◆	◆
Output code	Gray code, binary code	◆	◆	◆	◆
Input type	selection of counting direction (V/R)	◆	◆	◆	◆
Input type	zero-set (PRESET 1)	◆	◆	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆
Connection					
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆	◆	◆
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP64	◆	◆	◆	◆
Material	Housing: aluminium Flange: aluminium Shaft stainless steel	◆	◆	◆	◆
Mass	approx. 300 g (combination 1)	◆	◆	◆	◆
Rotational speed	max. 3000 min <sup>-1</sup>	◆	◆	◆	◆

Rotary encoders, absolute

6.2



- Industrial standard housing Ø58 mm
- Data transmission up to 2 Mbaud
- Optically isolated RS 422 interface
- Recessed hollow shaft
- 30 Bit multiturn
  - ASM58-0
  - ASM58-H
- 16 Bit singleturn
  - ASS58-0
  - ASS58-H
- Hardware encoder
  - ASS58-H
  - ASM58-H
- Zero-set function
  - ASS58-0
  - ASM58-0



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		ASS 58-0	ASS 58-H	ASM 58-0	ASM 58-H
Resolution					
Singleturn	up to 16 Bit	◆	◆	◆	◆
Multiturn	14 Bit			◆	◆
Overall resolution	up to 16 Bit up to 30 Bit	◆	◆	◆	◆
Interface type	SSI	◆	◆	◆	◆
Transfer rate	0.1 ... 2 MBit/s	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
No-load supply current	max. 180 mA	◆	◆	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆	◆	◆
Output code	Gray code, binary code	◆	◆	◆	◆
Input type	selection of counting direction (V/R)	◆	◆	◆	◆
Input type	zero-set (PRESET 1)	◆	◆	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆
Connection					
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆	◆	◆
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP 65	◆	◆	◆	◆
Material					
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆	◆	◆
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)	◆	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆	◆

Rotary encoders, absolute

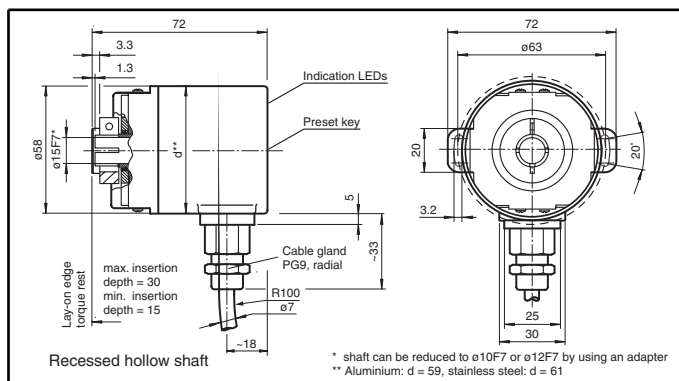
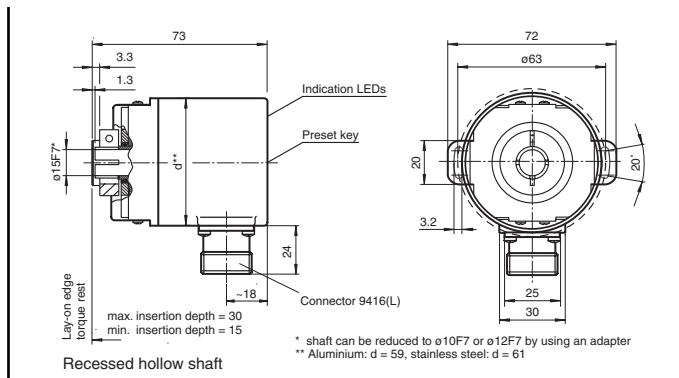
6.2

Date of edition 2008-03-20





- Industrial standard housing Ø58 mm
- Data transmission up to 2 MBaud
- Optically isolated RS 422 interface
- Recessed hollow shaft
- Zero-set function electrically and by preset key
- 16 Bit singleturn  
ASS58-K
- 30 Bit multiturn  
ASM58-K

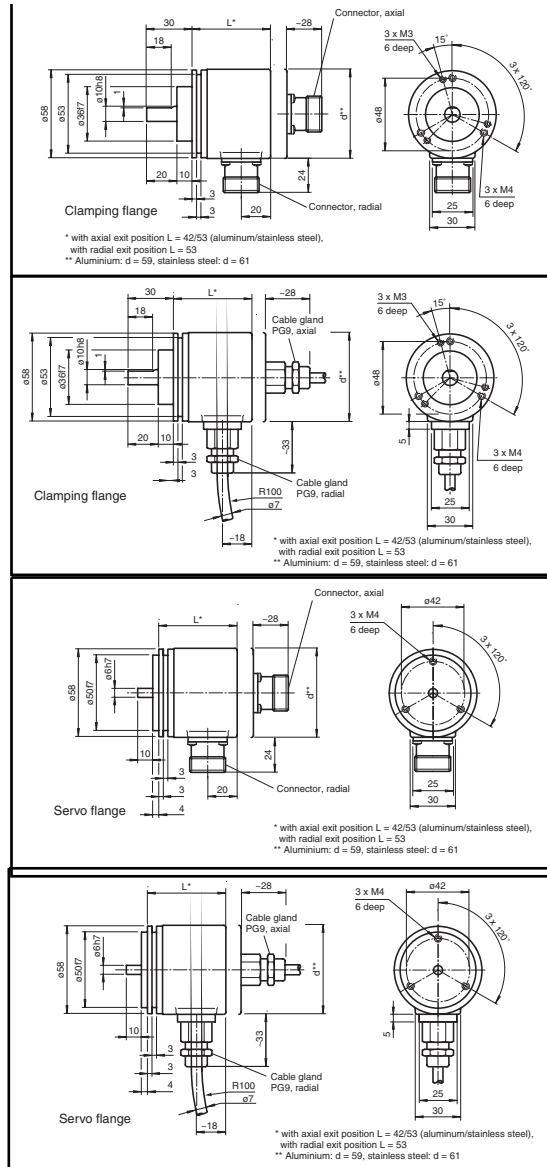


Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		ASS58-K	ASM58-K
Resolution			
Singleturn	up to 16 Bit	◆	◆
Multiturn	14 Bit	◆	◆
Overall resolution	up to 16 Bit	◆	◆
	up to 30 Bit		◆
Interface type	SSI	◆	◆
Transfer rate	0.1 ... 2 MBit/s	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
Power consumption	≤ 1 W	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆
Output code	Gray code, binary code	◆	◆
Operating elements	preset key	◆	◆
LED green	supply voltage/preset key pressed	◆	◆
LED red	internal diagnostic test failed	◆	◆
Input type	selection of counting direction (V/R)	◆	◆
Input type	zero-set (PRESET 1)	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆
Connection			
Connector	type 9416, 12-pin, type 9416L, 12-pin	◆	◆
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m	◆	◆
Protection degree	DIN EN 60529, IP65	◆	◆
Material			
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆



- Industrial standard housing Ø58 mm
- Output code: Gray and binary
- Short-circuit proof push-pull output
- Inputs for selection of counting direction, LATCH and PRESET
- Code change frequency up to 400 kHz
- Servo or clamping flange
- 13 Bit singleturn
- FVS58
- 25 Bit multiturn
- FVM58



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		FVS58	FVM58
Resolution			
Singleturn	13 Bit	◆	
Multiturn	25 Bit		◆
Interface type	push-pull, parallel, short-circuit proof	◆	◆
Code change frequency	400 kHz	◆	◆
Operating current	20 mA	◆	◆
	40 mA	◆	
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	max. 140 mA	◆	◆
Power consumption	≤ 2 W, without output drivers	◆	
	≤ 2.5 W, without output drivers		◆
Linearity	± 0.5 LSB	◆	◆
Output code	Gray code, binary code	◆	◆
	Gray code, binary code and Gray excess code	◆	
Input type	selection of counting direction (V/R)	◆	◆
Input type	temporary storage (LATCH)	◆	◆
Input type	zero-set (PRESET)	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆
	cable models:		
	-30 ... 70 °C (rigid wiring) / -5 ... 70 °C (flexible wiring)		
Connection			
Connector	type 9424, 19-pin	◆	
	type 9426, 26-pin		◆
Cable	Ø9 mm, 12 x 2 x 0.14 mm <sup>2</sup> , 2 m	◆	
	Ø9 mm, 15 x 2 x 0.14 mm <sup>2</sup> , 2 m		◆
Protection degree	DIN EN 60529, IP 65	◆	◆
Material			
Combination 1	housing: aluminium, powder coated flange: aluminium, shaft: stainless steel	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel, shaft: stainless steel	◆	◆
Mass			
	approx. 200 g (combination 1)	◆	
	approx. 400 g (combination 2)		◆
	approx. 400 g (combination 1)		◆
	approx. 800 g (combination 2)		◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆

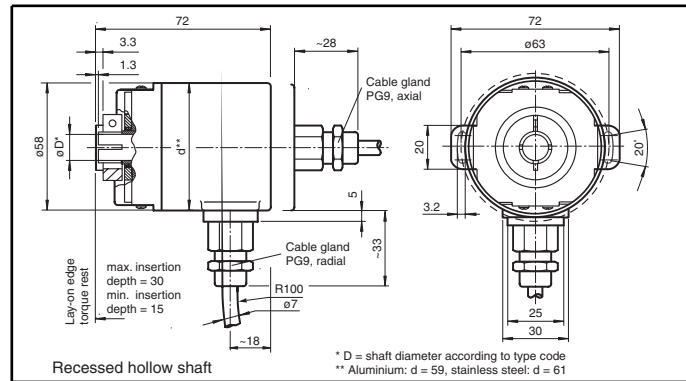
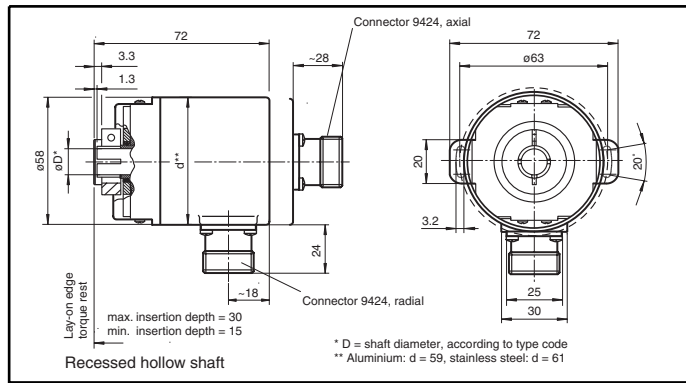
Date of edition 2008-03-20

Rotary encoders, absolute

6.2



- Industrial standard housing Ø58 mm
- Output code: Gray and binary
- Short-circuit proof push-pull output
- Inputs for selection of counting direction, LATCH and PRESET
- Code change frequency up to 400 kHz
- Recessed hollow shaft
- 13 Bit singleturn  
FSS58
- 25 Bit multiturn  
FSM58

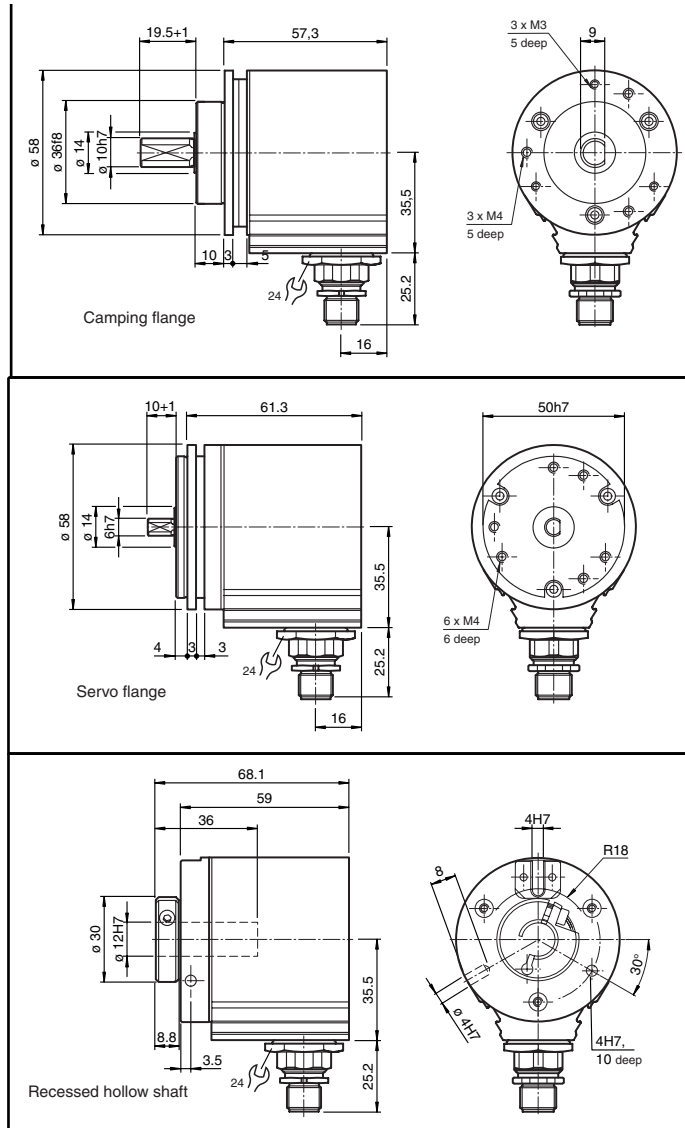


Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		FSS58	FSM58
Resolution			
Singleturn	13 Bit	◆	
Multiturn	25 Bit		◆
Interface type	push-pull, parallel, short-circuit proof	◆	◆
Code change frequency	400 kHz	◆	◆
Operating current	20 mA	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	max. 140 mA	◆	◆
Power consumption	≤ 2 W, without output drivers	◆	
	≤ 2.5 W, without output drivers		◆
Linearity	± 0.5 LSB	◆	◆
Output code	Gray code, binary code	◆	◆
	Gray code, binary code and Gray excess code	◆	
Input type	selection of counting direction (V/R)	◆	◆
Input type	temporary storage (LATCH)	◆	◆
Input type	zero-set (PRESET)	◆	◆
Operating temperature	-40 ... 85 °C (233 ... 358 K)	◆	◆
	cable models:		
	-30 ... 70 °C (rigid wiring)		
	-5 ... 70 °C (flexible wiring)		
Connection			
Connector	type 9424, 19-pin	◆	
	type 9426, 26-pin		◆
Cable	Ø9 mm, 12 x 2 x 0.14 mm <sup>2</sup> , 2 m	◆	
	Ø9 mm, 15 x 2 x 0.14 mm <sup>2</sup> , 2 m		◆
Protection degree	DIN EN 60529, IP65	◆	◆
Material			
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆
Mass			
	approx. 200 g (combination 1)	◆	
	approx. 400 g (combination 2)		◆
	approx. 400 g (combination 1)		◆
	approx. 800 g (combination 2)		◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆



- Industrial standard housing Ø58 mm
- Output code: Gray and binary
- Transfer of position data with 4 AS-Interface slaves
- Parameterisation and addressing via AS-Interface
- 13 Bit singleturn  
BVS58  
BSS58
- 16 Bit multiturn  
BVM58  
BSM58
- Recessed hollow shaft  
BSS58  
BSM58
- Servo or clamping flange  
BVS58  
BVM58



		BV 58	BS 58	BVM 58	BSM 58
Resolution					
Singleturn	max. 13 Bit			◆	◆
Multiturn	13 Bit	◆	◆		
Multiturn	max. 12 Bit			◆	◆
Overall resolution	16 Bit			◆	◆
Interface type	AS-Interface	◆	◆	◆	◆
Transfer rate	max. 0.167 MBit/s	◆	◆	◆	◆
Operating voltage	29.5 ... 31.6 V DC	◆	◆	◆	◆
No-load supply current	max. starting current 155 mA , operational current max. 85 mA	◆	◆	◆	◆
Linearity	± 1 LSB	◆	◆	◆	◆
Output code	parameterisable, Gray code, binary code	◆	◆	◆	◆
Operating temperature	-20 ... 70 °C (253 ... 343 K)	◆	◆	◆	◆
Connector	type V1, M12, 4-pin	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP 65	◆	◆	◆	◆
Material					
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆	◆	◆
Mass	approx. 330 g (combination 1) approx. 750 g (combination 2)	◆	◆		
	approx. 360 g (combination 1) approx. 800 g (combination 2)			◆	◆
Rotational speed	max. 10000 min <sup>-1</sup>	◆	◆		
	max. 6000 min <sup>-1</sup>			◆	◆

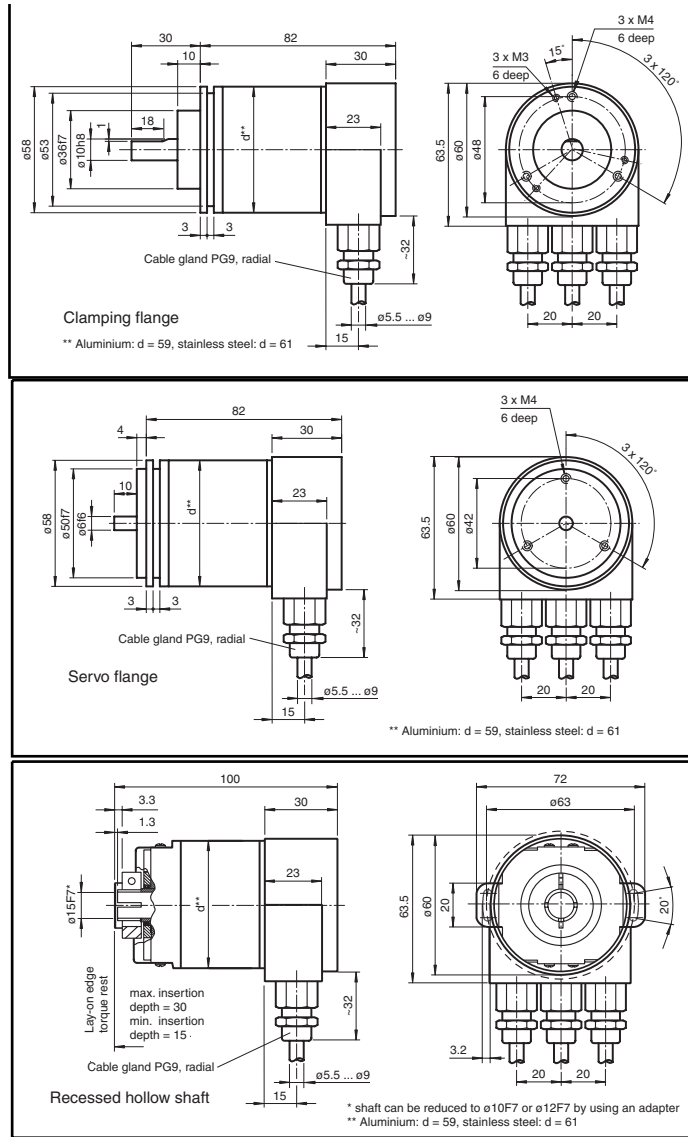
Date of edition 2008-03-20

Rotary encoders, absolute

6.2



- Industrial standard housing Ø58 mm
- Galvanically isolated CAN interface
- DSP 406, CLASS 1 and 2
- Cam function
- 2 limit switches
- 16 Bit singleturn  
CVS58  
CSS58
- 30 Bit multiturn  
CVM58  
CSM58
- Recessed hollow shaft  
CSS58  
CSM58
- Servo or clamping flange  
CVS58  
CVM58



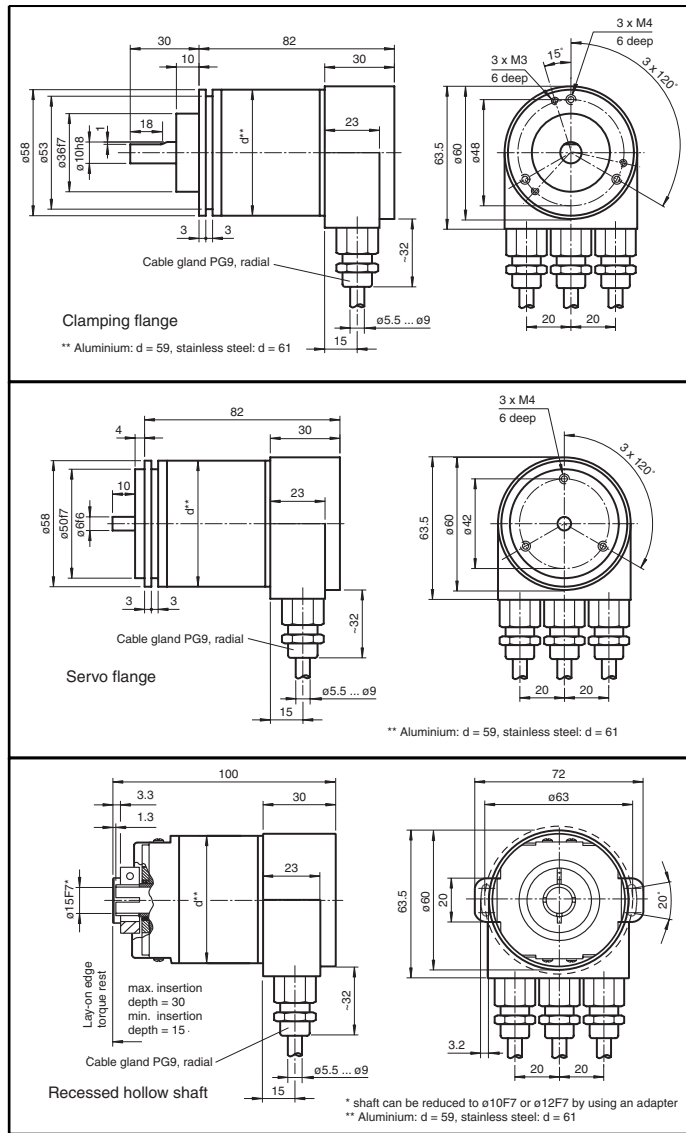
Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		CVS58	CSS58	CVM58	CSM58
Resolution	Singleturn	up to 16 Bit	◆	◆	◆
	Multiturn	14 Bit		◆	◆
Overall resolution		up to 16 Bit	◆	◆	◆
		up to 30 Bit		◆	◆
Interface type		CANopen	◆	◆	◆
Transfer rate		max. 1 MBit/s	◆	◆	◆
Operating voltage		10 ... 30 V DC	◆	◆	◆
No-load supply current		max. 230 mA at 10 V DC		◆	◆
		max. 100 mA at 24 V DC		◆	◆
		max. 350 mA	◆		◆
Linearity		$\pm 2$ LSB at 16 Bit, $\pm 1$ LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit	◆	◆	◆
Output code		binary code	◆	◆	◆
Operating temperature		-40 ... 85 °C (233 ... 358 K)	◆	◆	◆
Terminal compartment		in removable housing cover	◆	◆	◆
Protection degree		DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	◆	◆	◆
Material	Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆
	Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel		◆	◆
Mass		approx. 550 g (combination 1)	◆		
		approx. 1000 g (combination 2)			
		approx. 550 g (combination 1)		◆	
		approx. 1100 g (combination 2)			
		approx. 600 g (combination 1)			◆
		approx. 1200 g (combination 2)			
		approx. 700 g (combination 1)		◆	
		approx. 1200 g (combination 2)			
Rotational speed		max. 12000 min <sup>-1</sup>	◆	◆	◆

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- Industrial standard housing Ø58 mm
- Galvanically isolated DeviceNet interface
- 16 Bit singleturn  
DVS58  
DSS58
- 30 Bit multiturn  
DVM58  
DSM58
- Recessed hollow shaft  
DSS58  
DSM58
- Servo or clamping flange  
DVS58  
DVM58



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		DVS58	DSS58	DVM58	DSM58
Resolution	Singleturn	up to 16 Bit	◆	◆	◆
	Multiturn	14 Bit			◆
Overall resolution		up to 16 Bit	◆	◆	◆
		up to 30 Bit			◆
Interface type		DeviceNet	◆	◆	◆
Transfer rate		max. 0.5 MB it/s	◆	◆	◆
Operating voltage		10 ... 30 V DC	◆	◆	◆
No-load supply current		max. 230 mA at 10 V DC	◆	◆	◆
		max. 100 mA at 24 V DC			◆
		max. 350 mA			◆
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0.5 LSB at 12 Bit	◆	◆	◆
Output code		binary code	◆	◆	◆
Operating temperature		-40 ... 85 °C (233 ... 358 K)	◆	◆	◆
Terminal compartment		in removable housing cover	◆	◆	◆
Protection degree		DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	◆	◆	◆
Material	Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆
	Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆	◆
	Mass	approx. 550 g (combination 1) approx. 1000 g (combination 2)	◆		
Rotational speed		approx. 550 g (combination 1) approx. 1100 g (combination 2)		◆	
		approx. 600 g (combination 1) approx. 1200 g (combination 2)			◆
		approx. 700 g (combination 1) approx. 1200 g (combination 2)			◆
		max. 12000 min <sup>-1</sup>	◆	◆	◆

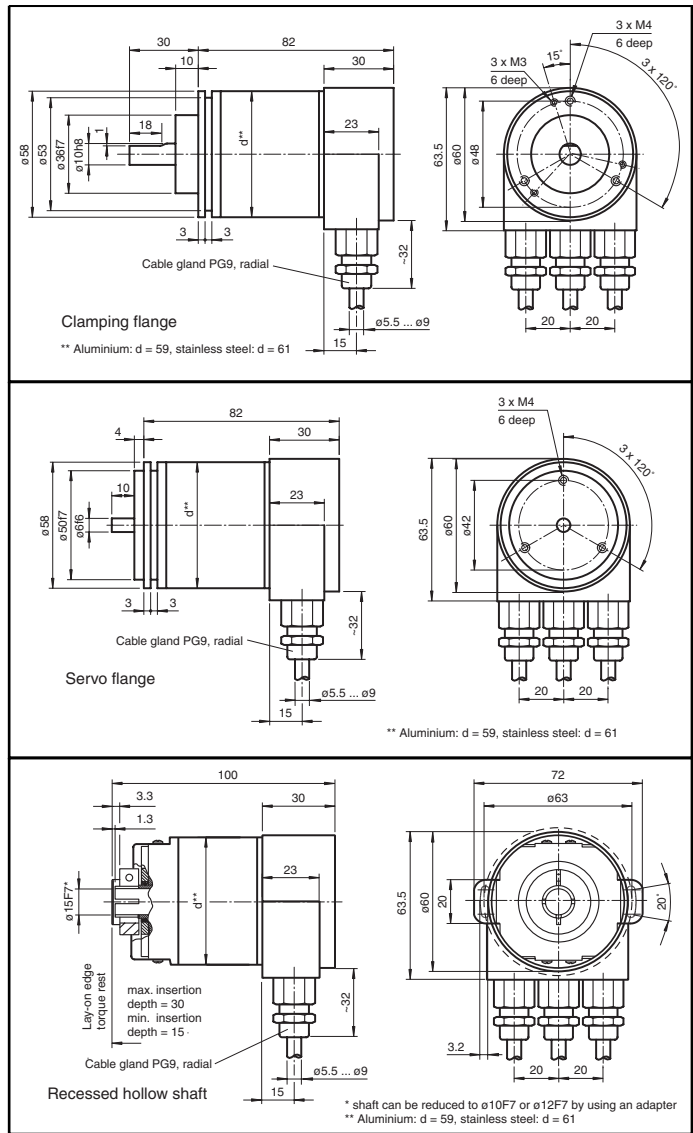
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Rotary encoders, absolute

6.2

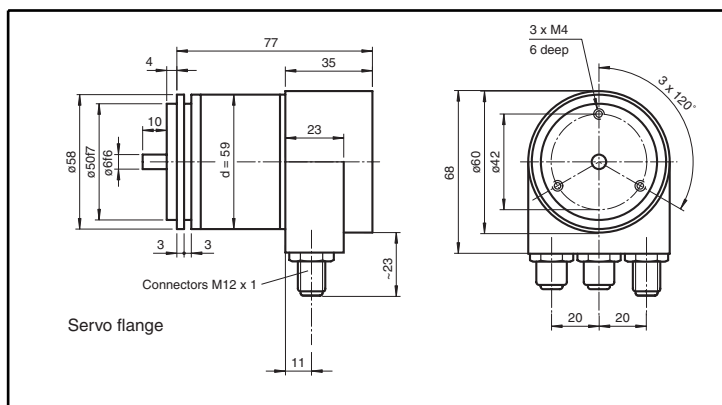
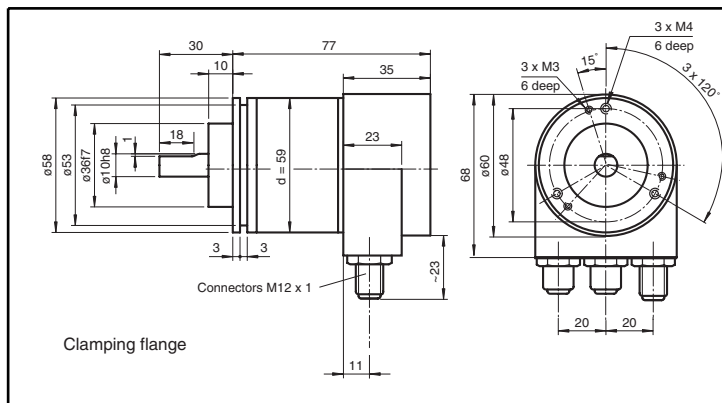


- Industrial standard housing Ø58 mm
- PROFIBUS interface
- Speed transfer
- Extended scaling functions
- Programmable limit switches
- Commissioning mode
- 16 Bit singleturn  
PVS58  
PSS58
- 30 Bit multiturn  
PVM58  
PSM58
- Recessed hollow shaft  
PSS58  
PSM58
- Servo or clamping flange  
PVS58  
PVM58



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		PVS58	PSS58	PVM58	PSM58
<b>Resolution</b>					
Singleturn	up to 16 Bit	◆	◆	◆	◆
Multiturn	14 Bit			◆	◆
<b>Overall resolution</b>	up to 16 Bit	◆	◆		
	up to 30 Bit			◆	◆
<b>Interface type</b>	PROFIBUS	◆	◆	◆	◆
<b>Transferrate</b>	0.0096 ... 12 Mbit/s	◆	◆	◆	◆
<b>Operating voltage</b>	10 ... 30 V DC	◆	◆	◆	◆
<b>Current consumption</b>	max. 230 mA at 10 V DC, max. 100 mA at 24 V DC	◆	◆	◆	◆
<b>Power consumption</b>	max. 2.5 W	◆	◆	◆	◆
<b>Linearity</b>	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆	◆	◆
<b>Output code</b>	binary code	◆	◆	◆	◆
<b>Operating temperature</b>	-40 ... 85 °C (233 ... 358 K)	◆	◆	◆	◆
<b>Terminal compartment</b>	in removable housing cover	◆	◆	◆	◆
<b>Protection degree</b>	DIN EN 60529, shaft side: IP64 (without shaft seal) / IP66 (with shaft seal) housing side: IP65	◆	◆	◆	◆
<b>Material</b>					
Combination 1	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	◆	◆	◆	◆
<b>Mass</b>					
	approx. 550 g (combination 1) approx. 1100 g (combination 2)	◆	◆		
	approx. 600 g (combination 1) approx. 1200 g (combination 2)				◆
	approx. 700 g (combination 1) approx. 1200 g (combination 2)			◆	
<b>Rotational speed</b>	max. 12000 min <sup>-1</sup>	◆	◆	◆	◆



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		EVS58-TZ	EVS58-PZ	EVS58-PN	EVM58-TZ	EVM58-PZ	EVM58-PN
Resolution	Singleturn	♦	♦	♦	♦	♦	♦
	Multiturn				♦	♦	♦
Overall resolution	up to 16 Bit	♦	♦	♦			
	up to 30 Bit				♦	♦	♦
Interface type	Powerlink		♦				♦
	PROFINET			♦			♦
	TCP/IP	♦			♦		
Physical	Ethernet	♦	♦	♦	♦	♦	♦
Transfer rate	10 MBit/s / 100 MBit/s	♦	♦	♦	♦	♦	♦
Operating voltage	10 ... 30 V DC	♦	♦	♦	♦	♦	♦
Power consumption	max. 4 W	♦	♦	♦	♦	♦	♦
Linearity	± 0.5 LSB (12 Bit)	♦	♦	♦	♦	♦	♦
Output code	binary code	♦	♦	♦	♦	♦	♦
Operating temperature	0 ... 60 °C (273 ... 333 K)	♦	♦	♦	♦	♦	♦
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded	♦	♦	♦	♦	♦	♦
	Supply: 1 plug M12 x 1, 5-pin, A-coded				♦	♦	♦
Protection degree	DIN EN 60529	♦	♦	♦	♦	♦	♦
	shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	♦	♦	♦	♦	♦	♦
Material	housing: aluminium, powder coated	♦	♦	♦	♦	♦	♦
	flange: aluminium shaft: stainless steel						♦
Mass	approx. 550 g	♦	♦	♦			
	approx. 700 g				♦	♦	♦
Rotational speed	max. 12000 min <sup>-1</sup>	♦	♦	♦	♦	♦	♦



- Industrial standard housing Ø58 mm
- Integrated webserver
- Servo or clamping flange
- 30 Bit multiturn  
EVM58-TZ  
EVM58-PZ  
EVM58-PN
- 16 Bit singleturn  
EVS58-TZ  
EVS58-PZ  
EVS58-PN
- Ethernet interface with TCP/IP  
EVS58-TZ  
EVM58-TZ
- Ethernet interface with Powerlink  
EVS58-PZ  
EVM58-PZ
- Ethernet interface with ProfiNet  
EVS58-PN  
EVM58-PN

Rotary encoders, absolute

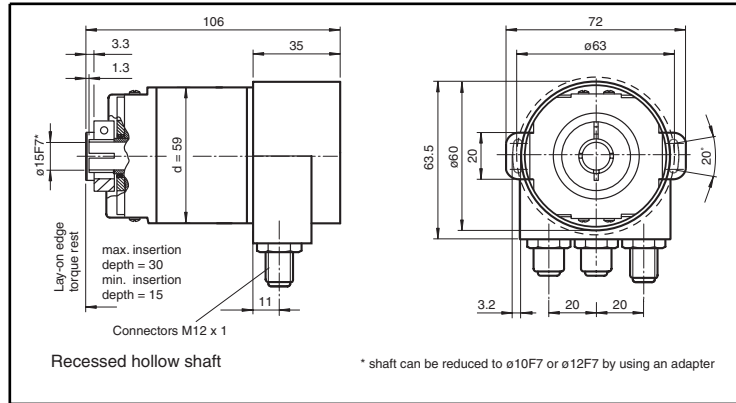
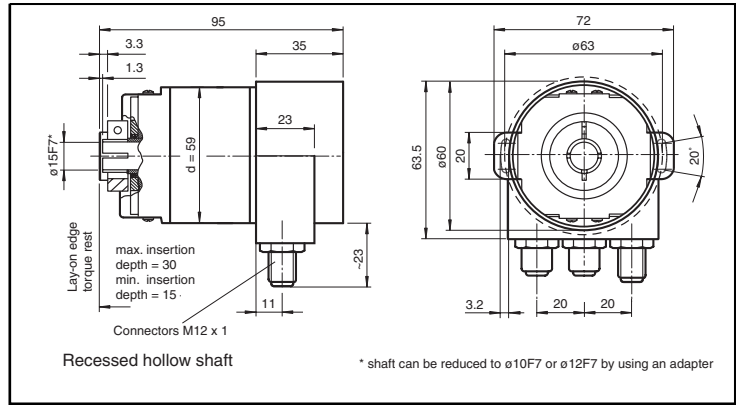
6.2

Date of edition 2008-03-20



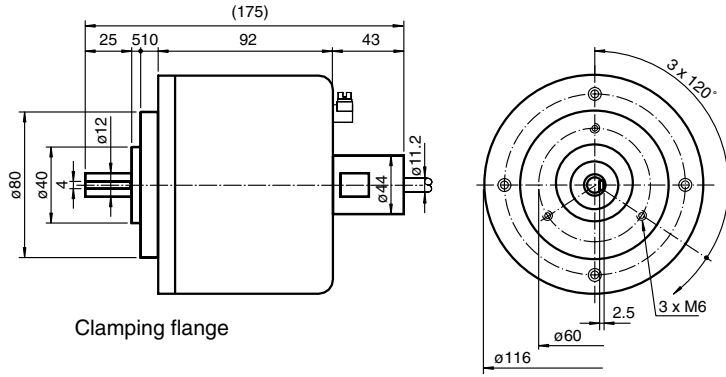


- Industrial standard housing Ø58 mm
- Integrated webserver
- Recessed hollow shaft
- 16 Bit singleturn  
ESS58-TZ  
ESS58-PZ  
ESS58-PN
- 30 Bit multiturn  
ESM58-TZ  
ESM58-PZ  
ESM58-PN
- Ethernet interface with TCP/IP  
ESS58-TZ  
ESM58-TZ
- Ethernet interface with Powerlink  
ESS58-PZ  
ESM58-PZ
- Ethernet interface with ProfiNet  
ESS58-PN  
ESM58-PN



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		ESS58-TZ	ESS58-PZ	ESS58-PN	ESM58-TZ	ESM58-PZ	ESM58-PN
Resolution							
Singleturn	up to 16 Bit	◆	◆	◆	◆	◆	◆
Multiturn	14 Bit				◆	◆	◆
Overall resolution	up to 16 Bit	◆	◆	◆			
	up to 30 Bit				◆	◆	◆
Interface type	Powerlink		◆				
	PROFINET			◆			◆
	TCP/IP	◆			◆		
Physical	Ethernet	◆	◆	◆	◆	◆	◆
Transferrate	10 MBit/s / 100 MBit/s	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
Power consumption	max. 4 W	◆	◆	◆	◆	◆	◆
Linearity	± 0.5 LSB (12 Bit) ,	◆	◆	◆	◆	◆	◆
Output code	binary code	◆	◆	◆	◆	◆	◆
Operating temperature	0 ... 60 °C (273 ... 333 K)	◆	◆	◆	◆	◆	◆
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 5-pin, A-coded	◆	◆	◆	◆	◆	◆
Protection degree	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	◆	◆	◆	◆	◆	◆
Material	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆	◆	◆
Mass	approx. 550 g approx. 700 g	◆	◆	◆	◆	◆	◆
Rotational speed	max. 12000 min <sup>-1</sup>	◆	◆	◆	◆	◆	◆



- Up to 5000 ppr
- ATEX approval
- Flameproof enclosure
- 10 V ... 30 V with RS 422 interface 14-1436X
- 10 V ... 30 V with short-circuit proof push-pull output 14-14361
- 5 V with RS 422 interface 14-14366

Electrical connection

Signal	Cable Ø11.2 mm, 9-core
GND	1
+U <sub>b</sub>	2
A	3
B	4
$\bar{A}$	5
$\bar{B}$	6
0	7
$\bar{0}$	8
PE	Green/Yellow

		14-14361	14-14366	14-1436X
Pulse count (ppr)	max. 5000	◆	◆	◆
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %	◆	◆	◆
No-load supply current	max. 150 mA max. 80 mA	◆	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof, reverse polarity protected max. per channel 40 mA, short-circuit proof, reverse polarity protected	◆	◆	◆
Output frequency	max. 100 kHz	◆	◆	◆
Connection				
Cable	Ø11.2 mm, 9-core, 2 m	◆	◆	◆
Protection degree	DIN EN 60529, IP 66	◆	◆	◆
Operation temperature				
Glass disk	-20 ... 55 °C (253 ... 328 K)	◆	◆	◆
Plastic disk	-20 ... 55 °C (253 ... 328 K)	◆	◆	◆
Material				
Housing	aluminium 3.1645	◆	◆	◆
Flange	aluminium 3.1645	◆	◆	◆
Shaft	stainless steel 1.4305	◆	◆	◆
Mass	approx. 3000 g	◆	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆	◆
EC-Type Examination Certificate	ZELM 02 ATEX 0078 X	◆	◆	◆
Group, category, type of protection	Ex II 2G EEx d IIC T6 Ex II 2D IP66 T80°C	◆	◆	◆
Directive 94/9 EC	EN 50014, EN 50018, EN 50281-1-1	◆	◆	◆

Rotary encoders for hazardous areas

6.3

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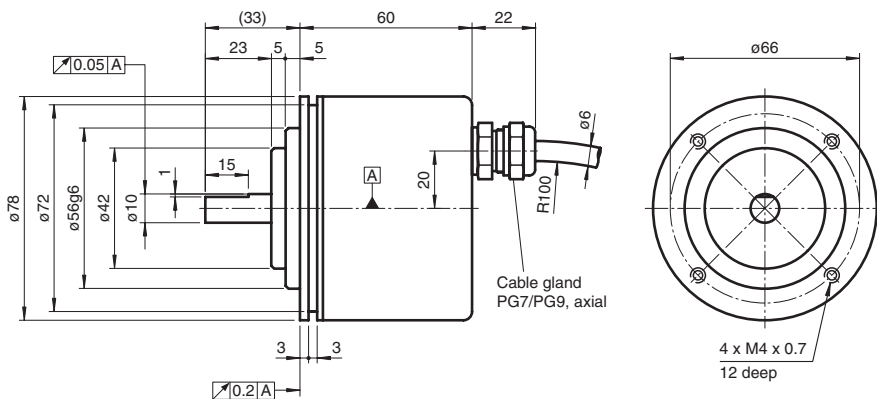


- Up to 25 ppr
- ATEX approval
- Intrinsically safe
- NAMUR interface in accordance with DIN EN 60947-5-6

**Electrical connection**

Signal	Cable Ø6 mm, 4-core
A <sub>NAMUR+</sub>	Brown
A <sub>NAMUR-</sub>	Blue
B <sub>NAMUR+</sub>	White
B <sub>NAMUR-</sub>	Black

The circuits A and B are not connected and not grounded.

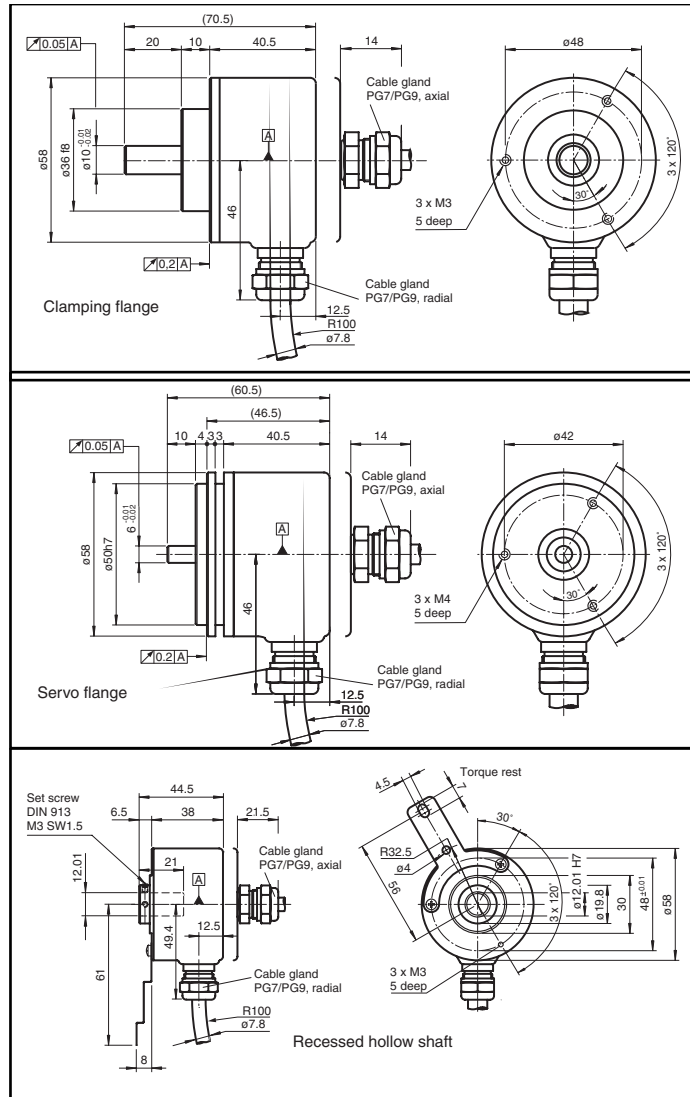


Pulse count (ppr)	max. 25	◆	RV184
Operating voltage	8 V DC	◆	
Output type	NAMUR (SJ2-N)	◆	
Operating current	max. per channel 3 mA, short-circuit proof	◆	
Output frequency	max. 5 kHz	◆	
Connection			
Cable	Ø6 mm, 4 x 0.38 mm <sup>2</sup> , 2 m	◆	
Protection degree	DIN EN 60529, IP65	◆	
Operation temperature	-20 ... 60 °C (253 ... 333 K)	◆	
Material			
Housing	aluminium	◆	
Flange	aluminium 3.1645	◆	
Shaft	stainless steel 1.4305	◆	
Mass	approx. 630 g	◆	
Rotational speed	max. 3000 min <sup>-1</sup>	◆	
EC-Type Examination Certificate	PTB 99 ATEX 2219 X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>	◆	
Group, category, type of protection	Ex II 2G EEx ia IIC T6	◆	
Internal capacitance	C <sub>i</sub> max. 30 nF, a cable length of 10 m is considered	◆	
Internal inductance	L <sub>i</sub> max. 100 µH, a cable length of 10 m is considered	◆	
Cable capacitance	approx. 0.2 nF/m	◆	
Directive 94/9 EC	EN 50014, EN 50020	◆	

Rotary encoders for hazardous areas



- Industrial standard housing Ø58 mm
- ATEX approval
- Up to 5000 ppr
- Recessed hollow shaft
  - RSI58X-\*\*\*\*\*1
  - RSI58X-\*\*\*\*\*6
  - RSI58X-\*\*\*\*\*X
- Servo or clamping flange
  - RVI58X-\*\*\*\*\*1
  - RVI58X-\*\*\*\*\*6
  - RVI58X-\*\*\*\*\*X
- 10 V ... 30 V with short-circuit proof push-pull output
  - RVI58X-\*\*\*\*\*1
  - RSI58X-\*\*\*\*\*1
- 10 V ... 30 V with RS 422 interface
  - RVI58X-\*\*\*\*\*X
  - RSI58X-\*\*\*\*\*X
- 5 V with RS 422 interface
  - RVI58X-\*\*\*\*\*6
  - RSI58X-\*\*\*\*\*6

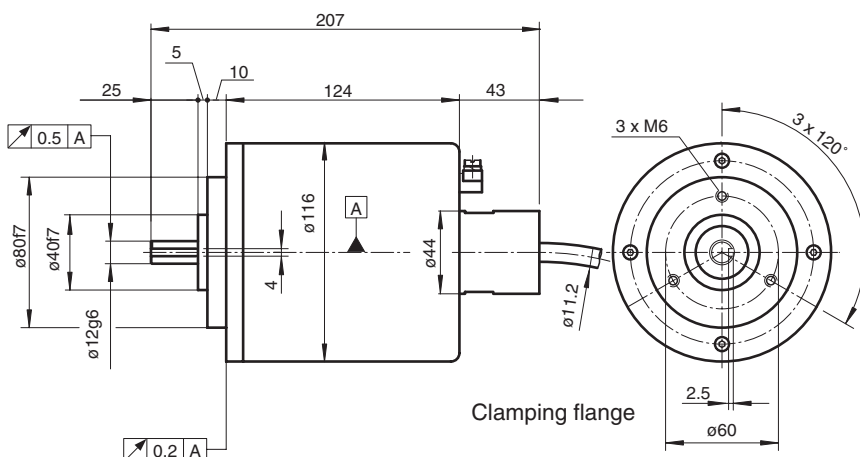


		RVI58X-*****1	RVI58X-*****6	RVI58X-*****X	RSI58X-*****1	RSI58X-*****6	RSI58X-*****X
Pulse count (ppr)	max. 5000	◆	◆	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %	◆	◆	◆	◆	◆	◆
No-load supply current	max. 50 mA max. 60 mA max. 70 mA	◆	◆	◆	◆	◆	◆
Output type	push-pull, incremental RS 422, incremental	◆	◆	◆	◆	◆	◆
Operating current	max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ) max. per channel 20 mA, conditionally short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected max. per channel 40 mA, short-circuit proof (not with U <sub>b</sub> ), reverse polarity protected	◆	◆	◆	◆	◆	◆
Output frequency	max. 200 kHz	◆	◆	◆	◆	◆	◆
Connection	Cable	◆	◆	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP 54 DIN EN 60529, IP 65	◆	◆	◆	◆	◆	◆
Operation temperature	Glass disk -30 ... 60 °C (243 ... 333 K), fixed cable -30 ... 70 °C (243 ... 343 K), fixed cable Plastic disk -30 ... 60 °C (243 ... 333 K), fixed cable	◆	◆	◆	◆	◆	◆
Material	Housing Flange	◆	◆	◆	◆	◆	◆
Shaft	aluminium, powder coated	◆	◆	◆	◆	◆	◆
Mass	aluminium Stainless steel approx. 280 g approx. 350 g	◆	◆	◆	◆	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆	◆	◆	◆	◆
Group, category, type of protection	Ex II 3G EE x nA II T4 Ex II 3D IP65 T105 °C Ex II 3G EE x nA II T4 Ex II 3D IP54 T105 °C	◆	◆	◆	◆	◆	◆
Directive 94/9 EC	EN 60079-0 EN 60079-15 EN 50281-1-1	◆	◆	◆	◆	◆	◆

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Rotary encoders for hazardous areas

6.3



**CAN** DeviceNet.



- **ATEX approval**
- **Flameproof enclosure**
- **25 Bit multiturn**  
PVM14  
CVM14  
DVM14
- **PROFIBUS interface**  
PVS14  
PVM14
- **Galvanically isolated RS 422 interface**  
AVS14  
AVM14
- **Class 1 and 2 in accordance with PNO profile 3.062**  
PVS14  
PVM14
- **13 Bit singleturn**  
PVS14
- **12 Bit singleturn**  
AVS14
- **24 Bit multiturn**  
AVM14
- **Galvanically isolated DeviceNet interface**  
DVM14
- **Galvanically isolated CAN interface**  
CVM14
- **DSP 406, CLASS 1 and 2**  
CVM14
- **Cam function**  
CVM14
- **2 limit switches**  
CVM14

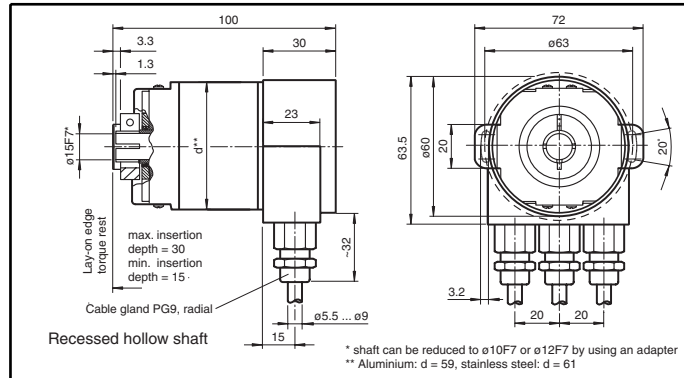
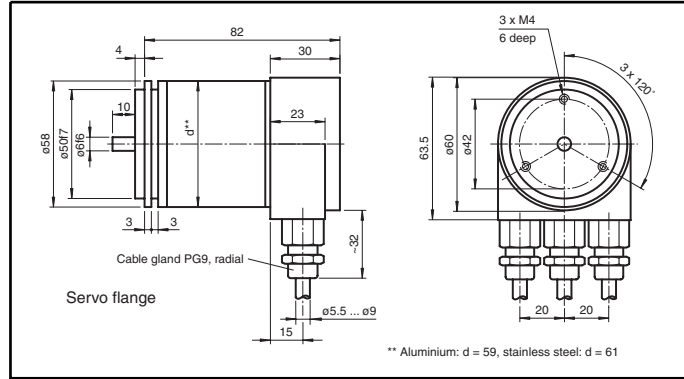
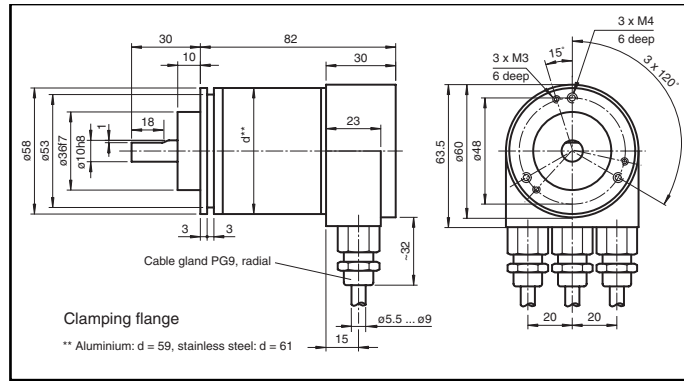
		AVS14	AVM14	PVS14	PVM14	CVM14	DVM14
Resolution							
Singleturn	12 Bit	◆	◆				
	13 Bit			◆	◆	◆	◆
Multiturn	12 Bit		◆		◆	◆	◆
Overall resolution	24 Bit		◆				
	25 Bit				◆	◆	◆
Interface type	CANopen						◆
	DeviceNet						◆
	PROFIBUS				◆	◆	
	SSI	◆	◆				
Transferrate	max. 0.5 MBit/s						◆
	max. 1 MBit/s						◆
	0.0096 ... 12 MBit/s				◆	◆	
	0.05 ... 1.5 MBit/s		◆				
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	max. 190 mA			◆	◆	◆	◆
	max. 90 mA			◆	◆	◆	◆
Linearity	± 0.5 LSB	◆	◆				
	± 1 LSB				◆	◆	◆
Output code	binary code				◆	◆	◆
	Gray code, binary code	◆	◆				
Code course (counting direction)	cw descending (clockwise rotation, code course descending)	◆	◆				
	parameterisable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)				◆	◆	◆
Input type	selection of counting direction (V/R)	◆	◆				
Input type	zero-set (PRESET 1)	◆	◆				
Connection							
Cable	Ø11.2 mm, 9-core, 2 m	◆	◆	◆	◆	◆	◆
Protection degree	DIN EN 60529, IP66	◆	◆	◆	◆	◆	◆
Operation temperature							
Gas Ex-Area	-40 ... 55 °C	◆	◆	◆	◆	◆	◆
Dust Ex-Area	-30 ... 55 °C	◆	◆	◆	◆	◆	◆
Material							
Housing	aluminium	◆	◆	◆	◆	◆	◆
Flange	aluminium	◆	◆	◆	◆	◆	◆
Shaft	Stainless steel	◆	◆	◆	◆	◆	◆
Mass	approx. 3400 g	◆	◆	◆	◆	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆	◆	◆	◆	◆
EC-Type Examination Certificate	ZELM 02 ATEX 0078 X	◆	◆	◆	◆	◆	◆
Group, category, type of protection	Ex II 2G EEx d IIC T6	◆	◆	◆	◆	◆	◆
	Ex II 2D IP66 T80 °C	◆	◆	◆	◆	◆	◆
Directive 94/9 EC	EN 50014, EN 50018, EN 50281-1-1	◆	◆	◆	◆	◆	◆

Rotary encoders for hazardous areas

6.3



- Industrial standard housing Ø58 mm
- PROFIBUS interface
- Ex approval for zone 2 and zone 22
- Speed transfer
- Extended scaling functions
- Programmable limit switches
- Commissioning mode
- 16 Bit singleturn  
PVS58X  
PSS58X
- 30 Bit multiturn  
PVM58X  
PSM58X
- Servo or clamping flange  
PVS58X  
PVM58X
- Recessed hollow shaft  
PSS58X  
PSM58X



Encoder length depends on the particular type. Please refer to [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

		PVS 58X	PVM 58X	PSS 58X	PSM 58X
Resolution					
Singleturn	up to 16 Bit	◆	◆	◆	◆
Multiturn	14 Bit		◆		◆
Overall resolution	up to 16 Bit up to 30 Bit	◆	◆	◆	◆
Interface type	PROFIBUS	◆	◆	◆	◆
Transfer rate	0.0096 ... 12 MB it/s	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
Current consumption	max. 230 mA at 10 V DC, max. 100 mA at 24 V DC	◆	◆	◆	◆
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	◆	◆	◆	◆
Output code	binary code	◆	◆	◆	◆
Code course (counting direction)	parameterisable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	◆	◆	◆	◆
Connection					
Terminal compartment	in removable housing cover	◆	◆	◆	◆
Protection degree	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	◆	◆	◆	◆
Operating temperature	-30 ... 55 °C (243 ... 328 K)	◆	◆	◆	◆
Material	housing: aluminium, powder coated flange: aluminium shaft: stainless steel	◆	◆	◆	◆
Mass	approx. 550 g (combination 1) approx. 600 g (combination 2)	◆	◆	◆	◆
Rotational speed	max. 6000 min <sup>-1</sup>	◆	◆	◆	◆
Group, category, type of protection	Ex II 3D IP64 T120°C Ex II 3G EEx nA II T4	◆	◆	◆	◆
Directive 94/9 EC	EN 60079-0 EN 60079-15 EN 50281-1-1	◆	◆	◆	◆

Date of edition 2008-03-20

Rotary encoders for hazardous areas

6.3

# Positioning systems

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... for laser distance measuring systems .....	see chapter 9.9 .713
... for ultrasonic sensors .....	see chapter 9.7 .701
... for rotary encoders .....	see chapter 9.8 .709

## Positioning

Accurate position detection plays a key role in many industrial processes.

Possible applications are the detection of linear movement, the detection of angles, or position monitoring.

### 1. Inductive distance measuring systems

Based on the high precision evaluation of several coil systems, the new positioning systems combine proven inductive sensor and innovative microcontroller technology.



The simultaneous evaluation of several coil systems means that positioning systems offer very high precision, reproducibility, and resolution. Due to the inductive principle of operation, the target does not have to be made of ferrites or magnets.

Like the inductive sensor, the target can be made of any metal. With an accurate sensing range of up to 6 mm, the F90 (3 mm) and F110 (6 mm) Inductive Positioning Systems can be used in a variety of applications.

Integrated error functions that indicate if the target was removed from the measurement or sensing range, guarantee users additional system reliability.

The integrated temperature compensation ensures that the inductive positioning systems are optimally suited for harsh environments and critical positioning tasks.

#### Basic characteristics:

- High resolution and accuracy
- Very good reproducibility
- Minimum temperature drift
- Non-contact inductive principle of operation
- Teachable

## F90 Series

The compact and robust design of the F90 series allows noncontact, and thus wear-free position detection in measurement ranges of 80 mm, 104 mm and 120 mm.



The F90 Position Measuring System is available in two versions:

- with current and voltage signal at the outputs
- with current and voltage signal at the outputs and two teachable switching points



## F110 Series

The F110 is available with measurement lengths of 210 mm and 360 mm. This inductive position measuring system sets new standards with its extremely large sensing range of 6 m.



The F110 position measurement system is available with analog current and voltage signals.

It can be installed with mounting brackets and adjusted to each unique installation requirement.





## PMI360D- F130...

The PMI360D-F130... inductive position measuring system is a high-precision measuring system for non-contact recording of the position of rotary actuators and valves.



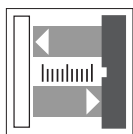
Because of its flexible configuration, it is also suitable for universal sensing of rotary motions around a fixed center of rotation in all fields of mechanical, system, and apparatus engineering.

In addition to its 4 ... 20 mA analog output, the PMI360D-F130... has two independently configurable switching outputs providing two important positions (e.g. start and stop positions).

The "zero point" of the analog output can be selected to allow the user to reference the electrical zero to a known mechanical position (e.g. mounting and alignment). This significantly facilitates both mounting of the PMI360D-F130... and subsequent calibration during commissioning.

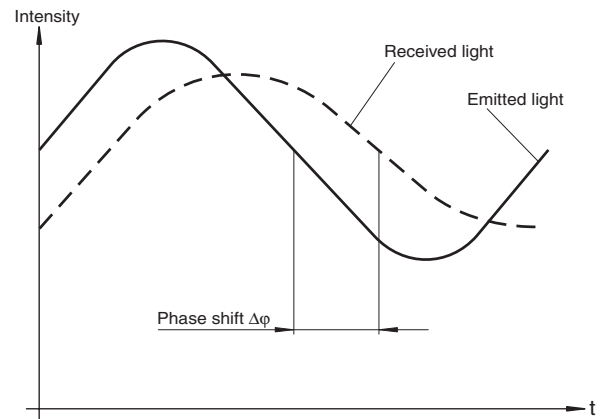
Mounting the BT-F130-A target on the sensor housing bore enables position sensing. This target rotates in the central bore of the PMI360D-F130 and contains the metal insert required for position sensing. It is optimally designed for the mechanical conditions of valves or rotary actuators. The BT-F130-A target can be omitted. If you choose to do so, a metal target must be secured to the sensor housing bore. This metal target must meet the material, dimensional and distance requirements of the PMI360D-F130.

## 2 Laser displacement devices

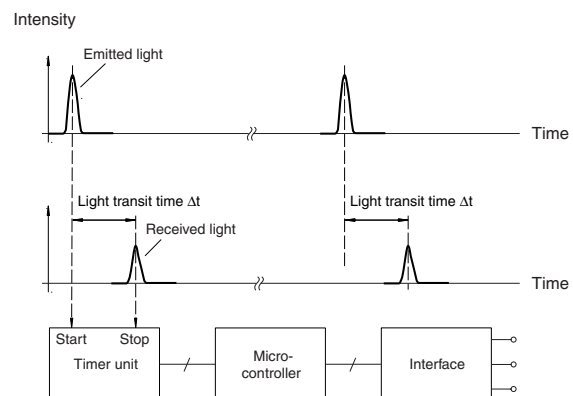


One method for indirect distance measuring is the phase correlation method. This is used in our EDM series of sensors. The distance is calculated via the phase displacement between the transmitted and the reflected intensity modulated light.

The transmitter generates a constant sinusoidal intensity modulated light with a modulation frequency of several MHz. The light reflected by the reflector or the object reaches the receiver with the phase displacement  $\Delta\varphi$  (see fig.). The downstream phase indicator provides an output signal proportional to the distance.



Another method is time-of-flight. This method is used by our VDM laser distance measuring devices. This represents a direct distance detection based on the runtime measurement. A measuring laser emits short light impulses. An internal counter is started at the same time. After the measuring distance has been completed, an optical sensor receives the arriving light impulse and stops the counter. The counter value read represents the completed measuring distance. Depending on the sensor and reflector used, different measuring ranges can be observed. For example the VDM series of sensors have a measuring range of up to 240 m.



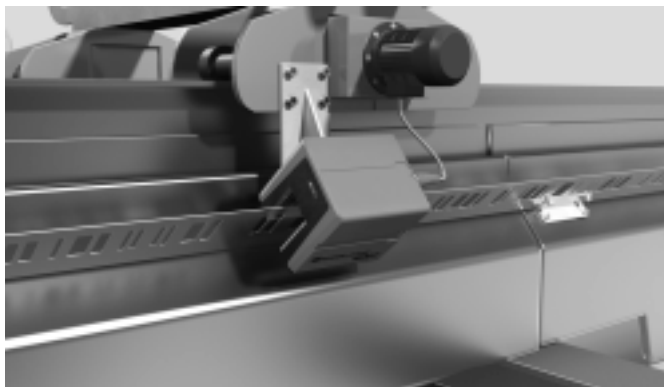
## 3 WCS position encoding system

For positioning over long distances, Pepperl+Fuchs offers the proven WCS position encoding system.

The position encoding system WCS excels in particular in systems with turns, junctions as well as inclined paths and under difficult ambient conditions such as dirt, dust, aggressive vapors.

With measuring distances of up to 327 meters it is suitable for position detection in:

- warehouse and conveyor systems
- studio technology
- crane positioning
- galvanic equipment
- elevators



The WCS position encoding system consists of two components: The coding rail, which carries the absolute position information, and the read head, which photoelectrically scans the coding rail.

The code rail is placed parallel to the track and assigns a unique position to every point on the track. It is possible to lay the code rail only where positioning is required. The system is also able to recognize junctions and curves.

The U-shaped reading head scans the code rail photoelectrically and in a contactless way. The read head calculates the position value in real time. The position value is detected reliably at high speeds and under difficult ambient conditions.

A wide variety of interface modules is available for the connection to standard bus systems:

- Parallel
- SSI
- Profibus DP
- DeviceNet
- CANopen
- Ethernet
- InterBus-S
- Profinet
- Modbus-RTU

With the exception of the SSI interface, up to four read heads can be connected simultaneously to all interface modules.

#### Identification via WCS

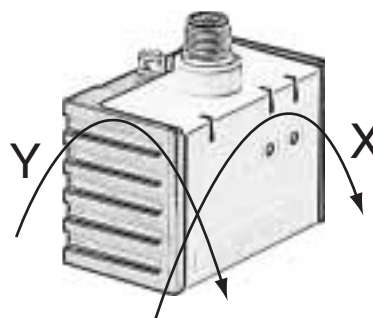
The WCS system is also suited for the identification of vehicles in conveyor systems and their position to the millimeter.

Since the code rails used in these applications are made of stainless steel, they are suited for use in extreme temperatures.

## 4 Inclination sensors

There are many electronic components available for sensing inclination angles. However, a simple device that is suitable for industrial needs is rare.

The new F99 sensor from Pepperl + Fuchs provides a standardized 4... 20 mA analog interface with selectable angle measurement range between 0...360° without the need for a costly bus system. Pepperl + Fuchs offers the F99 non-contact inclination sensor in both single- and dual-axis versions.



Using two Teach-In buttons you can easily adjust the switching outputs.

#### Features:

- non-contact sensing of the inclination angle in one or two axes
- measuring range 0 ... 360°
- angular resolution 0.5°
- analog and switching outputs
- two adjustable switching points
- IP rating IP68/IP69K

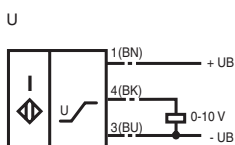
## 5 Other sensors for position detection

In addition to these sensors, we offer ultrasonic sensors and rotary encoders suitable for use in positioning applications.

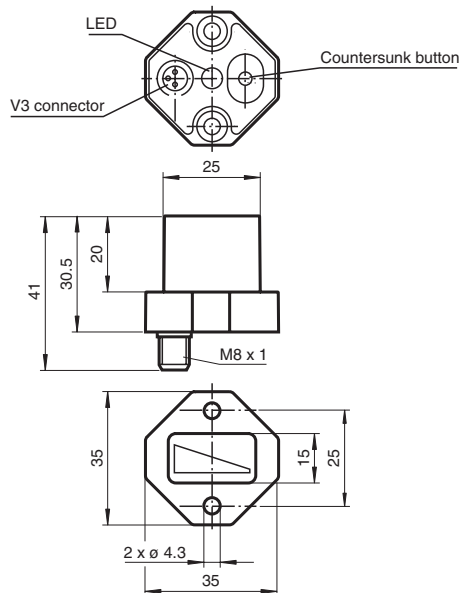


- Analogue output 0 V ... 10 V
- Measuring range 0 ... 14 mm
- Scalable measurement range, programmable via key

**Electrical connection**



Core colours in accordance with EN 60947-5-2.



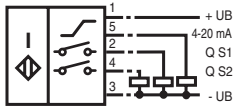
Switching element function	Analogue voltage output	◆	PMI14V-F112-U-V3
Object distance	max. 2.5 mm	◆	
Installation	embeddable	◆	
Measurement range	0 ... 14 mm	◆	
Operating voltage	18 ... 30 V	◆	
No-load supply current	≤ 20 mA	◆	
Operating voltage display	LED	◆	
Reverse polarity protection	protected against reverse polarity	◆	
Output voltage	0 ... 10 V	◆	
Short-circuit protection	pulsing	◆	
Repeat accuracy	± 0.05 mm	◆	
Resolution	33 µm	◆	
Linearity error	± 0.3 mm	◆	
Output rated operating current		◆	
Load resistor	voltage output > 1000 Ω	◆	
Temperature drift	± 0.4 mm	◆	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	
Connection type	M8 connector, 3-pin	◆	
Housing material	PA 6	◆	
Protection degree	IP67	◆	
Note	The data relating to accuracy only apply to a distance to the object to be detected of 1 ... 2.5 mm.	◆	



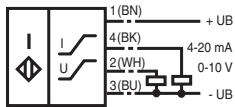
- **Measuring range** 0 ... 80 mm
- **Analogue output** 0 V ... 10 V/4 mA ... 20 mA  
PMI80-F90-IU-V1
- **Analogue output** 4 mA ... 20 mA  
PMI80-F90-IE8-V15
- **Adjustable switch points**  
PMI80-F90-IE8-V15

**Electrical connection**

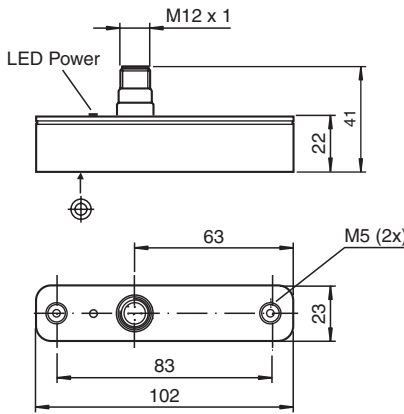
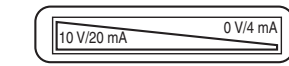
IE8



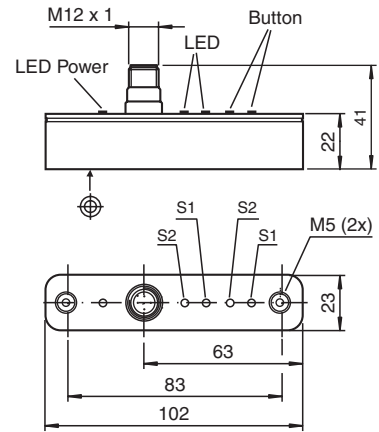
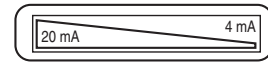
IU



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PMI80-F90-IU-V1



PMI80-F90-IE8-V15



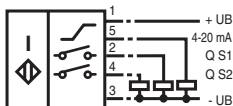
		PMI80-F90-IE8-V15	PMI80-F90-IU-V1
Switching element function	analogue, current or voltage output		◆
Object distance	Analogue current output with PNP binary NO	◆	◆
Installation	max. 3 mm	◆	◆
Installation	embeddable	◆	◆
Measurement range	0 ... 80 mm	◆	◆
Operating voltage	18 ... 30 V	◆	◆
No-load supply current	≤ 35 mA	◆	◆
Operating voltage display	LED green	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Output voltage	0 ... 10 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Repeat accuracy	± 0.1 mm	◆	◆
Resolution	125 μm	◆	◆
Linearity error	± 0.4 mm	◆	◆
Output rated operating current	4 ... 20 mA	◆	◆
Load resistor	voltage output: > 1000 Ω current output: < 400 Ω	◆	◆
	current output: < 400 Ω	◆	◆
Temperature drift	± 0.5 mm (-25 °C ... 70 °C)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	M 12 connector	◆	◆
Housing material	ABS	◆	◆
Protection degree	IP67	◆	◆
Note	The data relating to accuracy only apply to a distance to the object to be detected of 1 ... 3 mm.	◆	◆



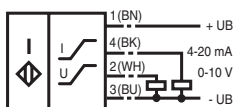
- Measuring range 0 ... 104 mm
- Analogue output 0 V ... 10 V/4 mA ... 20 mA  
PMI104-F90-IU-V1
- Analogue output 4 mA ... 20 mA  
PMI104-F90-IE8-V15
- Adjustable switch points  
PMI104-F90-IE8-V15

**Electrical connection**

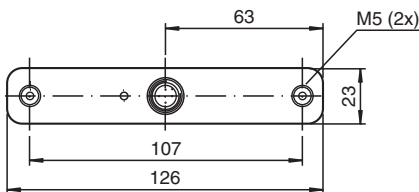
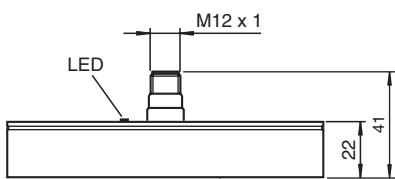
IE8



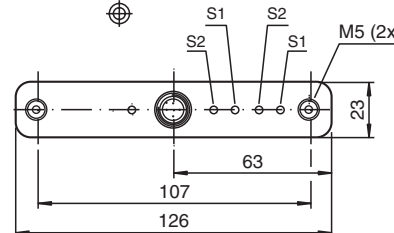
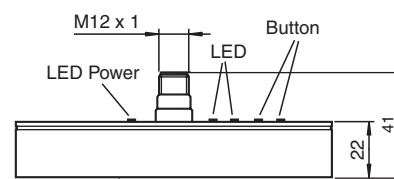
IU



Core colours in accordance with EN 60947-5-2.



PMI104-F90-IU-V1



PMI104-F90-IE8-V15



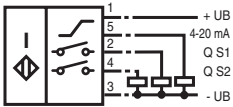
		PMI104-F90-IE8-V15	PMI104-F90-IU-V1
Switching element function	analogue, current or voltage output	◆	◆
Object distance	Analogue current output with PNP binary NO	◆	◆
Object distance	max. 3 mm	◆	◆
Installation	embeddable	◆	◆
Measurement range	0 ... 104 mm	◆	◆
Operating voltage	18 ... 30 V	◆	◆
No-load supply current	≤ 35 mA	◆	◆
Operating voltage display	LED green	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Output voltage	0 ... 10 V	◆	◆
Operating current	0 ... 100 mA	◆	◆
Short-circuit protection	pulsing	◆	◆
Voltage drop	≤ 3 V	◆	◆
Repeat accuracy	± 0.1 mm	◆	◆
Resolution	125 µm	◆	◆
Linearity error	± 0.4 mm	◆	◆
Output rated operating current	4 ... 20 mA	◆	◆
Load resistor	voltage output: > 1000 Ω current output: < 400 Ω	◆	◆
Temperature drift	± 0.5 mm (-25 °C ... 70 °C)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	M12 connector	◆	◆
Housing material	ABS	◆	◆
Protection degree	IP67	◆	◆
Note	The data relating to accuracy only apply to a distance to the object to be detected of 1 ... 3 mm.	◆	◆



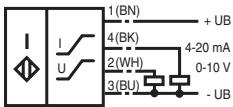
- **Measuring range** 0 ... 120 mm
- **Analogue output** 0 V ... 10 V/4 mA ... 20 mA  
PMI120-F90-IU-V1
- **Analogue output** 4 mA ... 20 mA  
PMI120-F90-IE8-V15
- **Adjustable switch points**  
PMI120-F90-IE8-V15

**Electrical connection**

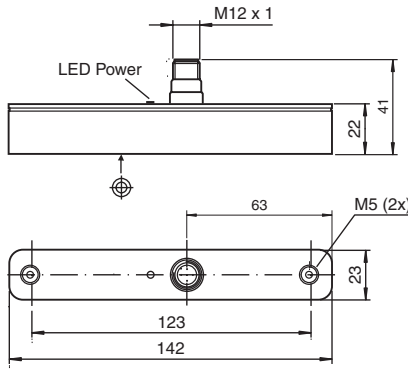
IE8



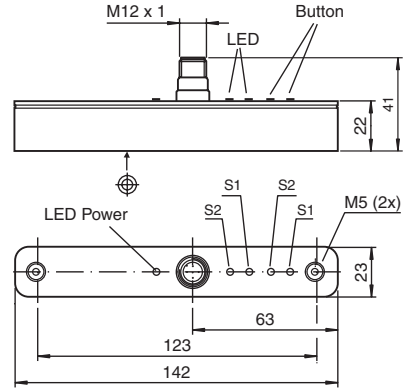
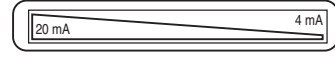
IU



Core colours in accordance with EN 60947-5-2.



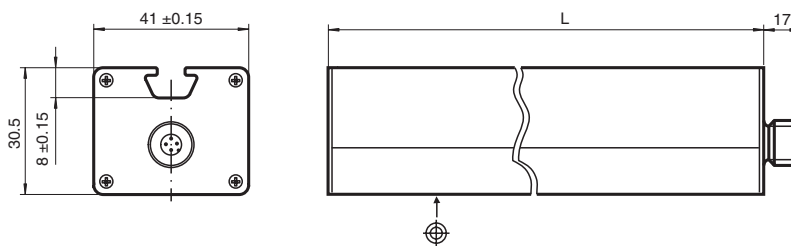
PMI120-F90-IU-V1



PMI120-F90-IE8-V15



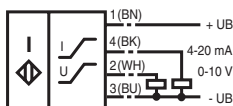
		PMI120-F90-IE8-V15	PMI120-F90-IU-V1
Switching element function	analogue, current or voltage output	◆	◆
Object distance	Analogue current output with PNP binary NO	◆	◆
Installation	max. 3 mm	◆	◆
Measurement range	embeddable	◆	◆
Operating voltage	0 ... 120 mm	◆	◆
No-load supply current	18 ... 30 V	◆	◆
Operating voltage display	≤ 35 mA	◆	◆
Reverse polarity protection	LED green	◆	◆
Output voltage	protected against reverse polarity	◆	◆
Operating current	0 ... 10 V	◆	◆
Short-circuit protection	0 ... 100 mA	◆	◆
Voltage drop	pulsing	◆	◆
Repeat accuracy	≤ 3 V	◆	◆
Resolution	± 0.1 mm	◆	◆
Linearity error	125 µm	◆	◆
Output rated operating current	± 0.4 mm	◆	◆
Load resistor	4 ... 20 mA	◆	◆
	voltage output: > 1000 Ω	◆	◆
	current output: < 400 Ω	◆	◆
	current output: < 400 Ω	◆	◆
Temperature drift	± 0.5 mm (-25 °C ... 70 °C)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	M 12 connector	◆	◆
Housing material	ABS	◆	◆
Protection degree	IP67	◆	◆
Note	The data relating to accuracy only apply to a distance to the object to be detected of 1 ... 3 mm.	◆	◆



- **Analogue output**  
0 V ... 10 V/4 mA ... 20 mA
- **Measuring range 0 ... 210 mm**  
PMI210-F110-IU-V1
- **Measuring range 0 ... 360 mm**  
PMI360-F110-IU-V1

**Electrical connection**

IU

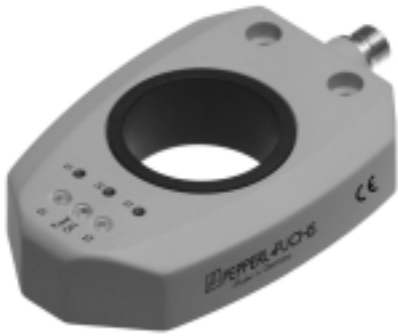


Core colours in accordance with EN 60947-5-2.



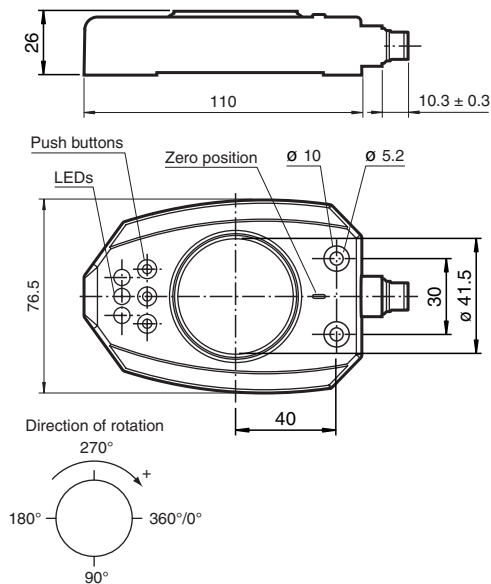
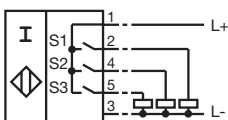
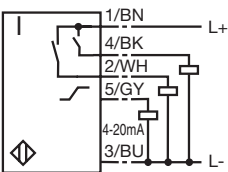
		P MI210-F110-IU-V1	P MI360-F110-IU-V1
Switching element function	analogue, current or voltage output	◆	◆
Object distance	max. 6 mm	◆	◆
Installation	embeddable	◆	◆
Measurement range	0 ... 210 mm	◆	◆
	0 ... 360 mm		◆
Operating voltage	18 ... 30 V	◆	◆
No-load supply current	≤ 40 mA	◆	◆
Operating voltage display	LED green	◆	◆
Reverse polarity protection	protected against reverse polarity	◆	◆
Output voltage	0 ... 10 V	◆	◆
Short-circuit protection	pulsing	◆	◆
Repeat accuracy	± 0.2 mm	◆	◆
Resolution	210 μm	◆	◆
	360 μm		◆
Linearity error	± 0.4 mm	◆	◆
Output rated operating current	4 ... 20 mA	◆	◆
Load resistor	voltage output > 1000 Ω current output: < 400 Ω	◆	◆
Temperature drift	± 0.5 mm (-25 °C ... 70 °C)	◆	◆
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	◆	◆
Connection type	M12 connector	◆	◆
Housing material	PA 6 / AL	◆	◆
Length of housing L	245 mm	◆	◆
	390 mm		◆
Protection degree	IP67	◆	◆
Note	The data relating to accuracy only apply to a distance to the object to be detected of 1 ... 6 mm.	◆	◆

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- **Measuring range 0 ... 360°**
- **Adjustable switch points**  
PMI360D-F130-IE8-V15  
PMI360D-F130-3E2-V15
- **Analogue output, load-dependent voltage or current**  
PMI360D-F130-IUE8-V15
- **Analogue output 4 mA ... 20 mA**  
PMI360D-F130-IE8-V15
- **3 switch outputs**  
PMI360D-F130-3E2-V15
- **2 switch outputs freely adjustable**  
PMI360D-F130-IUE8-V15

**Electrical connection**



		PMI360D-F130-IE8-V15	PMI360D-F130-IUE8-V15	PMI360D-F130-3E2-V15
Switching element function	Analogue current output or analogue voltage output (depends on load) with PNP binary NO		♦	
	Analogue current output with PNP binary NO	♦		
	3 PNP outputs, short-circuit and overload protected, NO			♦
Installation	not embeddable	♦	♦	♦
Measurement range	360°	♦	♦	♦
Rotational speed	≤ 100 min <sup>-1</sup>	♦	♦	♦
Operating voltage	10 ... 30 V		♦	♦
	18 ... 30 V	♦		
No-load supply current	≤ 35 mA	♦	♦	♦
Operating voltage display	LED green	♦	♦	♦
Reverse polarity protection	protected against reverse polarity	♦	♦	♦
Output voltage	0 ... 5 V		♦	
Operating current	0 ... 100 mA	♦	♦	♦
Short-circuit protection	pulsing	♦	♦	♦
Voltage drop	≤ 3 V	♦	♦	♦
Repeat accuracy	0.5°	♦	♦	♦
Resolution	0.4°	♦	♦	♦
Linearity error	1.2°	♦	♦	♦
Output rated operating current	4 ... 20 mA	♦	♦	♦
Load resistor	current output: < 500 Ω	♦		
	current output: nicht uebersetzt!		♦	
	voltage output: nicht uebersetzt!			♦
Temperature drift	1.5° (-25 °C ... 70 °C)	♦	♦	♦
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	♦	♦	♦
Connection type	connector M12 x 1, 5-pin	♦	♦	♦
Housing material	PBT	♦	♦	♦
Shaft diameter	≤ 27.5 mm Steel	♦	♦	♦
Protection degree	IP67	♦	♦	♦
Mass	180 g	♦	♦	♦

Positioning / Position sensing, inductive positioning systems

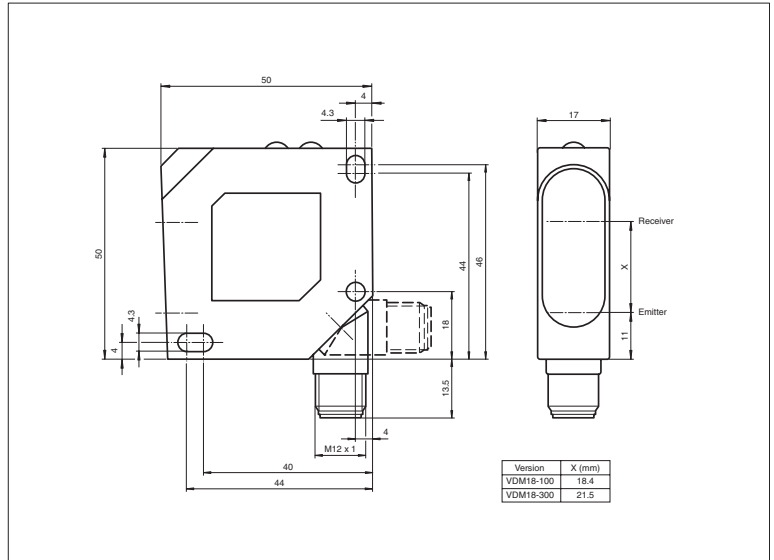
7.1

Date of edition 2008-03-20





- Analogue output 4 mA ... 20 mA
- High resolution
- Very fast response characteristic, suitable for rapid scanning process
- Interface 485



Laser Class II

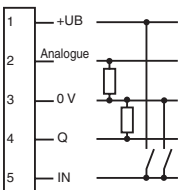
		VDM18-100/20/122/151	VDM18-100/20/88/122/151	VDM18-100/32/105/122	VDM18-300/20/122/151	VDM18-300/20/88/122/151	VDM18-300/32/105/122
Measurement range	30 ... 100 mm 80 ... 300 mm	◆	◆	◆	◆	◆	◆
Light source	laser diode red , 650 nm	◆	◆	◆	◆	◆	◆
Laser class	2 (EN 60825/1)	◆	◆	◆	◆	◆	◆
Light spot representation	approx. 1.5 mm x 3 mm at 100 mm approx. 1.5 mm x 3.25 mm at 100 mm approx. 1.5 mm x 3.5 mm at 300 mm approx. 1.5 mm x 4.5 mm at 300 mm	◆	◆	◆	◆	◆	◆
Linearity error	0.25 % of the measuring range	◆	◆	◆	◆	◆	◆
Resolution	< 0.1 % of the measuring range	◆	◆	◆	◆	◆	◆
Temperature influence	< 0,02% /°C	◆	◆	◆	◆	◆	◆
Operating display	LED green	◆	◆	◆	◆	◆	◆
Function display	2 yellow LEDs: Switching status (each output) , 4 green LEDs: Operating mode	◆	◆	◆	◆	◆	◆
Parameterisation display	LED red	◆	◆	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆	◆	◆	◆	◆
No-load supply current	≤ 40 mA at 24 V DC	◆	◆	◆	◆	◆	◆
Protection class	II , rated voltage ≤ 50 V DC	◆	◆	◆	◆	◆	◆
Control input	Laser off (HIGH +UB) , Keypad lock (LOW 0V)	◆	◆	◆	◆	◆	◆
Interfaces	RS 485	◆	◆	◆	◆	◆	◆
Signal output	1 PNP output, short-circuit proof, protected from reverse polarity, open collector 2 PNP outputs, independent 2 PNP outputs, independent , short-circuit proof, reverse polarity protected	◆	◆	◆	◆	◆	◆
Switching current	max. 100 mA	◆	◆	◆	◆	◆	◆
Measurement output	1 analogue output 4 ... 20 mA, short-circuit/overload protected , Rmax = 500 Ohm	◆	◆	◆	◆	◆	◆
Switching frequency	≤ 1 kHz	◆	◆	◆	◆	◆	◆
Response time	0.4 ms	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 60 °C (263 ... 333 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP67	◆	◆	◆	◆	◆	◆
Connection	plastic connector M12 x 1, 5-pin M12 connector, 8-pin	◆	◆	◆	◆	◆	◆
Material							
Housing	ABS , resistant to knocks	◆	◆	◆	◆	◆	◆
Optical face	PMMA	◆	◆	◆	◆	◆	◆
Mass	approx. 43 g	◆	◆	◆	◆	◆	◆

Positioning / Position sensing, Laser ranging

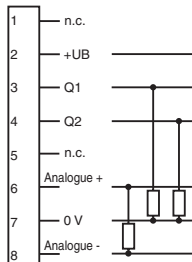
7.2

The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

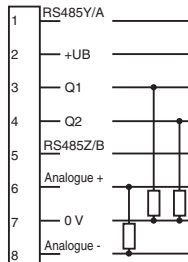
VDM18-100/32/105/122  
VDM18-300/32/105/122

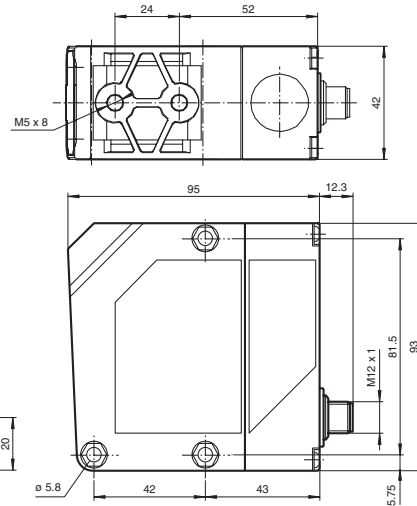


VDM18-100/20/122/151  
VDM18-300/20/122/151



VDM18-100/20/88/122/151  
VDM18-300/20/88/122/151



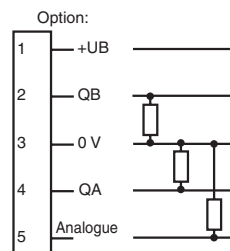


- Can be aligned using an integrated pilot laser
- Adjustable switch outputs
- Not sensitive to ambient light
- Analogue output 4 mA ... 20 mA



		VDM35-6-L/20/105/122	VDM35-30-R/20/105/122
Measurement range	0.2 ... 30 m	◆	◆
Reference target	0.2 ... 6 m Kodak white (90%) OFR100/100	◆	◆
Light source	laser diode	◆	◆
Laser class	1 EN 60825-1	◆	◆
Temperature influence	analogue typ. 0.1 ‰/K, switch output typ. 0.05 ‰/K typ. ≤ 1.2 mm/K	◆	◆
Alignment aid	adjustment laser, Laser class 2	◆	◆
Operating display	LED green	◆	◆
Function display	LED yellow: switching state (2x), LED orange: Operating mode	◆	◆
Parameterisation display	LED red (4x)	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
Ripple	10 % within the supply tolerance	◆	◆
No-load supply current	≤ 125 mA / 24 V DC	◆	◆
Switching type	light/dark ON, switchable	◆	◆
Signal output	2 pnp, short-circuit proof	◆	◆
Switching current	max. 100 mA	◆	◆
Measurement output	1 analogue output 4 ... 20 mA, short-circuit/overload protected, R <sub>max</sub> = 500 Ohm	◆	◆
Voltage drop	≤ 2.4 V	◆	◆
Deviation of the characteristic curve	typ. ≤ ± 40 mm typ. ≤ ± 60 mm	◆	◆
Switching frequency	Fast: 17 Hz / Slow: 8 Hz Fast: 40 Hz / Slow: 16 Hz	◆	◆
Response time	Fast: 13 ms / Slow: 80 ms Fast: 30 ms / Slow: 65 ms	◆	◆
Repeat accuracy	Fast: ≤ ± 15 mm / Slow: ≤ ± 10 mm Fast: typ. ≤ ± 10 mm / Slow: typ. ≤ ± 5 mm	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	connector M 12 x 1, 5-pin	◆	◆
Material			
Housing	ABS	◆	◆
Optical face	PMMA	◆	◆
Mass	200 g	◆	◆

VDM35-30-R/20/105/122  
VDM35-6-L/20/105/122

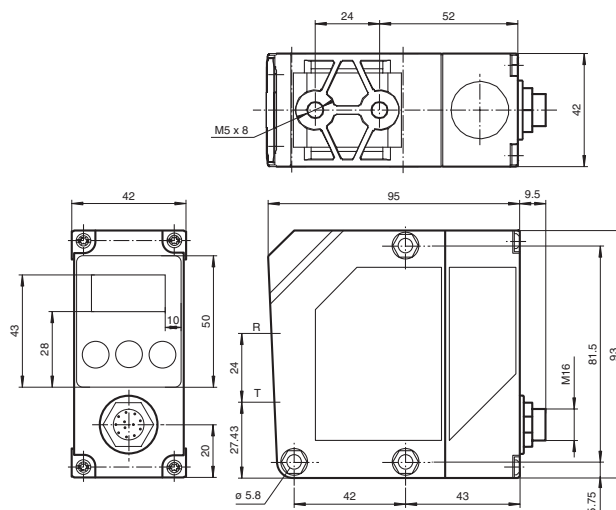


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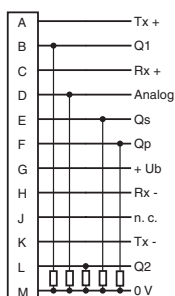
- Can be aligned using an integrated pilot laser
- SSI interface
- Adjustable switch outputs
- Not sensitive to ambient light



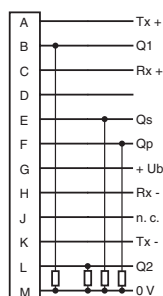
The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

		VDM70-10-L/87/122/160	VDM70-250-R/2087/160
Measurement range	0.5 ... 10 m by 90 % reflection (white) 0.5 ... 250 m on reflector	◆	◆
Reference target	Kodak white (90%) OFR100/100	◆	◆
Light source	laser diode	◆	◆
Laser class	1 EN 60825-1	◆	◆
Absolute accuracy	± 12 mm	◆	◆
	± 8 mm	◆	◆
Linearity error	+/- 3 mm	◆	◆
	+/- 8 mm	◆	◆
Resolution	0.1 mm or 0.125 mm	◆	◆
Temperature influence	< ± 5 mm absolute	◆	◆
Hysteresis	min. 10 mm (adjustable)	◆	◆
Alignment aid	adjustment laser, Laser class 2	◆	◆
Operating display	LED green	◆	◆
Function display	LED yellow: switching state, LED orange: error message	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
Ripple	10 % within the supply tolerance	◆	◆
No-load supply current	190 mA	◆	◆
Protection class	II	◆	◆
Interfaces	RS 422, SSI	◆	◆
Signal output	2 pnp, short-circuit proof, protected against reverse polarity	◆	◆
Switching current	100 mA	◆	◆
Measurement output	1 analogue output 4 ... 20 mA, short-circuit/overload protected	◆	◆
Response time	12 ms	◆	◆
Repeat accuracy	± 2 mm	◆	◆
	± 4 mm	◆	◆
Other outputs	Service output, plausibility output, PNP, short-circuit proof 50 mA	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆
Protection degree	IP67	◆	◆
Connection	with 12-pin, M16 connector	◆	◆
Material			
Housing	ABS	◆	◆
Optical face	PMMA	◆	◆
Mass	230 g	◆	◆

VDM70-10-L/87/122/160



VDM70-250-R/2087/160



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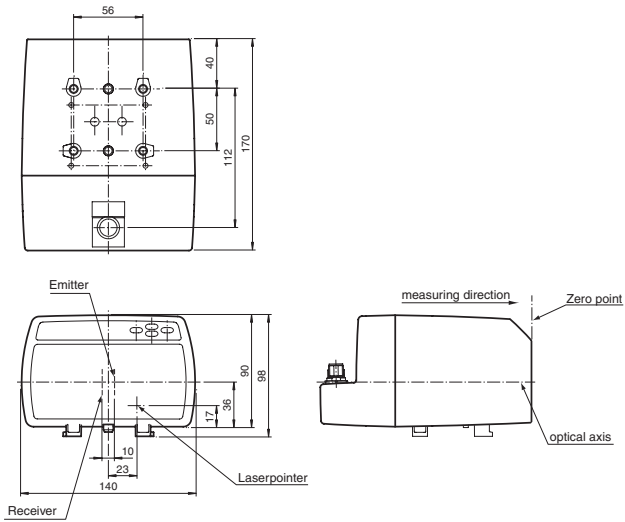
Subject to reasonable modifications due to technical advances.

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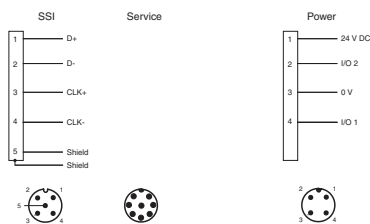
- Time of flight measurement procedure
- Non-contact precision measurement
- Ultra-fast data acquisition
- Active dynamic control



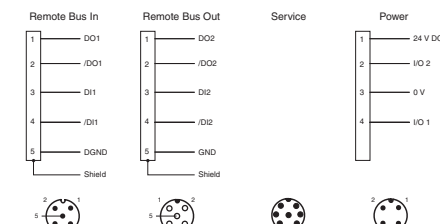
		VDM100-50-SSI	VDM100-50-P	VDM100-50-IBS	VDM100-150-SSI	VDM100-150-P	VDM100-150-IBS
Measurement range	0.3 ... 150 m	◆	◆	◆	◆	◆	◆
Reference target	Foil reflector 500 mm x 500 mm	◆	◆	◆	◆	◆	◆
Light source	laser diode	◆	◆	◆	◆	◆	◆
Laser class	1 EN 60825-1 in the measurement operating mode	◆	◆	◆	◆	◆	◆
Diameter of the light spot	< 15 cm at 50 m < 35 cm at 150 m	◆	◆	◆	◆	◆	◆
Beam divergence	≤ 2 mrad	◆	◆	◆	◆	◆	◆
Absolute accuracy	± 3.5 mm (0.3 m to 3 m), ± 2.5 mm (< 3 m)	◆	◆	◆	◆	◆	◆
Resolution	0.1 mm, adjustable	◆	◆	◆	◆	◆	◆
Max. Motion velocity	10 m/s	◆	◆	◆	◆	◆	◆
Alignment aid	Laserpointer Laser class 2, flashes for approx. 2 minute after the beam has been broken	◆	◆	◆	◆	◆	◆
Operating display	LED green	◆	◆	◆	◆	◆	◆
Function display	LED red: fault signal, LED green: Target (reflector) detected	◆	◆	◆	◆	◆	◆
Parameterisation display	Illuminated display for displaying measured values and parameterisation	◆	◆	◆	◆	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆	◆	◆	◆	◆
Operating current	250 mA	◆	◆	◆	◆	◆	◆
Protection class	III (operating voltage 50 V)	◆	◆	◆	◆	◆	◆
Interface type	INTERBUS	◆	◆	◆	◆	◆	◆
	PROFIBUS DP acc. to EN 50170		◆			◆	
	SSI	◆			◆		
Repeat accuracy	± 0.5 mm (1 Sigma), adjustable	◆	◆	◆	◆	◆	◆
Other outputs	2 PNP inputs/outputs, independent configuration, short-circuit proof, reverse polarity protection	◆	◆	◆	◆	◆	◆
Sample rate	1000 Hz	◆	◆	◆	◆	◆	◆
Average data age	3 ms, 6 ms, 12 ms, 25 ms, 50 ms, adjustable	◆	◆	◆	◆	◆	◆
Offset	± 2 mm (between two devices)	◆	◆	◆	◆	◆	◆
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	◆	◆	◆	◆	◆	◆
Protection degree	IP 65	◆	◆	◆	◆	◆	◆
Connection	M 12x1 connector, 4-pin, standard (supply), M 12x1 connector, 5-pin, B-coded (Bus In), M 12x1 socket, 5-pin, B-coded (Bus Out), M 12x1 plug, 8-pin, service	◆	◆	◆	◆	◆	◆
	M 12x1 connector, 4-pin, standard (supply), M 12x1 plug, 5-pin, B-coded (SSI), M 12x1 plug, 8-pin, service	◆			◆		
Material							
Housing	ABS / PC	◆	◆	◆	◆	◆	◆
Optical face	Plastic pane	◆	◆	◆	◆	◆	◆
Mass	0.8 kg	◆	◆	◆	◆	◆	◆

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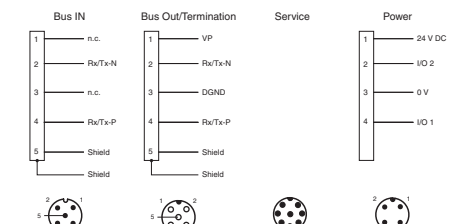
VDM100-50-SSI  
VDM100-150-SSI



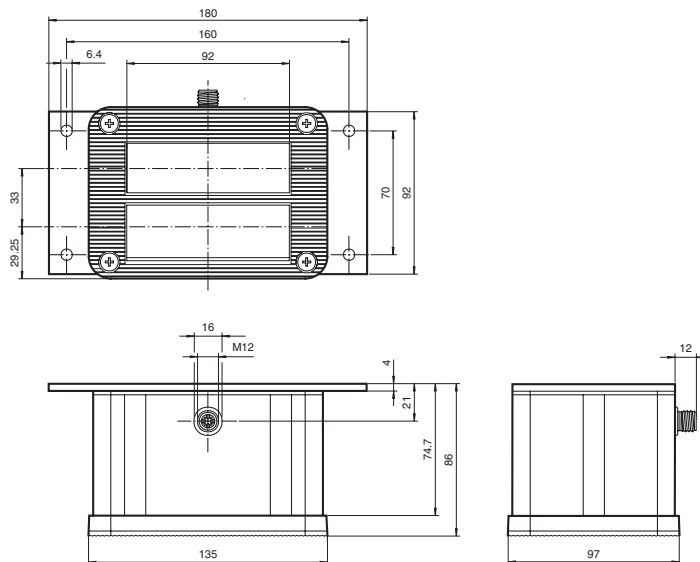
VDM100-50-IBS  
VDM100-150-IBS



VDM100-50-P  
VDM100-150-P



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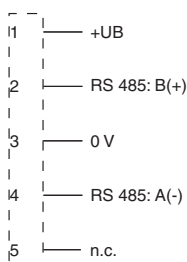
- Not sensitive to ambient light
- Sturdy housing
- Object tracking also when cornering up to +/- 40°
- Simple switching of the measuring direction for cornering or straight ahead navigation



The shown photograph and dimensions drawing are sensor family representatives. The real appearance of a particular product might be slightly different and is shown in the product data sheet on www.pepperl-fuchs.com.

Measurement range	400 ... 4900 mm	◆
Reference target	Reflector 800 mm x 200 mm type OFR-800/200	◆
Light source	2 x 7 emit LEDs, 626 nm	◆
Angle of divergence	max. ± 40 ° horizontal, max. ± 6 ° vertical	◆
Linearity error	± 125 mm	◆
Temperature influence	≤ 17 mm/K	◆
Read out rate	50 s <sup>-1</sup>	◆
Operating display	LED green	◆
Function display	LED yellow: Target (reflector) detected	◆
Operating voltage	18 ... 30 V DC	◆
Ripple	10 %	◆
No-load supply current	≤ 250 mA	◆
Data rate	62500 MBit/s	◆
Interface type	RS 485, half duplex	◆
Ambient temperature	10 ... 50 °C (283 ... 323 K)	◆
Protection degree	IP64 according to EN 60529	◆
Connection	connector M12 x 1, 5-pin	◆
Material		
Housing	aluminium, lacquer-coated, fixing plate: aluminium, anodised	◆
Optical face	PMMA	◆
Mass	1000 g	◆

EDM/EHB-5-R

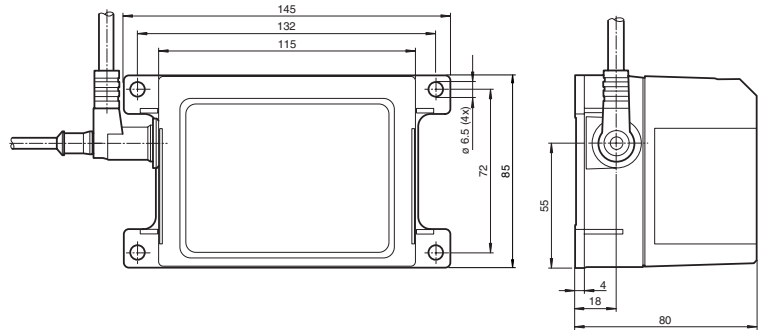


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VDM54-6000-R/20/105



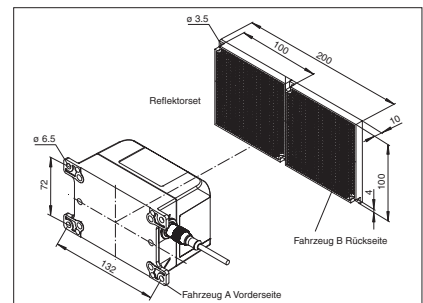
- Not sensitive to ambient light
- Time-of-flight measurement
- Adjustable switch outputs
- VDM54-6000-R/20/105



		VDM54-6000-R/20/105	VDM54-6000-R/20/89/105
Sensing range	0 ... 6 m	◆	◆
Reference target	Reflector H100-2R	◆	◆
Light source	laser diode	◆	◆
Laser class	1 EN 60825-1	◆	◆
Operating display	LED green	◆	◆
Function display	Switching state (output): 2x LED red Operating mode (Banking) : LED, green	◆	◆
Operating voltage	18 ... 30 V DC	◆	◆
Ripple	10 % within the supply tolerance	◆	◆
No-load supply current	≤200 mA	◆	◆
Switching type	dark ON	◆	◆
Interfaces	RS 485	◆	◆
Signal output	2 pnp, short-circuit proof, protected against reverse polarity	◆	◆
Switching current	max. 200 mA	◆	◆
Voltage drop	≤2.4 V	◆	◆
Ambient temperature	0 ... 50 °C (273 ... 323 K)	◆	◆
Protection degree	IP 54	◆	◆
Connection	connector M12 x 1, 5-pin	◆	◆
Housing	ABS	◆	◆
Mass	200 g	◆	◆

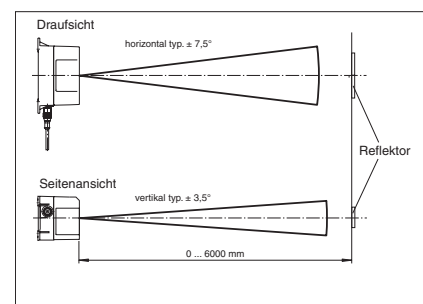
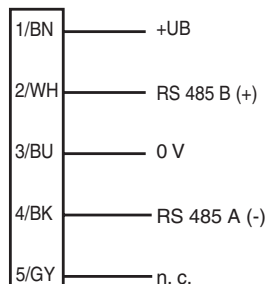
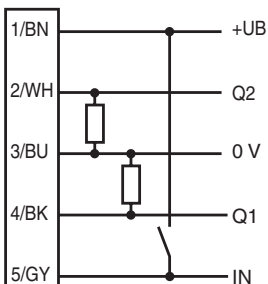
Positioning / Position sensing, Laser ranging

7.2



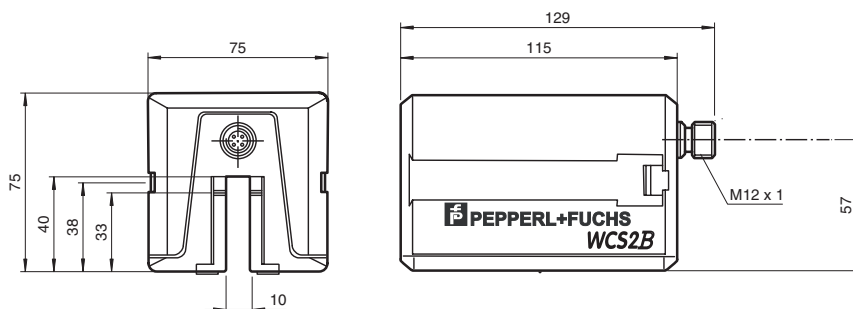
VDM54-6000-R/20/105

VDM54-6000-R/20/89/105



Date of edition 2008-03-20

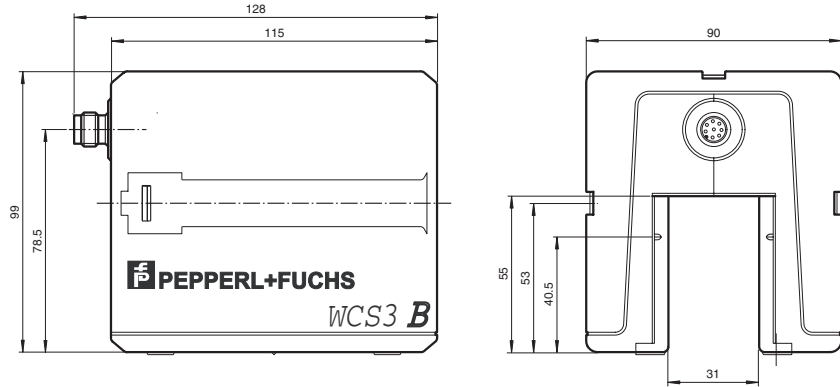
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- **Non-contact, absolute position encoder**
- **Automatic detection of dirt accumulation**
- **RS 485 interface**  
WCS2B-LS1\*\*  
WCS2B-LS2\*\*
- **SSI interface**  
WCS2B-LS310  
WCS2B-LS311
- **Output of position and speed**  
WCS2B-LS1\*\*  
WCS2B-LS2\*\*



		WCS2B-LS1**	WCS2B-LS2**	WCS2B-LS310	WCS2B-LS311
Measuring range	max. 327 m	◆	◆	◆	◆
Resolution	± 0.42 mm (1,200 positions/m)	◆	◆	◆	◆
Passage speed	≤ 12.5 m/s	◆	◆	◆	◆
Free tolerances to code rail	horizontal: 10 mm (± 5 mm) vertical: 10 mm (± 5 mm)	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
Power consumption	2 VA with option heating: 9 VA at 24 V DC	◆	◆	◆	◆
Interface type	RS 485 interface SSI interface	◆	◆	◆	◆
Data output code	binary code binary code, 25 bits Gray code, 25 bits	◆	◆	◆	◆
Transferrate	Baud rate 19.2 kB it/s ... 187.5 kB it/s (to be defined with order)	◆	◆	◆	◆
Clock frequency	100 ... 1000 kHz	◆	◆	◆	◆
Termination	with RS 485 termination without RS 485 termination	◆	◆	◆	◆
Pause time	≥ 20 μs double request possible, if t <sub>p</sub> ≤ 10 μs	◆	◆	◆	◆
Operating temperature	0 ... 60 °C (273 ... 333 K) with option heating: -40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆
Relative humidity	90 %, non-condensing	◆	◆	◆	◆
Connection type	connector M12 x 1, 5-pin connector M12 x 1, 8-pin	◆	◆	◆	◆
Protection degree	IP54	◆	◆	◆	◆
Housing	ABS, Polycarbonate, Polyamide (PA)	◆	◆	◆	◆
Mass	500 g	◆	◆	◆	◆
Ordering information	Mounting plate included in scope of delivery	◆	◆	◆	◆



- **Non-contact, absolute position encoder**
- **Automatic detection of dirt accumulation**
- **Output of position and speed**  
 WCS3B-LS1\*\*  
 WCS3B-LS2\*\*  
 WCS3B-LS410
- **RS 485 interface**  
 WCS3B-LS1\*\*  
 WCS3B-LS2\*\*
- **SSI interface**  
 WCS3B-LS310
- **CANopen interface**  
 WCS3B-LS410

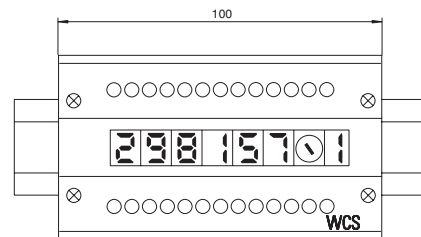
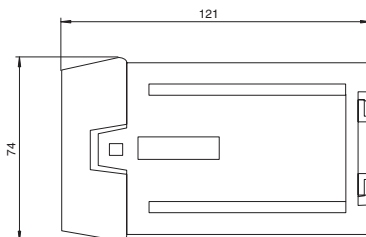


		WCS3B-LS1**	WCS3B-LS2**	WCS3B-LS310	WCS3B-LS410
Measuring range	max. 314.5 m	◆	◆	◆	◆
Resolution	± 0.4 mm (1,250 positions/m)	◆	◆	◆	◆
Passage speed	≤ 12.5 m/s	◆	◆	◆	◆
Free tolerances to code rail	horizontal: 31 mm ( ± 15.5 mm ) vertical: 28 mm ( ± 14 mm )	◆	◆	◆	◆
Operating display	LED green: power on	◆	◆	◆	◆
Data flow display	LED yellow: data communication active	◆	◆	◆	◆
velocity indication	LED yellow (only with option S, velocity output) off, if speed limit is exceeded (instead of data flow display)	◆	◆	◆	◆
error display	LED red flashing: reading head outside of code rail permanently on: internal diagnostic test failed	◆	◆	◆	◆
Display	6-digit 7-segment display (only with option D, display) adaptable to installation position	◆	◆	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆	◆	◆
Power consumption	2 VA with option heating: 11 VA at 24 V DC	◆	◆	◆	◆
Interface type	CANopen , electrically isolated				◆
	RS 485 interface	◆	◆		
	SSI interface			◆	
Data output code	binary code	◆	◆		◆
	binary code , 25 bits			◆	
Transfer rate	Baud rate 19.2 kBit/s ... 187.5 kBit/s (to be defined with order) max. 1 MBit/s	◆	◆		◆
Clock frequency	100 ... 1000 kHz			◆	
Termination	with RS 485 termination		◆		
	without RS 485 termination	◆			
	switchable				◆
Pause time	≥ 20 µs double request possible, if t <sub>p</sub> ≤ 10 µs			◆	
Output velocity	switch output , short-circuit proof (only with option S, velocity output)	◆	◆	◆	
Switching voltage	Operating voltage	◆	◆	◆	
Operating temperature	0 ... 60 °C (273 ... 333 K) with option heating: -40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆
Relative humidity	90 % , non-condensing	◆	◆	◆	◆
Connection type	connector M12 x 1, 5-pin connector M12 x 1, 8-pin	◆	◆	◆	◆
Protection degree	IP54	◆	◆	◆	◆
Housing	ABS , PC (Polycarbonate)	◆	◆	◆	◆
Mass	500 g	◆	◆	◆	◆
Ordering information	Mounting plate included in scope of delivery	◆	◆	◆	◆

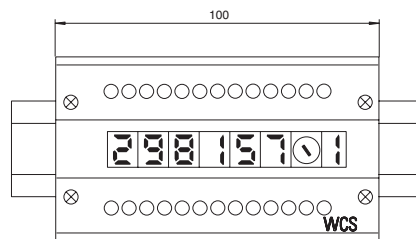
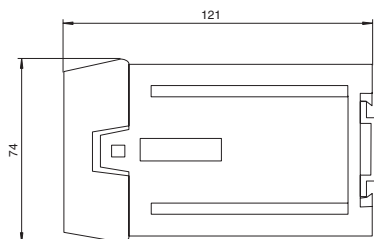




- Integrated display
- Connection of up to 4 reading heads LS211 or LS111
- DIN rail mounting



		WCS-IP11*
Installation	DIN rail mounting	◆
Operating voltage	24 V ± 20 %	◆
Power consumption	≤ 2 W (without reading heads)	◆
Connection of control system		◆
Interface type	push-pull, parallel	◆
Transferrate	max. 500 Updates/s	◆
Output stage	Push-pull output	◆
Operating current	max. 15 mA	◆
Data output format	WCS-IP110 : binary code WCS-IP111 : Gray code	◆
Connection of Read head		◆
Connectable reading heads	WCS-LS211 , WCS-LS111	◆
Interface type	RS 485	◆
transmission method	half duplex	◆
RS 485 termination resistor	integrated	◆
Control input	store input 2 inputs for reading head address	◆
Signal output	err or condition	◆
Output type	Push-pull output	◆
Rated operational current	≤ 15 mA	◆
Operating temperature	0 ... 55 °C (273 ... 328 K)	◆
Relative humidity	≤ 80 %	◆
Connection type	removable terminal block	◆
Housing width	100 mm	◆
Height of housing	74 mm	◆
Housing depth	121 mm	◆
Protection degree	IP20	◆
Material	plastic	◆
Installation position	any position	◆
Mass	approx. 400 g	◆



- Integrated display
- Long possible cable length between reading head and SSI master
- DIN rail mounting

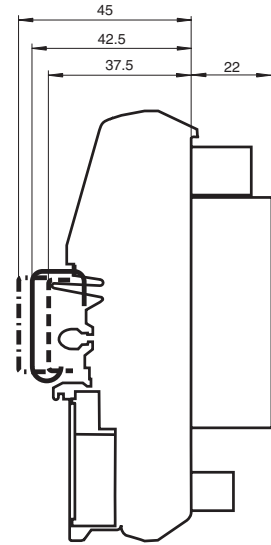
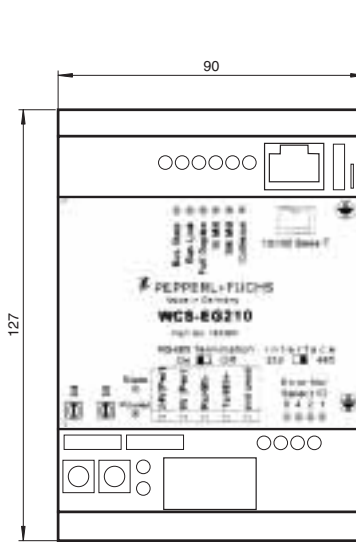


		WCS-IS31*	WCS-IS32*
Installation	DIN rail mounting	◆	◆
Operating voltage	24 V ± 20 %	◆	◆
Power consumption	≤ 2 W (without reading heads)	◆	◆
Connection of control system		◆	◆
Interface type	SSI	◆	◆
Transfer rate	max. 500 kHz	◆	◆
Data output format	WCS-IS310 : binary code WCS-IS311 : Gray code	◆	
	WCS-IS320 : binary code WCS-IS321 : Gray code		◆
Bus termination resistor	integrated	◆	◆
Connection of Read head		◆	◆
Connectable reading heads	WCS-LS211 WCS-LS221	◆	◆
Interface type	RS 485	◆	◆
transmission method	half duplex	◆	◆
RS485 termination resistor	integrated	◆	◆
Operating temperature	0 ... 55 °C (273 ... 328 K)	◆	◆
Relative humidity	≤ 80 %	◆	◆
Connection type	removable terminal block	◆	◆
Housing width	100 mm	◆	◆
Height of housing	74 mm	◆	◆
Housing depth	121 mm	◆	◆
Protection degree	IP20	◆	◆
Material	plastic	◆	◆
Installation position	any position	◆	◆
Mass	approx. 350 g	◆	◆

Positioning / Position sensing, Position encoding system WCS

7.3

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- Up to 4 reading heads can be connected
- DIN rail mounting
- CANopen interface  
WCS-CG210
- DeviceNet interface  
WCS-DG210
- INTERBUS interface  
WCS-IG110
- PROFIBUS interface  
WCS-PG210
- Ethernet interface with TCP/IP and UDP/IP  
WCS-EG210

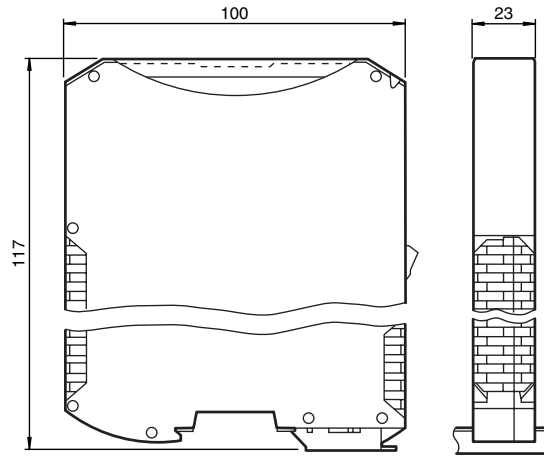


DeviceNet. CANopen

		WCS-PG210	WCS-DG210	WCS-CG210	WCS-EG210	WCS-IG110
Installation	DIN rail mounting	◆	◆	◆	◆	◆
Operating voltage	24 V ± 10 %	◆	◆	◆	◆	◆
	24 V ± 20 %	◆	◆	◆	◆	◆
Power consumption	≤ 3.6 W (without reading heads)	◆	◆	◆	◆	◆
Connection of control system		◆	◆	◆	◆	◆
Interface type	CANopen			◆		
	DeviceNet		◆			
	Ethernet				◆	
	INTERBUS-S					◆
Transferrate	PROFIBUS DP					◆
	max. [MBit/s]	12	500	1	10/100	0.5/2
Data output format	binary code	◆	◆	◆	◆	◆
	binary code / Gray code, switchable					◆
Bus termination resistor	switchable	◆	◆	◆	◆	◆
Connection of Read head		◆	◆	◆	◆	◆
Connectable reading heads	WCS-LS221, WCS-LS 121	◆	◆	◆	◆	◆
Interface type	RS 485	◆	◆	◆	◆	◆
transmission method	half duplex	◆	◆	◆	◆	◆
RS 485 termination resistor	switchable	◆	◆	◆	◆	◆
Operating temperature	0 ... 45 °C (273 ... 318 K), no moisture condensation	◆	◆	◆	◆	◆
Relative humidity	≤ 80 %	◆	◆	◆	◆	◆
Connection type	Interface 1: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin		◆			
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin					
	Interface 1: RJ-45 socket, 8-pin				◆	
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin					
	Interface 1: 9-pin Sub-D connector	◆		◆		
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin					
	Interface 1: 9-pin Sub-D connector and Sub-D socket, 9-pin					◆
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin					
Housing width	90 mm	◆	◆	◆	◆	◆
Height of housing	127 mm	◆	◆	◆	◆	◆
Housing depth	55 mm	◆	◆	◆	◆	◆
Protection degree	IP24	◆	◆	◆	◆	◆
Material	plastic	◆	◆	◆	◆	◆
Installation position	any position	◆	◆	◆	◆	◆
Mass	approx. 200 g	◆	◆	◆	◆	◆

Positioning / Position sensing, Position encoding system WCS

7.3



- Up to 4 reading heads can be connected
- DIN rail mounting



		WCS-PNG110	WCS-MBG110
Installation	DIN rail mounting	◆	◆
Operating voltage	24 V ± 10 %	◆	
	24 V ± 20 %		◆
Power consumption	≤ 3.6 W (without reading heads)	◆	◆
Connection of control system	Ethernet	◆	◆
Interface type	RS 422		◆
Transfer rate	10 MBit/s or 100 MBit/s	◆	
	19.2 kBit/s or 38.4 kBit/s		◆
Data output format	binary code	◆	◆
Bus termination resistor	switchable		◆
Connection of Read head	WCS-LS221, WCS-LS121	◆	◆
Connectable reading heads	RS 485	◆	◆
Interface type	half duplex	◆	◆
transmission method	switchable	◆	◆
RS485 termination resistor	0 ... 45 °C (273 ... 318 K), no moisture condensation	◆	
Operating temperature	-20 ... 55 °C (253 ... 328 K), no moisture condensation		◆
Relative humidity	≤ 80 %	◆	◆
Connection type	Interface 1: terminal connection ≤ 2.5 mm <sup>2</sup>		◆
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup>		
	Interface 1: RJ-45 socket, 8-pin	◆	
	Interface 2: terminal connection ≤ 2.5 mm <sup>2</sup> , 5 pin		
Housing width	23 mm	◆	◆
Height of housing	100 mm (without connector/terminals)		◆
	118 mm	◆	
Housing depth	115 mm	◆	
	117 mm (without connector/terminals)		◆
Protection degree	IP20	◆	◆
Material	plastic	◆	◆
Installation position	any position	◆	◆
Mass	approx. 130 g		◆
	approx. 200 g	◆	

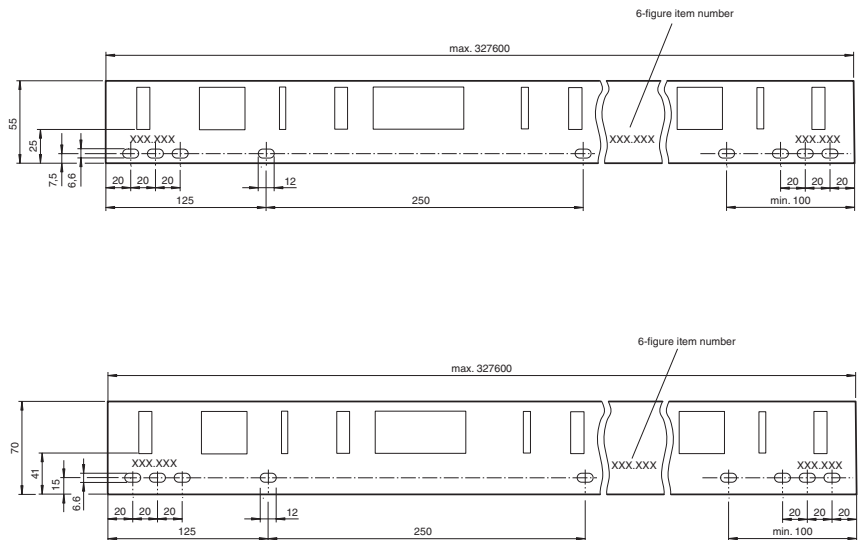
Positioning / Position sensing, Position encoding system WCS

7.3

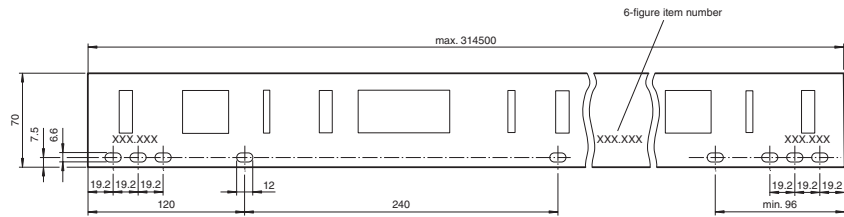
Date of edition 2008-03-20



- **Flexible installation by means of alu profile- or mounting bracket system**
- **High mechanical stability**  
WCS2-C S55-M1  
WCS2-C S70-M1
- **Suitable for applications with wide temperatur variations**  
WCS2-C S55-M1  
WCS2-C S70-M1
- **High chemical resistance**  
WCS2-C S55-L1  
WCS2-C S70-L1
- **Low weight**  
WCS2-C S55-L1  
WCS2-C S70-L1



		WCS2-CS55-L1	WCS2-CS55-M1	WCS2-CS70-L1	WCS2-CS70-M1
Length	0.1 ... 327 m	◆	◆	◆	◆
Radius of bend	≥ 500 mm	◆	◆	◆	◆
Operating temperature	-40 ... 100 °C (233 ... 373 K)	◆	◆	◆	◆
Installation temperature	-40 ... 60 °C (233 ... 333 K)	◆	◆	◆	◆
Material thickness	0.5 mm	◆	◆	◆	◆
	0.7 mm	◆	◆	◆	◆
Tension loading	≤	230 N	4500 N	340 N	6500 N
Material	stainless steel 1.4310	◆	◆	◆	◆
	polyester laminate	◆	◆	◆	◆
Thermal expansion coefficient	approx. $2.8 \times 10^{-5} / K$	◆	◆	◆	◆
	$1.6 \times 10^{-5} / K$	◆	◆	◆	◆
Mass	/ m	30 g	175 g	40 g	240 g



- **Flexible installation by means of alu profile- or mounting bracket system**
- **High mechanical stability**  
WCS3-CS70-M1
- **Suitable for applications with wide temperatur variations**  
WCS3-CS70-M1
- **High chemical resistance**  
WCS3-CS70-L\*
- **Low weight**  
WCS3-CS70-L\*

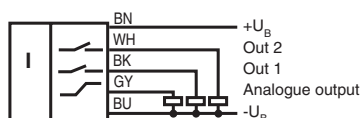
		WCS3-CS70-L*	WCS3-CS70-M1
Length	0.1 ... 314.5 m	◆	◆
Radius of bend	≥ 300 mm	◆	◆
Operating temperature	-40 ... 100 °C (233 ... 373 K)	◆	◆
Installation temperature	10 ... 60 °C	◆	◆
Material thickness	0.5 mm	◆	◆
Tension loading	≤ 260 N	◆	◆
	≤ 5000 N	◆	◆
Material	stainless steel 1.4310	◆	◆
	polyester laminate	◆	◆
Thermal expansion coefficient	approx. 2.8 x 10 <sup>-5</sup> / K	◆	◆
	1.6 x 10 <sup>-5</sup> / K	◆	◆
Mass	240 g / m	◆	◆
	40 g / m	◆	◆
Ordering information	WCS3-CS70-L0: without mounting holes WCS3-CS70-L1: with standard mounting holes WCS3-CS70-L2: with Vahle VKS mounting holes	◆	◆



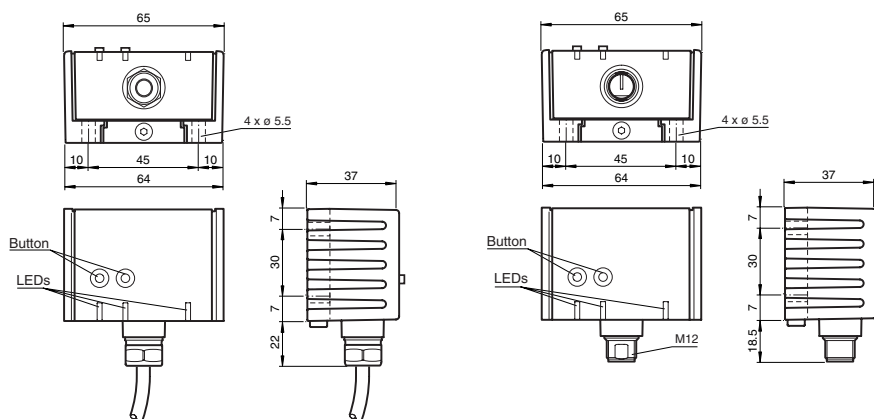
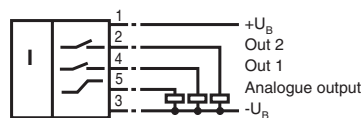
- Measuring range 0 ... 360°
- Analogue output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 switch outputs freely adjustable

**Electrical connection**

Standard symbol/Connection:



Standard symbol/Connection:



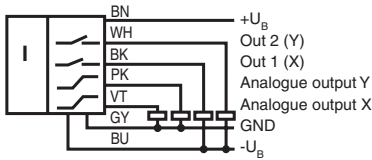
		INX360D-F99-I2E2-V15	INX360D-F99-I2E2-5M
Measurement range	0 ... 360 °	◆	◆
Absolute accuracy	≤ ± 0.5 °	◆	◆
Resolution	≤ 0.1 °	◆	◆
Repeat accuracy	≤ ± 0.1 °	◆	◆
Temperature influence	≤ 0.027 °/K	◆	◆
Operating display	LED, green	◆	◆
Teach-In indication	2 LEDs yellow /switching status), flashing	◆	◆
Button	2 pushbuttons ( TEACH-IN of the switch points , TEACH-IN for evaluation range )	◆	◆
Switching state	2 yellow LEDs: Switching status (each output)	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 25 mA	◆	◆
Time delay before availability	≤ 200 ms	◆	◆
Output type	2 switch outputs pnp, NO , protected against reverse polarity , short-circuit proof	◆	◆
Operating current	≤ 100 mA	◆	◆
Voltage drop	≤ 3 V	◆	◆
Output type	1 current output 4 ... 20 mA	◆	◆
Load impedance	nicht uebersetzt!	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆
Connection type	connector M12 x 1, 5-pin	◆	◆
Housing material	Grivory 30% GF	◆	◆
Protection degree	IP68 / IP 69K	◆	◆
Mass	240 g	◆	◆



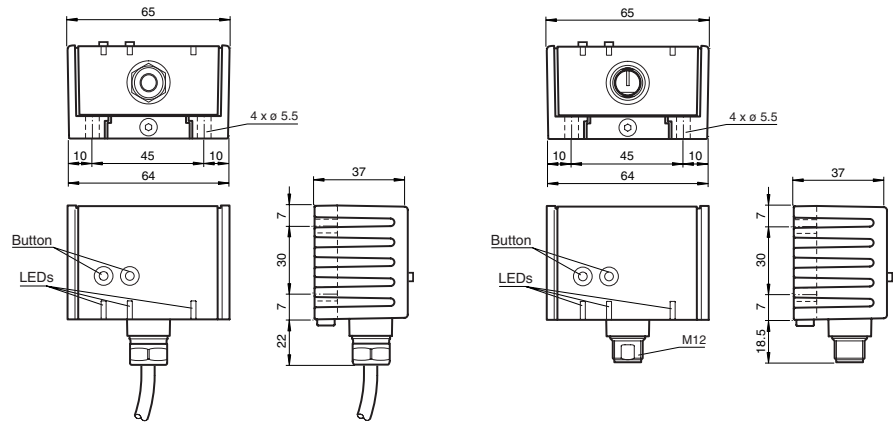
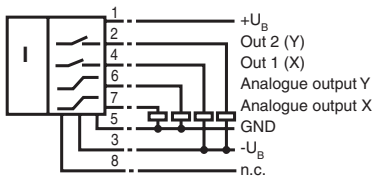
- Measuring range 0 ... 360°
- Analogue output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 switch outputs freely adjustable

**Electrical connection**

Standard symbol/Connection:



Standard symbol/Connection:



		INY360D-F99-2I2E2-V17	INY360D-F99-2I2E2-5M
Measurement range	0 ... 360 °	◆	◆
Absolute accuracy	≤ ± 0.5 °	◆	◆
Resolution	≤ 0.1 °	◆	◆
Repeat accuracy	≤ ± 0.1 °	◆	◆
Temperature influence	≤ 0.027 °/K	◆	◆
Operating display	LED, green	◆	◆
Teach-In indication	2 LEDs yellow /switching status), flashing	◆	◆
Button	2 pushbuttons ( TEACH-IN of the switch points , TEACH-IN for evaluation range )	◆	◆
Switching state	2 yellow LEDs: Switching status (each output)	◆	◆
Operating voltage	10 ... 30 V DC	◆	◆
No-load supply current	≤ 25 mA	◆	◆
Time delay before availability	≤ 200 ms	◆	◆
Output type	2 switch outputs pnp, NO , protected against reverse polarity , short-circuit proof	◆	◆
Operating current	≤ 100 mA	◆	◆
Voltage drop	≤ 3 V	◆	◆
Output type	2 current outputs 4 ... 20 mA (one output for each axis)	◆	◆
Load impedance	nicht uebersetzt!	◆	◆
Ambient temperature	-25 ... 85 °C (248 ... 358 K)	◆	◆
Connection type	connector M12 x 1, 8-pin	◆	◆
	5 m, PUR cable 7x 0.5 mm <sup>2</sup>	◆	◆
Housing material	Grivory 30% GF	◆	◆
Protection degree	IP68 / IP69K	◆	◆
Mass	240 g	◆	◆



# Evaluation devices

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## Overview

Besides the sensors in the previous chapters Pepperl+Fuchs also offers a wide product range for the evaluation of signals.

The sensor signals often need to be displayed clearly visible on site or further processed and used for the direct process control. For the optimum solution of this task we offer you a wide range of

- displays
- counters
- rate measurement devices
- switchgear
- sensor output converters
- speed monitors
- frequency converters
- standstill monitors.

## 1 Displays and counters

### 1.1 Visibility

Choose from 4 standard sizes for your application requirements. The front dimensions are 48x24 / 48x48 / 96x48 and 32x15 mm.

When good visibility is required, or perhaps if the observer is several meters from the display, the 96x48 mm size offers a solution with its highly visible LED.

### 1.2 Display type

Units are available with a high-contrast liquid crystal display (LCD) or a light emitting diode display (LED). The LCD display is more economical and requires less current. When a high level of readability is required, a large LED display should be selected.

### 1.3 Electromechanical counters

Electromechanical counters are used where no electrical output signals are required and a cost-effective counting function has to be achieved with or without a reset function. The KCM series satisfies these requirements.

### 1.4 Electronic preset counters

Electronic preset counters are used to control sequences via switch outputs and to display scaled values. KCT series electronic counters with LED display offer excellent readability.

### 1.5 Time measurement

The KCN and KCT series multifunction devices are suitable for both short and long-term measurements. They can measure times to an accuracy of one millisecond. The measuring intervals can be automatically started and stopped through the use of 2 inputs. Long term measurements are also possible. The maximum displayable time is 999999 hours.

### 1.6 Velocity / frequency measurement

In order to measure revolutions and frequencies, pulse separations are measured (measurement of the period of oscillation between 2 pulses). The indication can simply be scaled and represented in Hertz or rpm. The KCN and KCT series are ideal for these applications.

### 1.7 Multifunction devices

The KCN and KCT series with the timer, counter, and frequency measurement functions provide solutions when a number of signals must be acquired by one device and the related programming adapted quickly to the specific application. These series also offer advantages where future plant modifications may be involved and in reducing inventory by utilizing just one device.

### 1.8 Displaying analog values

The DA5 series is used to display measured analog values such as pressure, temperature, and distance. These devices provide a scaled indication of the measured values in a digital presentation with excellent readability. The series features a 96x48 mm display and two relay outputs for level detection. Depending on model selected, the display can provide power to the sensor.

### 1.9 Operation

The requirements vary depending on the specific application, but generally include:

- no adjustability / only reset function, so that nothing can be re-adjusted
- operation as simple and straightforward as possible, with limited functionality
- menu-driven operating control with great flexibility

These requirements are covered with Pepperl+Fuchs multifunction series:

- KCM (no adjustment option)
- KCY (simple adjustment of preset values by one button for each position)
- KCN and KCT (menu-driven operation up to the connection via an RS 232 interface; push-button lock can be activated).

## Overview of displays and counters

Type designation	Display type				Supply			Feature							Dimensions				Page		
	Digital display	LED display	LCD display	Number of digits	24 V DC	240 V AC	2 x 3.6 V battery (Lithium)	Number of presets	Adding	Subtracting	90° offset	Analog input (V/mA)	Relay output	Transistor output	Reset button	External reset	48 x 24 mm	48 x 48 mm		96 x 48 mm	32 x 15 mm
DA5-IU-C		•		5	•			2				•	0	0	•	•	•				627
DA5-IU-2K-C		•		5	•			2				•	2	0	•	•		•			628
DA5-IU-2K-V		•		5		•		2	•			•	2	0	•	•		•			628
KCM-51-C	•			5	•			0	•				0	0	•		•				629
KCM-51-V	•			5		•		0	•				0	0	•		•				629
KCM-70-C	•			7	•			0	•				0	0			•				630
KCM-70-V	•			7		•		0	•				0	0			•				630
KCM-70A-C	•			7	•			0	•				0	0						•	631
KCM-70A-V	•			7		•		0	•				0	0						•	631
KCT-6S-C		•		6	•			0	•	•	•		0	0	•	•	•				632
KCT-6ST-C		•		6	•			1	•	•	•		0	1	•	•	•				632
KCT1-6SR-C		•		6	•			1	•	•	•		1	0	•	•					633
KCT1-6SR-V		•		6		•		1	•	•	•		1	0	•	•					633
KCT1-6WR/RS232-V		•		6		•		2	•	•	•		2	0	•	•					634
KCT2-6ST-V		•		6		•		1	•	•	•		0	1	•	•			•		635
KCT1-5SR-V		•		5		•		1	•	•	•		1	0	•	•					636
KCY1-6SR-B			•	6			•	1	•	•	•		1	0	•	•					637
KCN1-6SR-C			•	6	•			1	•	•	•		1	0	•	•					638
KCN1-6SR-V			•	6		•		1	•	•	•		1	0	•	•					638
KCN1-6ST-C			•	6	•			1	•	•	•		0	1	•	•					639
KCN1-6ST-V			•	6		•		1	•	•	•		0	1	•	•					639
KCN1-6WR-C			•	6	•			2	•	•	•		2	0	•	•					640
KCN1-6WR-V			•	6		•		2	•	•	•		2	0	•	•					640
KCN1-6WT-C			•	6	•			2	•	•	•		0	2	•	•					641
KCN1-6WT-V			•	6		•		2	•	•	•		0	2	•	•					641

## 2 Rate monitors

Rate monitors are pulse-controlled time/frequency measuring devices. Unlike the standard speedometers (KCT...) that count the incoming pulses within a fixed time interval, our TC series rate monitor evaluates the period of time between two consecutive input pulses (cycle method).

The time period is assigned an adjustable multiplication factor and converted into a rotational speed in rpm or a velocity, depending on the mode of operation.

The advantage:

The cycle method only requires one pulse per rotation and maximum of two rotations to capture the speed with high accuracy.

$$\text{Speed} = 1 / T \times 60 \text{ min}^{-1}$$

T = time between two pulses  
 $\text{min}^{-1}$  = rotations per minute

## 3 Switchgear

The FC-21-V electronic cam switch functions the same as a mechanical cam switch.

The position of the machine to be controlled is read from an absolute value rotary encoder. Depending on the resolution of the rotary encoder, up to 512 cams can be programmed on each of the 24 cam paths. The electronic outputs are switched on and off depending on the position obtained.

The FC-21-V outputs are used to initiate the actuating elements of the machine (solenoid valves, relays, etc.) according to the operating cycle. It also provides a link to higher level control systems (PLCs, etc.).

The FC-21-V electronic cam switch meets the requirements of flexible manufacturing by storing up to 10 different programs in the working memory (EEPROM) and allowing their external selection.

To back up the data, the programs can be saved onto standard compact cassettes using a cassette recorder.

## 4 Sensor output converters

Sensor output converters form the interface between the sensor and the controller if the output signal of the sensor cannot be processed directly. This is the case when a 2-wire sensor with Namur interface has to directly switch a load. The sensor may be used with an output converter that supplies power to the sensor and lead monitoring functions. The sensor output evaluates the sensor circuit and switches its output accordingly. Sensor output converters are also used to convert 3 wire sensors when the current load capacity of the sensor output is not sufficient for the connected load.

## 5 Speed monitors

A speed monitor is a device used to indicate and monitor periodic signals (frequencies and rotational speeds) which occur in almost all areas of automation and process engineering.

The input signals are evaluated using the cycle method. That is by measuring the duration of a period and then converting it by a very fast microcontroller to a frequency or rotational speed.

During the development of this device, the frequently occurring case of rotational speed measurement was given particular attention. For this reason, indications and inputs can be either in Hz or in rpm. There is also the option in applications with slow processes whose sensors provide several pulses per rotation to automatically operate using the actual drive speed by pre-setting the number of pulses per rotation.

The monitoring function is achieved by a limit value whose upper and lower hysteresis values can be freely selected within the respective measurement or indicating range. The output signal is generated if the preset limits are exceeded upwards or downwards.

These devices include ON delay and OFF delay, defined ON time, and pulse lengthening features. Under-speed or overspeed monitoring can also be selected. A built-in start-up override prevents false signals from occurring during the start-up of the monitored system.

All currently available two-, three-, or four-wire sensors and rotary encoders are acceptable as the sensor. In addition, terminals are available for connecting sensors according to DIN 19234 (NAMUR).

## 6 Frequency to voltage/current converter

Frequency to voltage/current converters have a function similar to speed monitors. The difference is that a voltage or current value proportional to the input frequency

- 0 V ... 10 V
- 2 V ... 10 V
- 0 mA ... 20 mA
- 4 mA ... 20 mA

is used as an output signal. The pulse output produces the input frequency divided by the adjustable factor (1 ... 1200).



- Bright, high contrast 5-digit LED indicator
- Leading zero suppression
- Adjustable decimal point
- Maximum- and minimum-value display

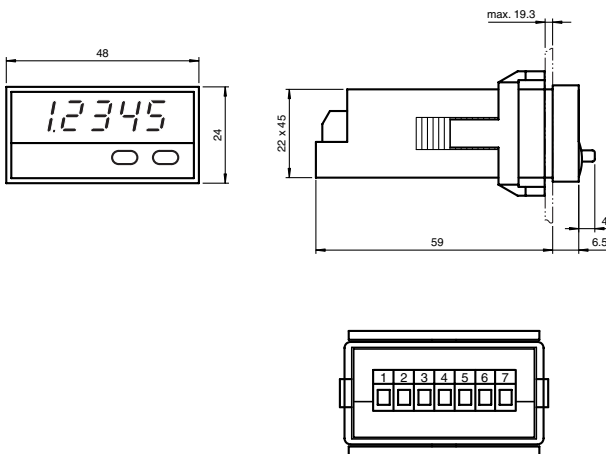
**Function**

The DA5-IU-C permits a simple visual inspection by operating and maintenance personnel. It converts the analogue sensor output signal into a readable form for this purpose. Depending on the task or setting, 4 ... 20 mA or 0 ... 100 % values can be displayed.

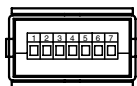
**Scope of delivery:**

- Process control unit DA5-IU-C
- Screw terminal, 7-pin
- Clamp clip
- Seal
- 1 sheet of adhesive symbols

**Dimensions**



**Electrical connection**



Terminal No.	
1	10 ... 30 V DC
2	0 V (GND)
3	0 V LATCH
4	LATCH
5	Current input
6	0 V input signal
7	Voltage input

General specifications	DA5-IU-C
Pre-selection	none
Data storage	10 <sup>6</sup> storage cycles or 10 years, EEPROM
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	5
Display value	digit height 8 mm
Display interval	-19999 ... 99999
Decimal point	freely adjustable
Resolution	14 Bit
Scale factor	via linear characteristic curve
Reset	maximum value, manually
Key interlock	-
<b>Electrical specifications</b>	
Operating voltage	10 ... 30 V DC
Power consumption	1.5 VA
<b>Input</b>	
Impedance	1 MOhm
Voltage	max. 30 DC
Analogue voltage input	0 ... 10 V / 2 ... 10 V DC
Analogue current input	0 ... 20 mA / 4 ... 20 mA
<b>Mechanical specifications</b>	
Connection	7-pin screw terminal
	max. core cross-section 0.34 ... 1.5 mm <sup>2</sup>
Mass	approx. 50 g



- 2 adjustable limit values
- 2 relay outputs
- Operation via keypad
- Programmable characteristics
- Resetting the outputs, automatic, manual or with external signal
- Connection via plug-in screw terminals
- Auxiliary power output for sensors (Only DA5-IU-2K-V)
- Protection degree IP65 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6
- System hum suppression

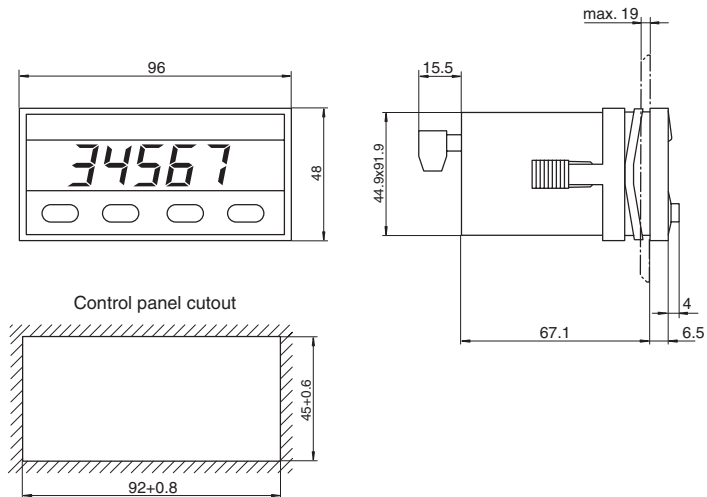
**Function**

The DA5-IU-2K... permits a simple visual inspection by operating and maintenance personnel. It converts the analogue sensor output signal into a readable form for this purpose. Depending on the task or setting, 4 mA ... 20 mA or 0 % ... 100 % values can be displayed.

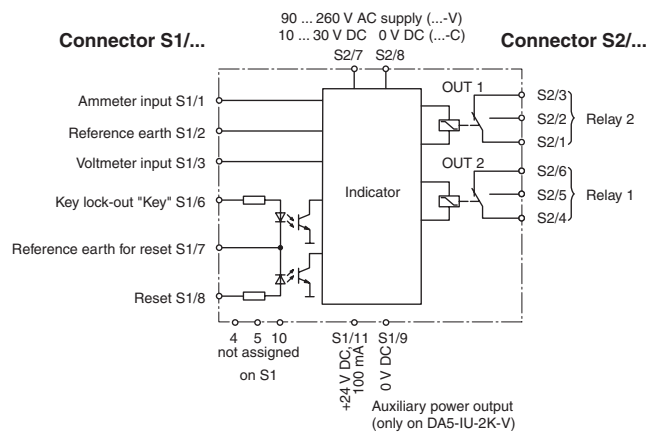
**Scope of delivery:**

- Process control unit DA5-IU-2K-...
- Screw terminals  
1 RM 5.08 8-pole terminal for power supply and outputs  
1 RM 3.81 11-pole terminal for measuring and control inputs
- Clamp clip
- Seal
- 1 sheet of adhesive symbols

**Dimensions**



**Electrical connection**



	DA5-IU-2K-C	DA5-IU-2K-V
<b>General specifications</b>		
Pre-selection		2-fold
Data storage		10 <sup>6</sup> storage cycles or 10 years, EEPROM
Programming		keypad-driven menu
<b>Indicators/operating means</b>		
Type		7-segment LED display, red
Number of decades		5
Display value		digit height 14.2 mm
Pre-selection		digit height 14.2 mm
Display interval		-19999 ... 99999
Decimal point		freely adjustable
Resolution		14 Bit
Scale factor		via characteristic curve with up to 24 value pairs
Reset		manually or external
Key interlock		with "high"-level at terminal "KEY"
<b>Electrical specifications</b>		
Operating voltage	10 ... 30 V DC	90 ... 260 V AC
Power consumption	2 W	7 VA
<b>Output</b>		
Relay	2 x 250 V AC / 300 V DC, 3 A, change-over contact	2 x 250 V AC / 300 V DC, 3 A, change-over contact
Sensor supply	-	24 V DC, 100 mA
<b>Input</b>		
Impedance		> 1 MΩ for voltage measurement < 50 Ω for current measurement
Analogue voltage input		0 ... 10 V / 2 ... 10 V DC, -10 ... 10 V DC
Analogue current input		0 ... 20 mA / 4 ... 20 mA
<b>Mechanical specifications</b>		
Connection	8-pin and 11 pin connectors with plug-in screw terminals	
Mass	220 g	

Evaluation devices

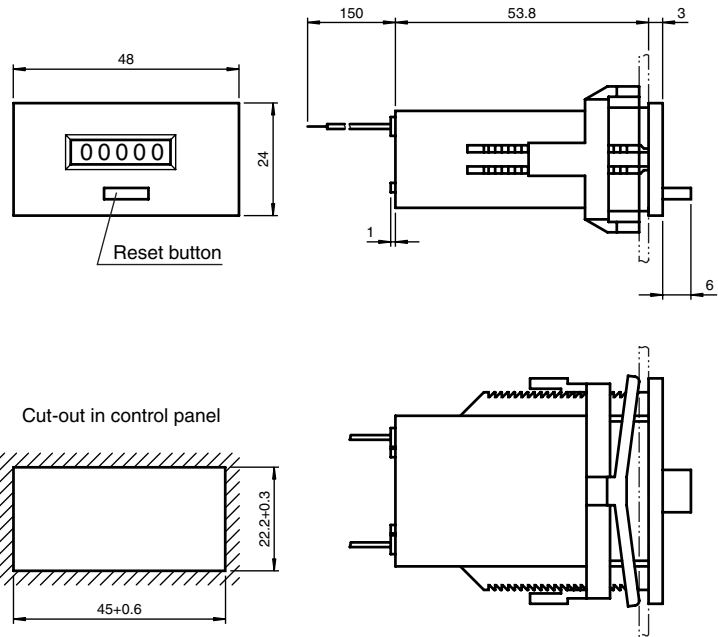
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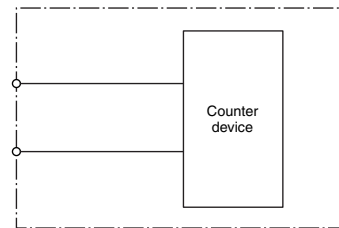
- Electromechanical summator
- 5 decade devices
- Counter frequency 10 Hz
- Manual reset
- Power supply 24 V DC or 230 V AC
- Fixing with latch fastener for easy installation
- Protection degree IP42 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6

Dimensions

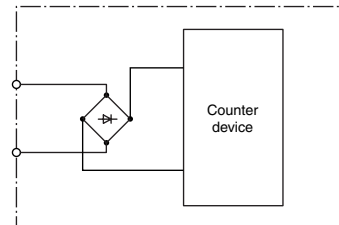


Electrical connection

DC Supply



AC Supply

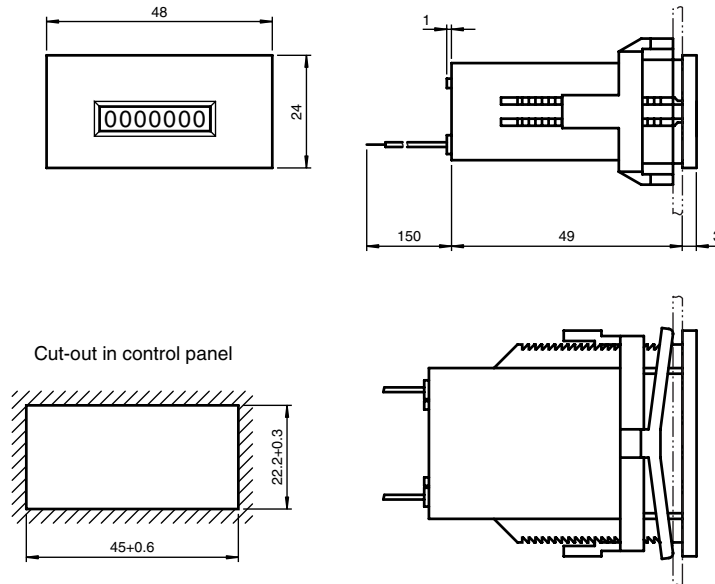


	KCM-51-C	KCM-51-V
<b>Indicators/operating means</b>		
Type		digital display
Number of decades		5
Display value		digit height 4 mm
Reset		manually
<b>Electrical specifications</b>		
Operating voltage	24 V DC	230 V AC
Power consumption	0.6 W	1.3 VA
<b>Input</b>		
Counting frequency		10 Hz
<b>Mechanical specifications</b>		
Lifetime	> 50 x 10 <sup>6</sup> pulses	> 50 x 10 <sup>6</sup> pulses
Connection	flexible leads AWG 22 150 mm long	flexible leads AWG 22 150 mm long
Mass	62 g	48 g



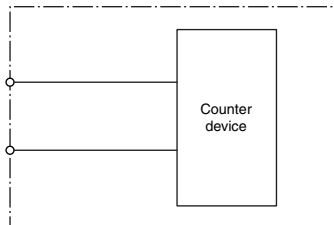
- Electromechanical summator
- 7 decade devices
- Without reset
- Power supply 24 V DC or 230 V AC
- Fixing with latching spring or latch fastener for easy installation
- Protection degree IP42 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6
- Counter frequency up to 25 Hz
- KCM-70-V
- Counter frequency 10 Hz
- KCM-70-C

**Dimensions**

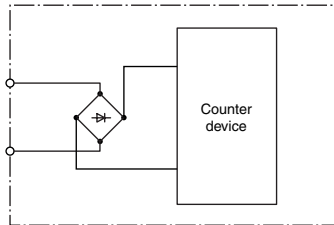


**Electrical connection**

**DC Supply**



**AC Supply**



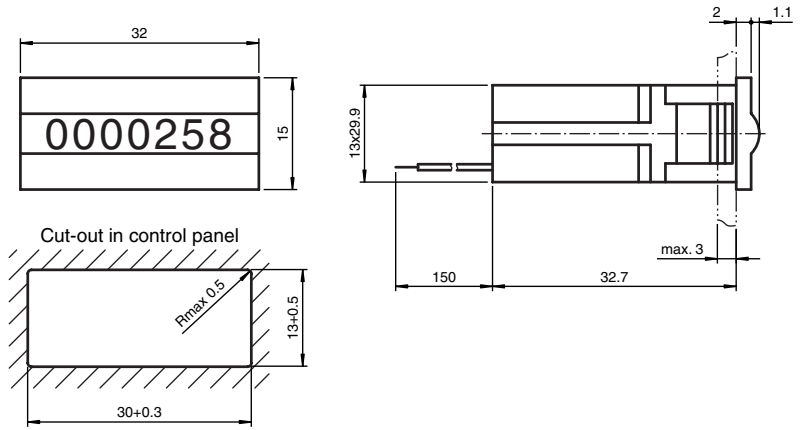
	KCM-70-C	KCM-70-V
<b>Indicators/operating means</b>		
Type		digital display
Number of decades		7
Display value		digit height 4 mm
<b>Electrical specifications</b>		
Operating voltage	24 V DC	230 AC
Power consumption	0.6 W	1.3 VA
<b>Input</b>		
Counting frequency		10 Hz
<b>Mechanical specifications</b>		
Lifetime	> 50 x 10 <sup>6</sup> pulses	> 50 x 10 <sup>6</sup> pulses
Connection	flexible leads AWG 22 150 mm long	flexible leads AWG 22 150 mm long
Mass	60 g	50 g





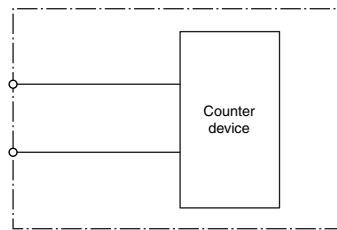
- Electromechanical summator
- 7 decade devices
- Counter frequency up to 25 Hz
- Without reset
- Power supply 24 V DC or 230 V AC
- Fixing with latching spring or latch fastener for easy installation
- Protection degree IP65 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6

Dimensions

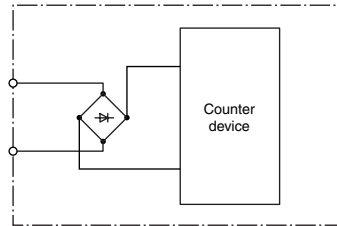


Electrical connection

DC Supply



AC Supply

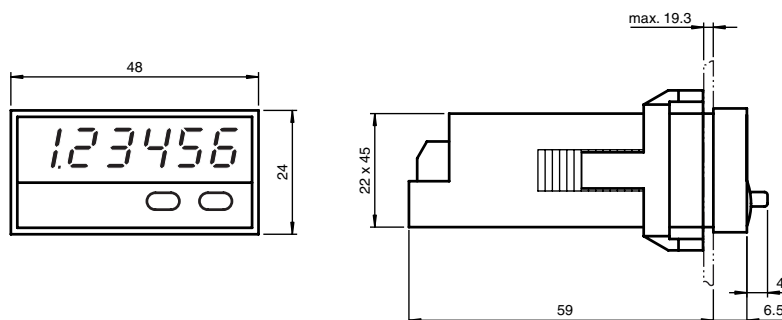


	KCM-70A-C	KCM-70A-V
<b>Indicators/operating means</b>		
Type		digital display
Number of decades		7
Display value		digit height 4 mm
<b>Electrical specifications</b>		
Operating voltage	24 V DC	230 AC
Power consumption	0.3 W	0.9 VA
<b>Input</b>		
Counting frequency	25 Hz	10 Hz
<b>Mechanical specifications</b>		
Lifetime		> 50 x 10 <sup>6</sup> pulses
Connection		flexible leads AWG 22 150 mm long
Mass		18 g

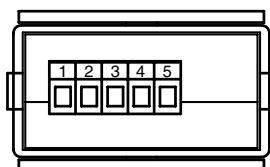


- Counter/Timer/Tachometer
- Counter frequency up to 20 kHz
- LED indicator, red
- 6 decade devices
- Operation via keypad
- Two counter inputs
- Fixing with plug-in frame for easy installation
- Connection via screw terminals
- Manual or external reset
- PNP and NPN sensors can be connected
- Protection degree IP65 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6

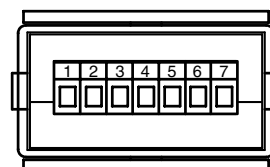
### Dimensions



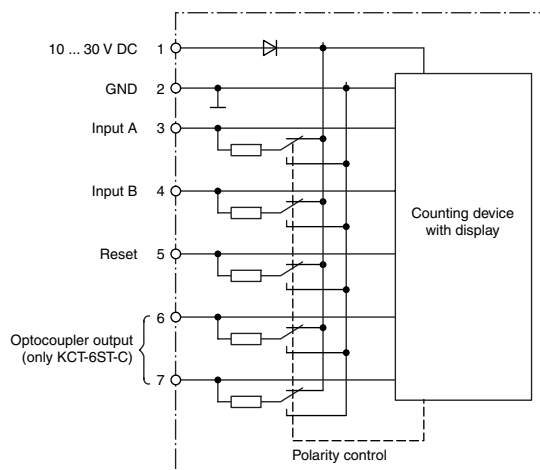
KCT-6S-C



KCT-6ST-C



### Electrical connection



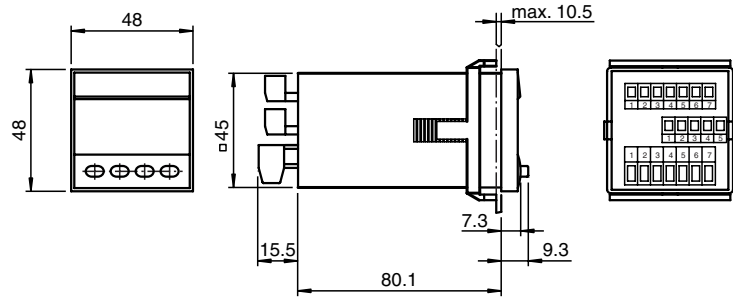
	KCT-6S-C	KCT-6ST-C
<b>General specifications</b>		
Pre-selection	-	single
Programming	keypad-driven menu	keypad-driven menu
<b>Indicators/operating means</b>		
Type	7-segment LED display, red	7-segment LED display, red
Number of decades	6	6
Display value	digit height 8 mm	digit height 8 mm
Pre-selection	-	active at counter value $\leq 0$
Display interval	-199999 ... 999999 with suppression of leading zeros	-199999 ... 999999 with suppression of leading zeros
Decimal point	0 to max 3 fractional digits	0 to max 3 fractional digits
Scale factor	0.0001 ... 99,9999	0.0001 ... 99,9999
Reset	manually or external	manually or external
Key interlock	-	-
<b>Electrical specifications</b>		
Operating voltage	10 ... 30 V DC	
Power consumption	1.5 W	
<b>Input</b>		
Counting frequency	30 Hz / 20 kHz	
Impedance	10 kOhm	
Voltage	low: 0 V DC ... 0.2 x supply voltage; high: 0.6 x supply voltage ... 30 V DC	
Counting method	adding or subtracting	
<b>Output</b>		
Optocoupler	-	Semiconductor output 30 V, max. 10 mA
<b>Mechanical specifications</b>		
Connection	5-pin screw terminal, max. core cross-section 0.34 ... 1.5 mm <sup>2</sup>	7-pin screw terminal, max. core cross-section 0.34 ... 1.5 mm <sup>2</sup>
Mass	48 g	48 g

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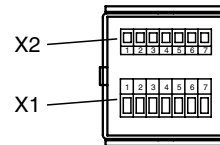


- Counter/Timer/Tachometer
- Counter frequency up to 20 kHz
- 6-digit LED indicator, red
- 1 Pre-selection
- Status LED indication for output an pre-selection value
- Display range and preselection range from -199999 up to 999999  
Overflow will be evaluated correctly up to 1 decade
- Programmable functionality as pulse counter, frequency counter, timer or
- Relay output
- Adding/subtracting via 2 separate inputs
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

Dimensions



Electrical connection



Connector assignment X1  
supply voltage and outputs

Terminal No.	AC version	10 ... 30 V DC version
1	n.c.	
2	n.c.	
3	output relay common contact (C)	
4	output relay normally open contact (NO)	
5	output relay normally closed contact (NC)	
6	supply voltage 90 ... 250 V AC	operating voltage 10 ... 30 V DC
7	supply voltage 90 ... 250 V AC	0 V DC (GND)

Connector assignment X2  
inputs

Terminal No.	Name	AC version	10 ... 30 V DC version
1	+24 VDC	Sensor Supply voltage	not connected
2	0 VDC (GND)	Reference voltage	not connected
3	INP A	Counter input A	
4	INP B	Counter input B	
5	RESET	Reset input	
6	GATE	Gate circuit	
7	KEY	Input for key locking	

Attention

In the case of selection of  $\overline{L}$  and  $\overline{N}$  (inverted relay function) the function of terminals 4 and 5 are changed:

Terminal No.	AC and DC versions
4	Relay normally closed (NC)
5	Relay normally open (NO)

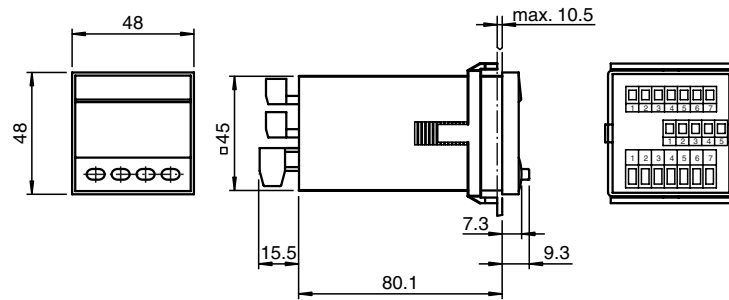
	KCT1-6SR-C	KCT1-6SR-V
<b>General specifications</b>		
Pre-selection		single
Programming		keypad-driven menu
<b>Indicators/operating means</b>		
Type		7-segment LED display, red
Number of decades		6
Display value		digit height 8 mm
Pre-selection		switchable
Display interval		-99999 ... 999999
Decimal point		0 to max 3 fractional digits
Scale factor		0.0001 ... 99.9999
Reset		manually or external
Key interlock		with "high"-level at terminal "KEY"
<b>Electrical specifications</b>		
Operating voltage	10 ... 30 V DC	90 ... 250 V AC
Power consumption	max. 1.2 VA	max. 7 VA
<b>Input</b>		
Counting frequency	20 kHz	20 kHz
Impedance	approx. 10 kOhm	approx. 10 kOhm
Voltage	low: 0 ... 0.2 x U <sub>e</sub> high: 0.6 x U <sub>e</sub> ... 30 V DC	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting	adding or subtracting
<b>Output</b>		
Relay	250 V AC, 0.3 ... 3 mA, changeover contact	250 V AC, 0.3 ... 3 mA, changeover contact
Sensor supply	-	14.4 ... 28 V DC, 100 mA
<b>Mechanical specifications</b>		
Connection	2 plug-in 7-pin screw terminals	
Mass	max. core cross-section 0.34 ... 1.5 mm <sup>2</sup> approx. 200 g	

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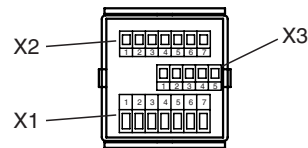


- Counter/Timer/Tachometer
- 6-digit LED indicator, red
- 2 independent pre-select values
- RS 232 interface for parameter assignment
- Status LED indication for output an pre-selection value
- Display range and preselection range from -199999 up to 999999  
Overflow will be evaluated correctly up to 1 decade
- Programmable functionality as pulse counter, frequency counter, timer or
- Relay output
- Adding/subtracting via 2 separate inputs
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

## Dimensions



## Electrical connection



### Connection assignment X1

Supply voltage and outputs

Terminal No.	AC version
1	Output 1 relay contact
2	Output 1 relay contact
3	Output 2 relay common contact (C)
4	Output 2 relay normally open contact (NO)
5	Output 2 relay normally closed contact (NC)
6	Power supply 90 ... 250 V AC
7	Power supply 90 ... 250 V AC

### Attention

In the case of selection of  $\overline{L}$  and  $\overline{L}$  (inverted relay control) the connections of terminals 4 and 5 are changed:

Terminal No.	AC version
4	Relay normally closed contact (NC)
5	Relay normally open contact (NO)

### Connection assignment X2

Inputs

Terminal No.	Name	AC version
1	+24 V DC	Sensor supply voltage
2	0 VDC (GND)	Reference voltage
3	INP A	Counter input A
4	INP B	Counter input B
5	RESET	Reset input
6	GATE	Gate input
7	KEY	Input of push-button lock

### Connection assignment X3

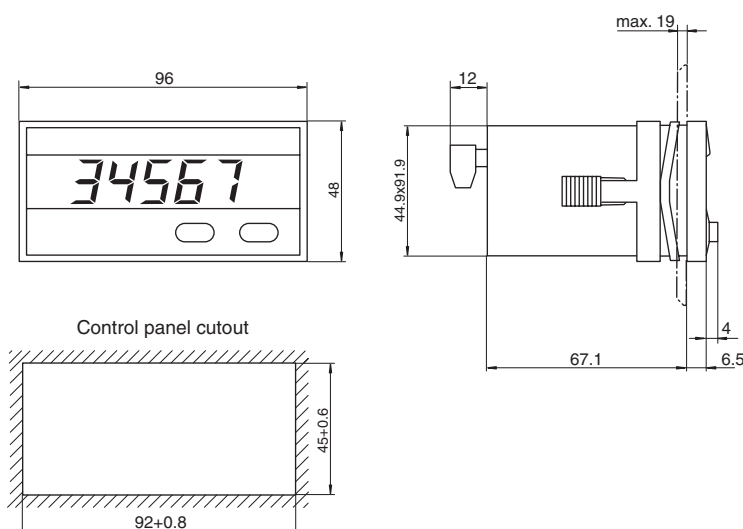
Serial interface

General specifications	KCT1-6WR/RS232-V
Pre-selection	2-fold
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	6
Display value	digit height 8 mm
Pre-selection	switchable
Display interval	-999999 ... 999999
Decimal point	0 to max 3 fractional digits
Scale factor	0.0001 ... 99.9999
Reset	manually or external
Key interlock	with "high"-level at terminal "KEY"
<b>Electrical specifications</b>	
Operating voltage	90 ... 250 V AC
Power consumption	max. 7 VA
<b>Input</b>	
Interface	RS 232 interface for parameter assignment
Counting frequency	20 kHz
Impedance	approx. 10 kOhm
Voltage	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting
<b>Output</b>	
Relay	250 V AC, 0.3 ... 3 A, 1 changeover contact, 1 normally-open
Sensor supply	14.4 ... 28 V DC, 100 mA
<b>Mechanical specifications</b>	
Connection	2 plug-in 7-pin screw terminals
Mass	approx. 200 g

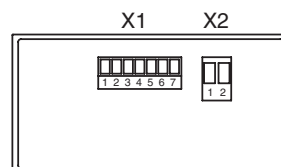


- Counter/Timer/Tachometer
- Extremely bright, large LED indicator
- 1 pre-select value with transistor output
- PNP and NPN sensors can be connected
- Adding/subtracting via 2 separate inputs
- Protection degree IP65 (front only)

### Dimensions



### Electrical connection



Connection assignment X2

Terminal No.	AC version
1	Power supply 90 ... 260 V AC
2	Power supply 90 ... 260 V AC

Connection assignment X1

Terminal No.	AC version
1	Optocoupler collector output
2	Optocoupler emitter output
3	SET
4	INP B
5	INP A
6	GND
7	+24 V out

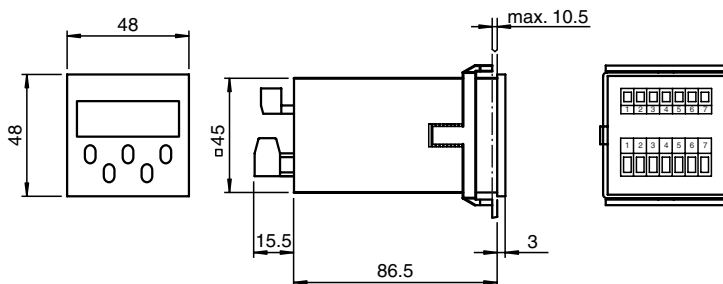
### General specifications

	KCT2-6ST-V
Pre-selection	single
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	6
Display value	digit height 14 mm
Pre-selection	active at counter value $\leq 0$
Display interval	-19999 ... 99999 with suppression of leading zeros
Decimal point	0 to max 3 fractional digits
Scale factor	0.0001 ... 99.9999
Reset	manually or external
Key interlock	-
<b>Electrical specifications</b>	
Operating voltage	90 ... 260 V AC
Power consumption	max. 6 VA
<b>Input</b>	
Counting frequency	30 Hz / 20 kHz (max. 11 kHz when counting with phase discriminator)
Impedance	10 kOhm
Voltage	low: 0 ... 4 V DC; high: 12 ... 30 V DC
Counting method	adding or subtracting
<b>Output</b>	
Sensor supply	24 V DC $\pm$ 15 % / 100 mA
Optocoupler	NP N, offener Kollektor und offener Emitter 30 V / 15 mA
<b>Mechanical specifications</b>	
Connection	2-pin and 7-pin plug-in connection terminals, core cross-section $\leq 1.5 \text{ mm}^2$
Mass	approx. 150 g

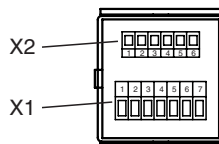


- Counter/Timer/Tachometer
- 5-digit LED indicator, red
- 1 Pre-selection
- Simple pre-selection setting via one button per decade
- Adding/subtracting via 2 separate inputs
- Display range and preselection range from -19999 up to 99999  
Overflow will be evaluated correctly up to 1 decade
- PNP and NPN sensors can be connected
- Protection degree IP54 (front only)

Dimensions



Electrical connection



Connection assignment X1

Terminal No.	AC version
1	+24 V DC Sensor supply voltage
2	0 V DC (GND)
3	Output relay common contact (C)
4	Output relay normally open contact (NO)
5	Output relay normally close contact (NC)
6	Power supply 230 V AC
7	Power supply 230 V AC

Connection assignment X2

Terminal No.	Name	AC version
1	INP A	Counter input A
2	INP B	Counter input B
3	GATE	Gate input
4	RESET	Reset input
5	LATCH	Hold input
6	KEY	Input of push-button lock

**Attention**  
In the case of setting the continuous signal = 99.99 (inverted relay function) the functions of terminals 4 and 5 are changed:

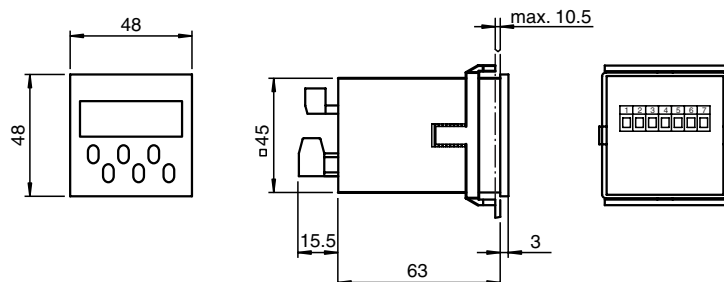
Terminal No.	AC version
4	Relay normally closed contact (NC)
5	Relay normally open contact (NO)

	KCT1-5SR-V
<b>General specifications</b>	
Pre-selection	single
Programming	keypad-driven menu and programming switch
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	5
Display value	digit height 7.5 mm
Pre-selection	digit height: 7.5 mm (selectable)
Display interval	-19999 ... 99999
Decimal point	0 to max 3 fractional digits
Scale factor	0.001 ... 9.999
Reset	manually or external
Key interlock	with "high"-level at terminal "KEY"
<b>Electrical specifications</b>	
Operating voltage	230 V AC
Power consumption	max. 4 VA
<b>Input</b>	
Counting frequency	30 Hz / 10 kHz
Impedance	approx. 10 kOhm
Voltage	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting
<b>Output</b>	
Relay	250 V AC / 300 V DC, 3 A, changeover contact
Sensor supply	14.4 ... 27.6 V DC, 80 mA
<b>Mechanical specifications</b>	
Mass	approx. 240 g

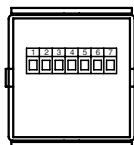


- Addition/Subtraction pre-select counter
- Simple pre-selection setting via one button per decade
- Easy-to-read 2-line LCD indicator
- With battery operation
- PNP and NPN sensors can be connected
- Relay output
- Input for keypad locking

### Dimensions



### Electrical connection



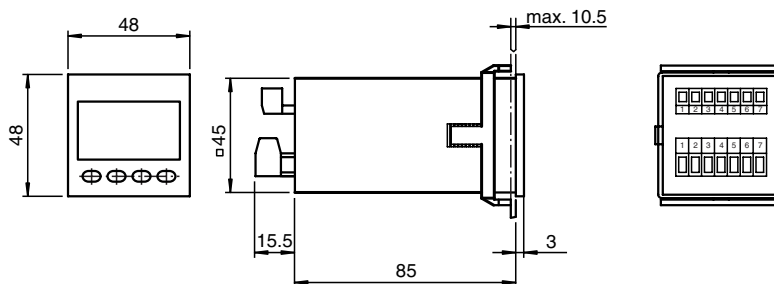
Terminal No.	
1	+3 V DC for terminal 2
2	Input of push-button lock
3	Relay contact
4	Relay contact
5	AC/DC optocoupler count input
6	AC/DC optocoupler reset input
7	Common AC/DC input for terminals 5 and 6

	KCY1-6SR-B
<b>General specifications</b>	
Pre-selection	single
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	2-line, 7-segment LC display with signs
Number of decades	6
Display value	digit height 7 mm
Pre-selection	digit height 4.5 mm
Display interval	0 ... 999999
Decimal point	0 to max 3 fractional digits
Scale factor	-
Reset	manually or external
Key interlock	via external "high" signal
<b>Electrical specifications</b>	
Operating voltage	2 x 3.6 V batteries
<b>Input</b>	
Counting frequency	25 Hz
Impedance	110 kOhm
Counting method	adding or subtracting
<b>Output</b>	
Relay	normally open contact (max. 60 VA) 230 V AC/0.5 A; 60 V DC/2 A
Supply	
<b>Mechanical specifications</b>	
Mass	80 g

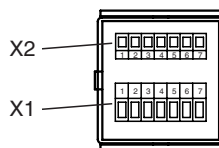


- Counter/Timer/Tachometer
- Adding/subtracting via 2 separate inputs
- Batch controller with 1 pre-selection
- Easy-to-read, 2-line LCD display with symbols for indicated pre-selection and output status
- Display range and preselection range from -99999 up to 99999  
Overflow will be evaluated correctly up to 1 decade
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

Dimensions



Electrical connection



Connection assignment X1  
Supply voltage and outputs

Terminal No.	AC version	DC version
1	n.c.	
2	n.c.	
3	Relay output common contact (C)	
4	Relay output normally open contact (NO)	
5	Relay output normally closed contact (NC)	
6	Power supply 230 V AC	Operating voltage 11 ... 30 V DC
7	Power supply 230 V AC	0 V DC (GND)

Connection assignment X2  
Inputs

Terminal No.	Name	230 V AC version	10 ... 30 V DC version
1	+24 VDC	Sensor supply voltage	n.c.
2	0 VDC (GND)	Reference voltage	n.c.
3	INP A	Counter input A	
4	INP B	Counter input B	
5	RESET	Reset input	
6	GATE	Gate input	
7	KEY	Input of push-button lock	

**Attention**  
In the case of selection of  $\lrcorner$  and  $\llcorner$  (inverted relay control) the connections of terminals 4 and 5 are changed:

Terminal No.	AC and DC versions
4	Relay normally closed contact (NC)
5	Relay normally open contact (NO)

	KCN1-6SR-C	KCN1-6SR-V
<b>General specifications</b>		
Pre-selection	single	
Programming	keypad-driven menu and programming switch	
<b>Indicators/operating means</b>		
Type	2-line, 7-segment LC display with signs	
Number of decades	6	
Display value	digit height 9 mm	
Pre-selection	digit height 7 mm	
Display interval	-99999 ... 99999	
Decimal point	0 to max 3 fractional digits	
Scale factor	0.0001 ... 9.9999	
Reset	manually or external	
Key inter lock	with "high"-level at terminal "KEY"	
<b>Electrical specifications</b>		
Operating voltage	11 ... 30 V DC	90 ... 260 V AC
Power consumption	max. 0.1 VA	max. 4 VA
<b>Input</b>		
Counting frequency	30 Hz / 10 kHz	30 Hz / 10 kHz
Impedance	approx. 10 kOhm	approx. 10 kOhm
Voltage	low: 0 ... 0.2 x U <sub>e</sub> high: 0.6 x U <sub>e</sub> ... 30 V DC	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting	
<b>Output</b>		
Relay	250 V AC / 300 V DC, 3 A, changeover contact	250 V AC / 300 V DC, 3 A, changeover contact
Sensor supply		14.4 ... 27.6 V DC, 80 mA
<b>Mechanical specifications</b>		
Mass	approx. 240 g	

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Evaluation devices

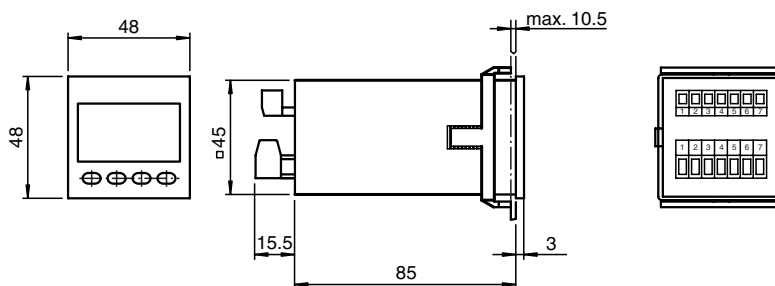
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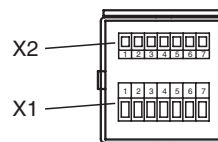


- Counter/Timer/Tachometer
- Adding/subtracting via 2 separate inputs
- Batch controller with 1 pre-selection
- 1 potential-free optocoupler output
- Easy-to-read, 2-line LCD display with symbols for indicated pre-selection and output status
- Display range and preselection range from -999999 up to 999999  
Overflow will be evaluated correctly up to 1 decade
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

Dimensions



Electrical connection



Connection assignment X1  
Supply voltage and outputs

Terminal No.	AC version	DC version
1	n.c.	
2	n.c.	
3	Optocoupler output emitter	
4	n.c.	
5	Optocoupler output collector	
6	Power supply 230 V AC	Operating voltage 11 ... 30 V DC
7	Power supply 230 V AC	0 V DC (GND)

Connection assignment X2  
Inputs

Terminal No.	Name	230 V AC version	10 ... 30 V DC version
1	+24 VDC	Sensor supply voltage	n.c.
2	0 VDC (GND)	Reference voltage	n.c.
3	INP A	Counter input A	
4	INP B	Counter input B	
5	RESET	Reset input	
6	GATE	Gate input	
7	KEY	Input of push-button lock	

Attention

In the case of selection of  $\overline{L}$  and  $\overline{I}$  (inverted optocoupler control) the connections of terminals 4 and 5 are changed:

Terminal No.	AC and DC versions
4	Optocoupler output collector
5	n.c.

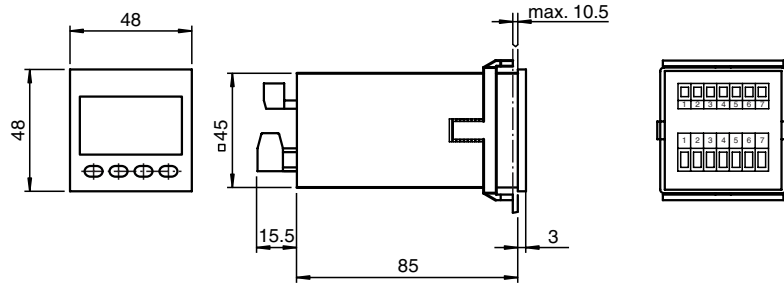
	KCN1-6ST-C	KCN1-6ST-V
<b>General specifications</b>		
Pre-selection		single
Programming		key pad-driven menu and programming switch
<b>Indicators/operating means</b>		
Type		2-line, 7-segment LC display with signs
Number of decades		6
Display value		digit height 9 mm
Pre-selection		digit height 7 mm
Display interval		-999999 ... 999999
Decimal point		0 to max 3 fractional digits
Scale factor		0.0001 ... 9.9999
Reset		manually or external
Key interlock		with "high"-level at terminal "KEY"
<b>Electrical specifications</b>		
Operating voltage	11 ... 30 V DC	90 ... 260 V AC
Power consumption	max. 0.1 VA	max. 4 VA
<b>Input</b>		
Counting frequency	30 Hz / 10 kHz	30 Hz / 10 kHz
Impedance	approx. 10 kOhm	approx. 10 kOhm
Voltage	low: 0 ... 0.2 x U <sub>e</sub> high: 0.6 x U <sub>e</sub> ... 30 V DC	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting	adding or subtracting
<b>Output</b>		
Sensor supply	-	14.4 ... 27.6 V DC, 80 mA
Optocoupler	30 V DC, 15 mA	30 V DC, 15 mA
<b>Mechanical specifications</b>		
Mass		approx. 240 g

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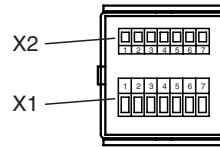


- Counter/Timer/Tachometer
- Adding/subtracting via 2 separate inputs
- Batch controller with 2 pre-selections
- Easy-to-read, 2-line LCD display with symbols for indicated pre-selection and the status of the two outputs
- Display range and preselection range from -999999 up to 999999  
Overflow will be evaluated correctly up to 1 decade
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

Dimensions



Electrical connection



Connection assignment X1

Supply voltage and outputs

Terminal No.	AC version	DC version
1	Output 1 Relay	
2	Output 1 Relay	
3	Output 2 Relay common contact (C)	
4	Output 2 Relay normally open contact (NO)	
5	Output 2 Relay normally closed contact (NC)	
6	Power supply 230 V AC	Operating voltage 11 ... 30 V DC
7	Power supply 230 V AC	0 V DC (GND)

Connection assignment X2

Inputs

Terminal No.	Name	230 V AC version	11 ... 30 V DC version
1	+24 VDC	Sensor supply voltage	n.c.
2	0 VDC (GND)	Reference voltage	n.c.
3	INP A	Counter input A	
4	INP B	Counter input B	
5	RESET	Reset input	
6	GATE	Gate input	
7	KEY	Input of push-button lock	

Attention

In the case of selection of  $\lrcorner$  and  $\llcorner$  (inverted relay control) the connections of terminals 4 and 5 are changed:

Terminal No.	AC and DC versions
4	Relay normally closed contact (NC)
5	Relay normally open contact (NO)

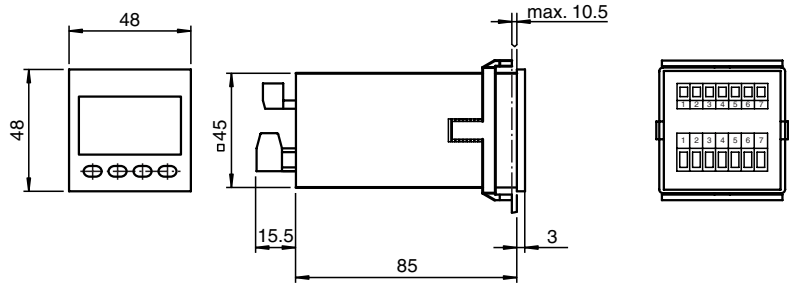
	KCN1-6WR-C	KCN1-6WR-V
<b>General specifications</b>		
Pre-selection		2-fold
Programming		keypad-driven menu and programming switch
<b>Indicators/operating means</b>		
Type		2-line, 7-segment LC display with signs
Number of decades		6
Display value		digit height 9 mm
Pre-selection		digit height 7 mm
Display interval		-999999 ... 999999
Decimal point		0 to max 3 fractional digits
Scale factor		0.0001 ... 9.9999
Reset		manually or external
Key interlock		with "high"-level at terminal "KEY"
<b>Electrical specifications</b>		
Operating voltage	11 ... 30 V DC	90 ... 260 V AC
Power consumption	max. 0.1 VA	max. 4 VA
<b>Input</b>		
Counting frequency	30 Hz / 10 kHz	30 Hz / 10 kHz
Impedance	approx. 10 kOhm	approx. 10 kOhm
Voltage	low: 0 ... 0.2 x U <sub>e</sub> high: 0.6 x U <sub>e</sub> ... 30 V DC	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method		adding or subtracting
<b>Output</b>		
Relay	250 V AC / 300 V DC, 3 A, 1 changeover contact, 1 normally-open	250 V AC / 300 V DC, 3 A, 1 changeover contact, 1 normally-open
Sensor supply		14.4 ... 27.6 V DC, 80 mA
<b>Mechanical specifications</b>		
Mass		approx. 240 g

Date of edition 2008-03-20

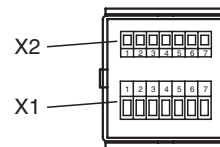


- Counter/Timer/Tachometer
- Adding/subtracting via 2 separate inputs
- Batch controller with 2 pre-selections
- 2 potential-free optocoupler outputs
- Easy-to-read, 2-line LCD display with symbols for indicated pre-selection and the status of the two outputs
- Display range and preselection range from -99999 up to 99999  
Overflow will be evaluated correctly up to 1 decade
- PNP and NPN sensors can be connected
- Protection degree IP65 (front only)

Dimensions



Electrical connection



Connection assignment X1

Supply voltage and outputs

Terminal No.	AC version	DC version
1	Optocoupler output 1 collector	
2	Optocoupler output 1 emitter	
3	Optocoupler output 2 emitter	
4	n.c.	
5	Optocoupler output 2 collector	
6	Power supply 90 ... 260 V AC	Operating voltage 11 ... 30 V DC
7	Power supply 90 ... 260 V AC	0 V DC (GND)

Connection assignment X2

Inputs

Terminal No.	Name	AC version	DC version
1	+24 VDC	Sensor supply voltage	n.c.
2	0 VDC (GND)	Reference voltage	n.c.
3	INP A	Counter input A	
4	INP B	Counter input B	
5	RESET	Reset input	
6	GATE	Gate input	
7	KEY	Input of push-button lock	

Attention

In the case of selection of  $\bar{\phantom{L}}$  and  $\bar{\phantom{I}}$  (inverted optocoupler control) the connections of terminals 4 and 5 are changed:

Terminal No.	AC and DC versions
4	Optocoupler output 2 collector
5	n.c.

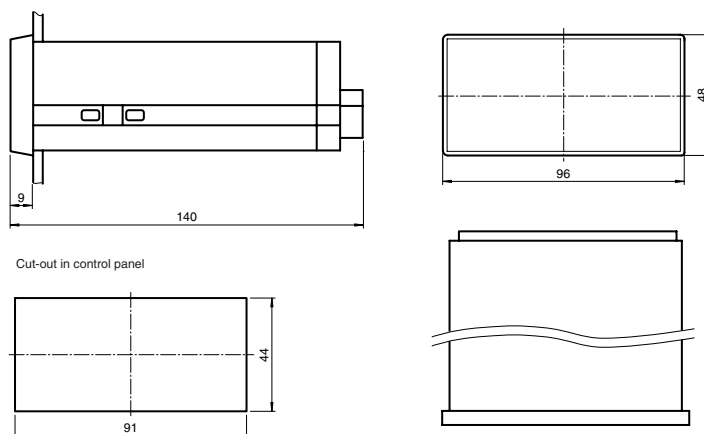
	KCN1-6WT-C	KCN1-6WT-V
<b>General specifications</b>		
Pre-selection	2-fold	
Programming	keypad-driven menu and programming switch	
<b>Indicators/operating means</b>		
Type	2-line, 7-segment LCD display with signs	
Number of decades	6	
Display value	digit height 9 mm	
Pre-selection	digit height 7 mm	
Display interval	-99999 ... 99999	
Decimal point	0 to max 3 fractional digits	
Scale factor	0.0001 ... 9.9999	
Reset	manually or external	
Key interlock	with "high"-level at terminal "KEY"	
<b>Electrical specifications</b>		
Operating voltage	11 ... 30 V DC	90 ... 260 V AC
Power consumption	max. 0.1 VA	max. 4 VA
<b>Input</b>		
Counting frequency	30 Hz / 10 kHz	30 Hz / 10 kHz
Impedance	approx. 10 kOhm	approx. 10 kOhm
Voltage	low: 0 ... 0.2 x U <sub>e</sub> high: 0.6 x U <sub>e</sub> ... 30 V DC	low: 0 ... 4 V DC high: 12 ... 30 V DC
Counting method	adding or subtracting	adding or subtracting
<b>Output</b>		
Sensor supply	-	14.4 ... 27.6 V DC, 80 mA
Optocoupler	30 V DC, 15 mA	30 V DC, 15 mA
<b>Mechanical specifications</b>		
Mass	approx. 240 g	

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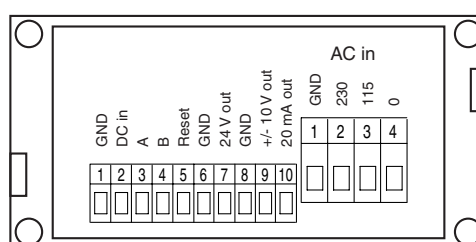


- Counter/Timer/Tachometer with analogue voltage and current output
- Bright 6-digit LED indicator
- AC/DC multi-range power pack
- Counter frequency up to 25 kHz
- Power supply for pulse generator
- 2 separate switch inputs
- Menu driven operation
- Protection degree IP64 in accordance with DIN EN 60529 (front only)
- Including fixing for control panel mounting

### Dimensions



### Electrical connection

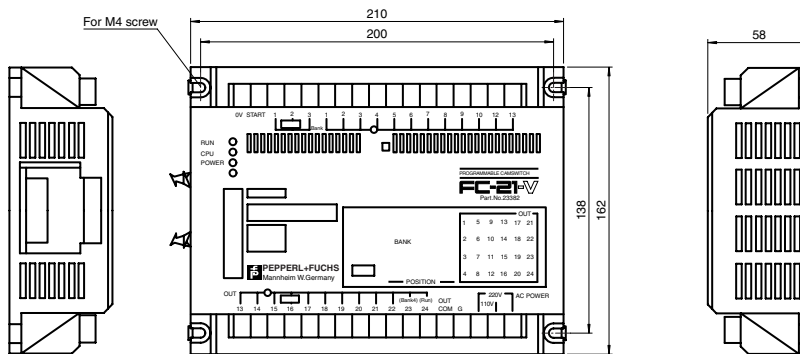


General specifications	TC-6A-V
Data storage	10 years, EEPROM
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	6
Display value	digit height 15 mm
Display interval	-99999 ... 999999
Decimal point	freely adjustable
Scale factor	0.0001 ... 9.9999
Reset	manually/external/automatically
<b>Electrical specifications</b>	
Operating voltage	115 ... 230 V AC 16 ... 35 V DC
Power consumption	7.5 VA
<b>Input</b>	
Counting frequency	25 kHz (Timer function 1 kHz)
Impedance	4.7 kOhm (positive logic)
Voltage	low: 0 ... 3.5 V DC high: 9 ... 35 V DC
<b>Output</b>	
Analogue voltage output	-10.0 ... 10 DC
Analogue current output	0/4 ... 20mA
Linearity	<0.1 %
Sensor supply	24 V DC, 150 mA
<b>Mechanical specifications</b>	
Connection	screw terminals, removable max. core cross-section 0.34 ... 1.5 mm <sup>2</sup> (AC max. 2.5 mm <sup>2</sup> )
Mass	approx. 450 g

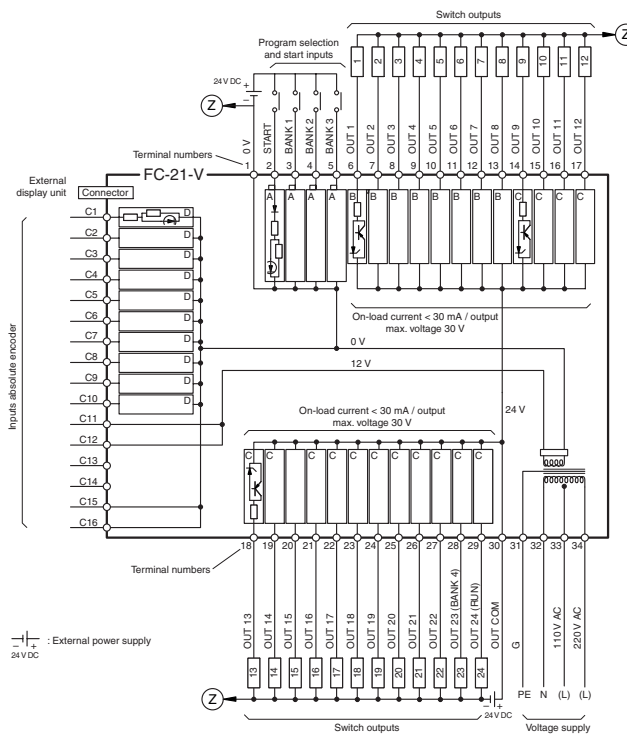


- Electronic cam-operated switch
- LED indicator, red
- Adding or subtracting
- Up to 24 outputs
- Storage of up to 10 programs
- 24 tracks with a max. of 512 cams
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6
- Manual inclusive
- Absolute value encoder can be connected (incl. connector plug MR-16L)
- FC-21D external indicator unit can be connected

Dimensions



Electrical connection

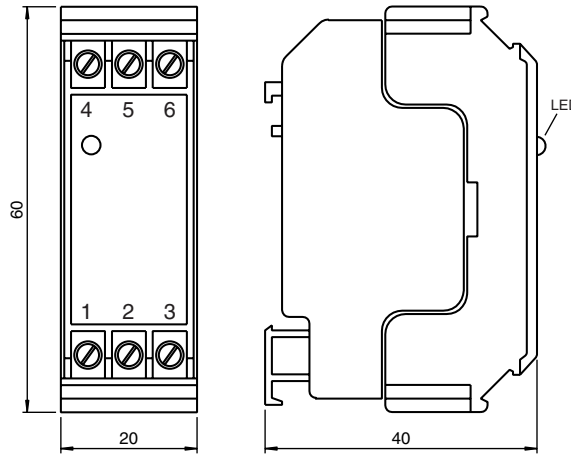


FC-21-V	
<b>General specifications</b>	
Data storage	EEP ROM
Programming	keypad-driven menu
<b>Indicators/operating means</b>	
Type	7-segment LED display, red
Number of decades	4
Display value	digit height 8 mm
Display interval	0 ... 9999
Resolution	360, 512, 720 or 1024 position can be set
Switching state	via 24 LEDs
<b>Electrical specifications</b>	
Operating voltage	93 ... 126 V AC / 195 ... 264 V AC, 50 ... 60 Hz (and external 24 V DC supply required for the outputs)
Power consumption	30 VA
<b>Input</b>	
Type	absolute encoder via Gray Code (10 bit) number of cam tracks: 24 number of cams: 512
<b>Output</b>	
Sensor supply	for absolute encoders
Optocoupler	max. 30 V and 30 mA every output
Measuring error	
Switch points, number	max. (resolution/2) per output
<b>Mechanical specifications</b>	
Connection	plug-in screw terminals, max. core cross-section 0.34 ... 1.5 mm <sup>2</sup>
Mass	2000 g

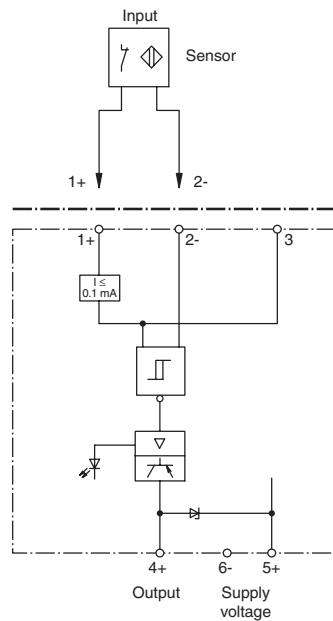


- 1-channel terminal amplifier
- NAMUR sensor input
- DC 24 V supply voltage
- Standard interface for prevention of signal transmission errors
- Switching status indicator, yellow LED
- Short-circuit proof electronic output
- Low noise sensitivity
- Compact terminal housing
- Mounting by clipping onto standard 35 mm rail to DIN EN 50022
- Protection degree IP20

Dimensions



Electrical connection



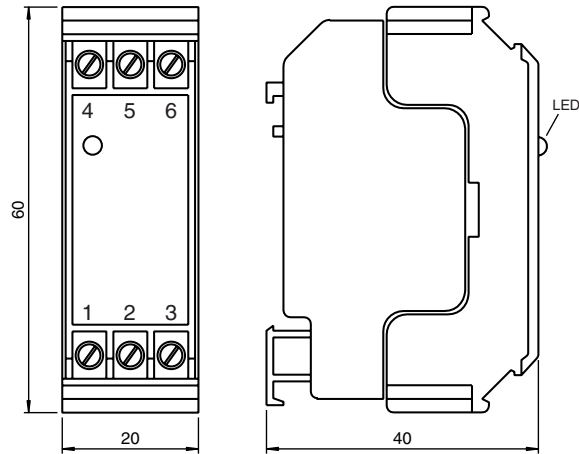
	KCD2-E	KCD2-E1	KCD2-E2	KCD2-E3
<b>Indicators/operating means</b>	LED yellow			
	switch output			
<b>Electrical specifications</b>	Operating voltage			
	10 ... 30 V DC			
	Operating current			
	approx. 22 mA			
	Ripple			
	≤ 10 %			
<b>Transfer characteristics</b>				
Mode of operation	NO	NC	NO	NC
Switching frequency	1 kHz	1 kHz	1 kHz	1 kHz
<b>Input</b>				
Connection	terminals 1+, 2-	terminals 1+, 2-	terminals 1+, 2-	terminals 1+, 2-
Connectable sensor types	NAMUR	NAMUR	NAMUR	NAMUR
Short-circuit current	approx. 8 mA	approx. 8 mA	approx. 8 mA	approx. 8 mA
Sensor supply	8 V DC	8 V DC	8 V DC, max. 9 V DC at input resistance min. 562 Ω	8 V DC
Switching point	1.2 ... 2.1 mA hysteresis approx. 0.2 mA	1.2 ... 2.1 mA hysteresis approx. 0.2 mA	1.2 ... 2.1 mA hysteresis approx. 0.2 mA	1.2 ... 2.1 mA hysteresis approx. 0.2 mA
Lead monitoring	without	without	without	without
Trip value	1 kHz	1 kHz	1 kHz	1 kHz
<b>Output</b>				
Connection	terminal 4-	terminal 4-	terminal 4+	terminal 4+
Current	200 mA short-circuit proof	200 mA short-circuit proof	200 mA short-circuit proof	200 mA short-circuit proof
Transistor	NPN	NPN	PNP	PNP
<b>Mechanical specifications</b>	Connection			
	self-opening apparatus connection terminals, max. core cross-section 0.34 ... 2.5 mm <sup>2</sup>			
Mass	60 g			

Date of edition 2008-03-20

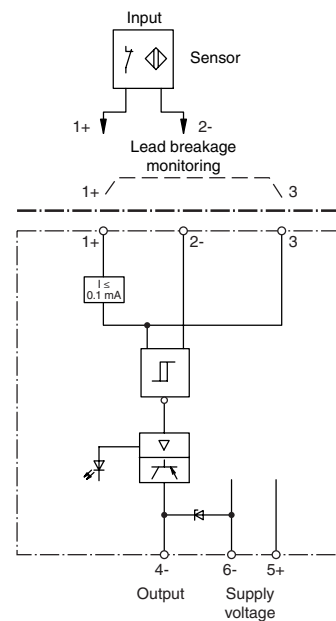


- 1-channel terminal amplifier
- NAMUR sensor input
- DC 24 V supply voltage
- Standard interface for prevention of signal transmission errors
- Switching status indicator, yellow LED
- Lead breakage monitoring: The lead breakage monitoring can be disconnected by bridging terminals 1 and 3 (When using a mechanical contact a 10 kΩ resistor is required in parallel circuit)
- Short-circuit proof electronic output
- Low noise sensitivity
- Compact terminal housing
- Mounting by clipping onto standard 35 mm rail to DIN EN 50022
- Protection degree IP20

Dimensions



Electrical connection



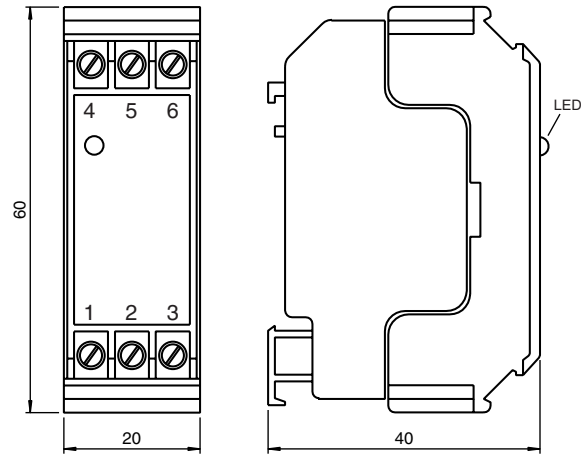
	KCD2-EL	KCD2-E2L
<b>Indicators/operating means</b>		switch output
LED		yellow
<b>Electrical specifications</b>		
Operating voltage		10 ... 30 V DC
Operating current		approx. 8 mA
Ripple		≤ 10 %
<b>Transfer characteristics</b>		
Mode of operation		NO
Switching frequency		1 kHz
<b>Input</b>		
Connection		terminals 1+, 2-
Connectable sensor types		NAMUR
Short-circuit current		approx. 8 mA
Sensor supply		8 V DC
Switching point		1.2 ... 2.1 mA hysteresis approx. 0.2 mA
Lead monitoring		with
Trip value		1 kHz
<b>Output</b>		
Connection	terminal 4-	terminal 4+
Current	200 mA short-circuit proof	200 mA short-circuit proof
Transistor	NPN	PNP
<b>Mechanical specifications</b>		
Connection	self-opening apparatus connection terminals, max. core cross-section 0.34 ... 2.5 mm <sup>2</sup>	
Mass	60 g	

Date of edition: 2008-03-20

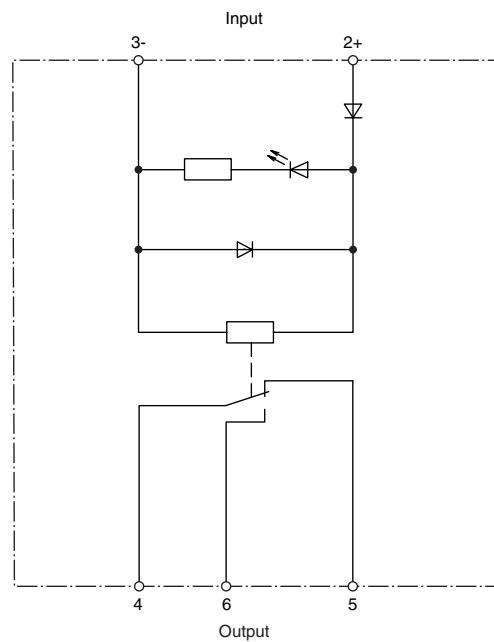


- Relay output with 1 pole, indication of the switching state LED yellow
- Free-wheeling diode
- Compact terminal housing
- Mounting by clipping onto standard 35 mm rail to DIN EN 50022
- Protection degree IP20

### Dimensions



### Electrical connection



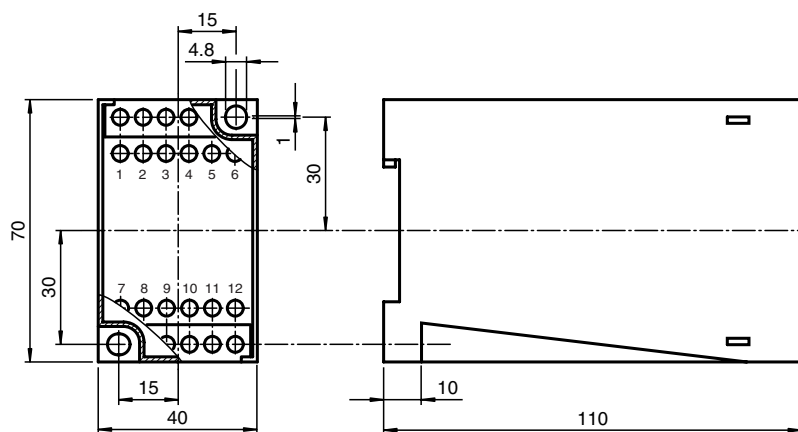
KCD2-R	
<b>Indicators/operating means</b>	
LED yellow	switch output
<b>Electrical specifications</b>	
Operating voltage	24 V DC $\pm$ 15 %
Operating current	16 mA
Ripple	$\leq$ 10 %
<b>Input</b>	
Connection	terminals 2+, 3-
Connectable sensor types	PNP or NPN 3-wire sensors
<b>Output</b>	
Switching frequency	$\leq$ 10 Hz
Relay	1 changeover contact
Contact loading	250 V AC/2A/cos $\phi \geq$ 0.7 30 V DC/2 A resistive load
Mechanical life	$\geq$ 10 <sup>8</sup> switching cycles
<b>Mechanical specifications</b>	
Connection	self-opening apparatus connection terminals, max. core cross-section 0.34 ... 2.5 mm <sup>2</sup>
Mass	60 g



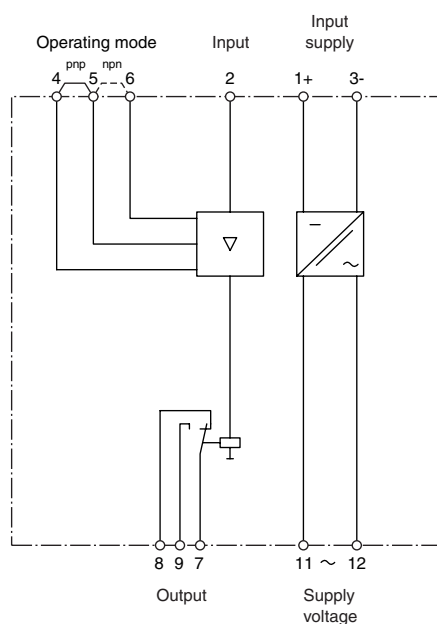


- 1-channel isolating amplifier
- Control circuit designed for 3-wire sensors in PNP and NPN
- 220 V AC rated operational voltage
- Switching frequency 10 kHz
- 1 relay output with 1 changeover contact
- Modular housing
- Mode of operation adjustable; for PNP-sensors the terminals 5 and 6, for NPN-sensors the terminals 6 and 7 are to short out
- Protection degree IP20

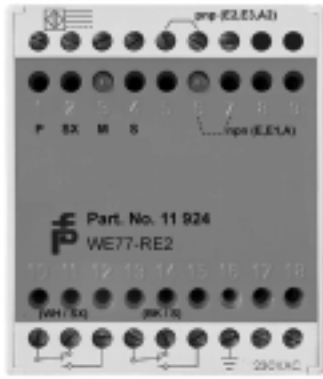
Dimensions



Electrical connection

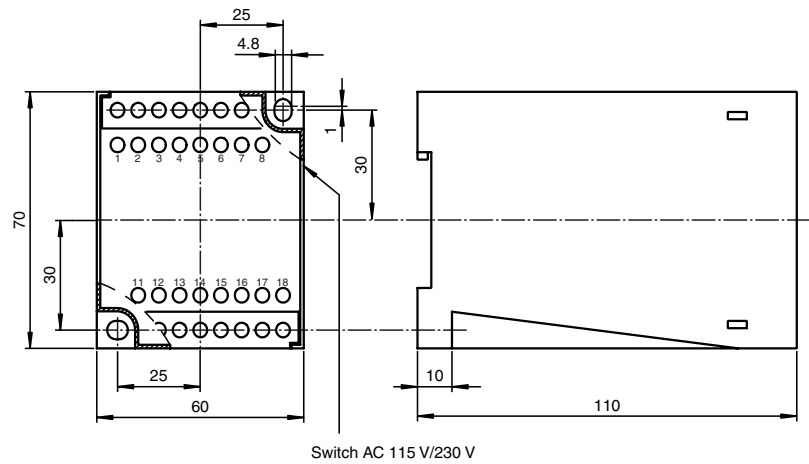


RE 1	
<b>Electrical specifications</b>	
Rated operational voltage	198 ... 253 V AC ; 45 ... 65 Hz
Power consumption	max. 3 VA
<b>Transfer characteristics</b>	
Switching frequency	10 Hz
<b>Input</b>	
Current	low: ≤ 0.5 mA high: ≤ 33 mA
Voltage	low: 0 ... 1 V high: 18 ... 24 V
<b>Output</b>	
Connection	terminals 7, 8, 9
Relay	1 changeover contact
Contact loading	250 V AC/4 A/500 VA / cos φ = 0.7 220 V DC 0.1 A; 60 V / 0.6 A; 24 V / 4 A
Mechanical life	≥ 1 x 10 <sup>7</sup> switching cycles
Sensor supply	22.5 V at 30 mA 20.0 V at 50 mA 18.0 V at 70 mA
<b>Mechanical specifications</b>	
Connection	self-opening apparatus connection terminals, max. conductor cross section 1 x 2.5 mm <sup>2</sup>
Mass	approx. 260 g

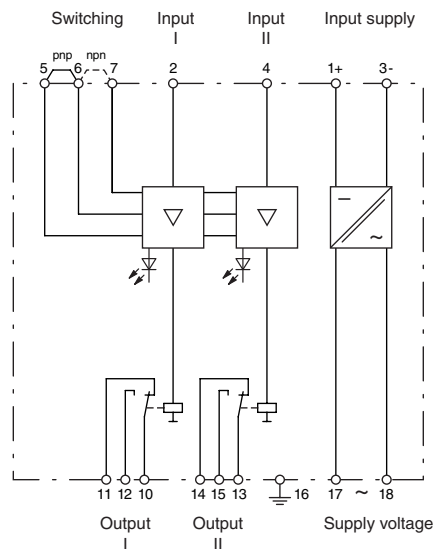


- 2-channel isolated switch amplifier
- Control circuit designed for the direct current versions of ultrasonic sensors and proximity switches
- 230 V AC/115 V AC mains nominal voltage
- Switching frequency 10 kHz
- Each with 1 relay output with 1 change-over contact
- One LED status display for each output relay
- Modular housing
- For PNP-sensors the terminals 5 and 6, for NPN-sensors the terminals 6 and 7 are to short out
- Mode of operation: input closed - energising the relay/input open - relay de-energised

Dimensions



Electrical connection

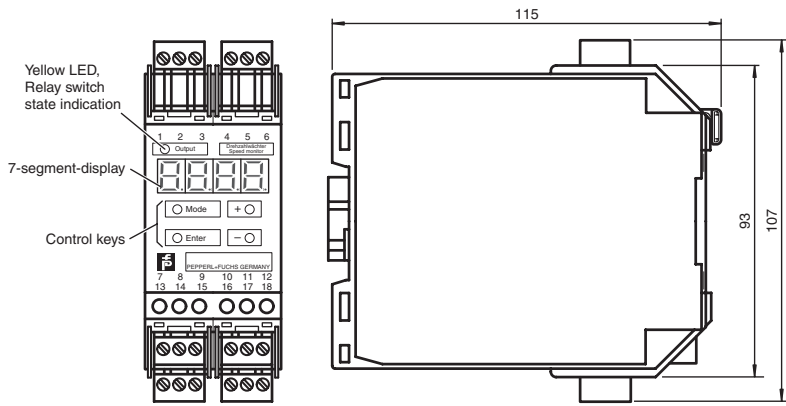


WE77-RE2	
<b>Supply</b>	
Connection	terminals 17, 18
Rated voltage	98 ... 126 V AC / 198 ... 253 V AC, 45 ... 63 Hz, switchable
Power consumption	approx. 7 VA
<b>Transfer characteristics</b>	
Switching frequency	≤ 10 Hz
<b>Input</b>	
Connection	terminals 2; 4
Input signal	high: 24 V DC ± 20 %, 37 mA low: < 1 V DC, ≤ 0.5 mA
<b>Output</b>	
Connection	terminals 10, 11, 12; 13, 14, 15 terminals 1+, 3-
Current	160 mA at 60 °C, short-circuit proof
Voltage	24 V DC ± 20 %
Contact loading	AC: 250 V / 4 A / 500 VA / cos φ ≥ 0.7 DC: 220 V / 0.1 A; 60 V / 0.6 A; 24 V / 4 A
Mechanical life	10 <sup>7</sup> switching cycles
<b>Mechanical specifications</b>	
Protection degree	IP20
Connection	self-opening apparatus connection terminals, max. conductor cross section 1 x 2.5 mm <sup>2</sup>
Mass	approx. 650 g

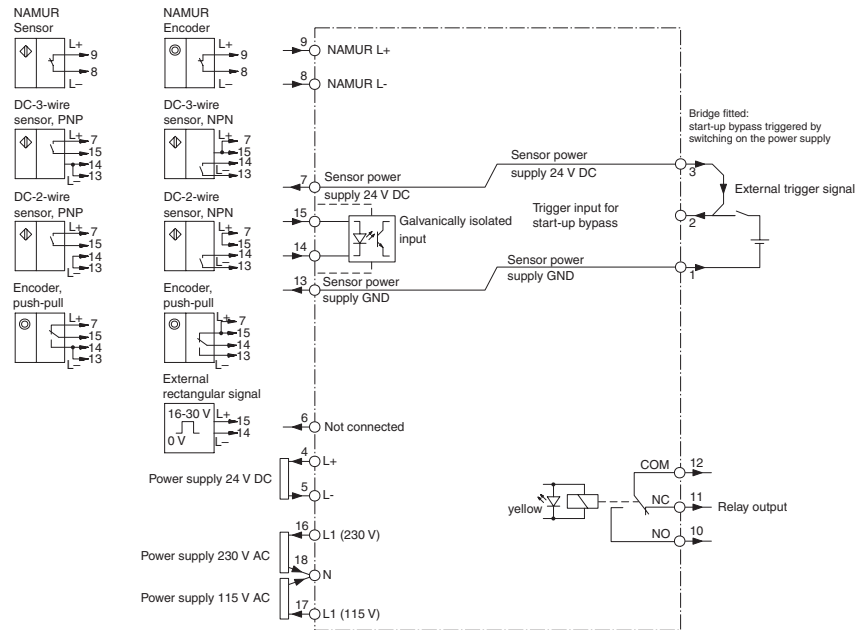


- Speed monitoring up to 40 kHz
- 1 pre-select value with relay output and LED indicator
- 2-, 3-, 4-wire and NAMUR sensors as well as rotary encoder connectable
- Start-up delay
- Menu driven operation via 4 front keys
- Period measurement
- Output signal can be inverted
- Display devices can be set between 0.1 ... 2.5 sec.

Dimensions



Electrical connection



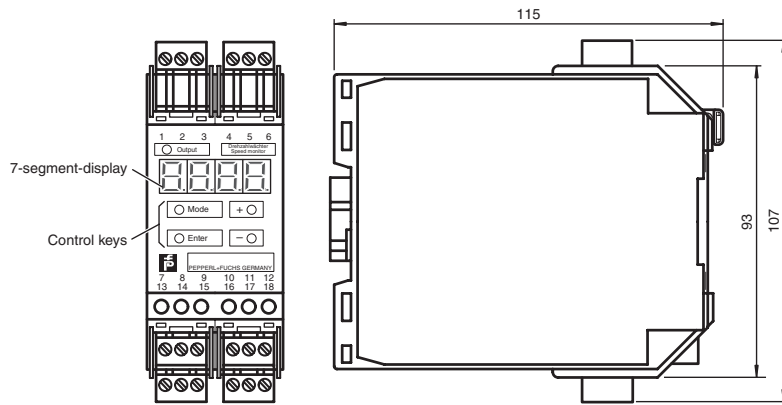
	KFU8-DW-1.D
<b>Supply</b>	
Rated voltage	196 ... 264 V AC ; 98 ... 132 V AC ; 47 ... 63 Hz 20.4 ... 28 V DC
Power consumption	AC : < 5 VA DC : < 5 W
<b>Indicators/operating means</b>	
Type	4-digit 7-segment display, red, 7 mm digit height
Display interval	0.002 ... 9999 Hz or 0.01 ... 9999 min <sup>-1</sup>
Parameter assignment	keypad-driven menu
Switching state	LED yellow, 3 mm
<b>Input 1</b>	
Connectable sensor types	NAMUR sensors according to DIN EN 60947-5-6
Open loop voltage	8.2 V DC
Short-circuit current	6.5 mA
Switching point	1.2 ... 2.1 mA Switching hysteresis approx. 0.2 mA
<b>Input 2</b>	
Connectable sensor types	Two, three, or four-wire proximity switch, incremental rotary encoder, or externally generated pulses 16 ... 30 V
Sensor supply	19 ... 28 V DC non-stabilised; ≤ 30 mA short-circuit proof
Switching point	high: 16 ... 30 V DC; max. 10 mA due to integrated constant current sink; R <sub>i</sub> ≅ 3 kΩ low: 0 ... 6 V DC
Input frequency	0.002 ... 40000 Hz, pulse length/duration: ≥ 12 μs
<b>Input 3</b>	
Start-up override	Triggering by external signal 16 ... 30 V or Place jumper between terminals 2/3 or by switching on supply voltage (terminal 2 and terminal 3 permanently bridged) 0.1 ... 999.9 s (External trigger signal)
Jumpering time	
<b>Output</b>	
Relay	1 changeover contact NO, NC, COM
Sensor supply	24 V DC ± 10 %, 30 mA, short-circuit proof
Contact loading	250 V AC/2 A/ cos φ ≥ 0.7 40 V DC/2 A
<b>Transfer characteristics</b>	
Measuring error	0 ... 40000 Hz: ≤ ±0,10% Display: ±1 digit
Timer function	Rise/fall delay, wipe contact, pulse extension
Time	0 ... 999.9 s ; Direction of action reversible
<b>Ambient conditions</b>	
Ambient temperature	-25 ... 60 °C (248 ... 333 K)
<b>Mechanical specifications</b>	
Protection degree	IP20
Connection	coded, removable terminals, max. core cross-section 0.34 ... 2.5 mm <sup>2</sup>

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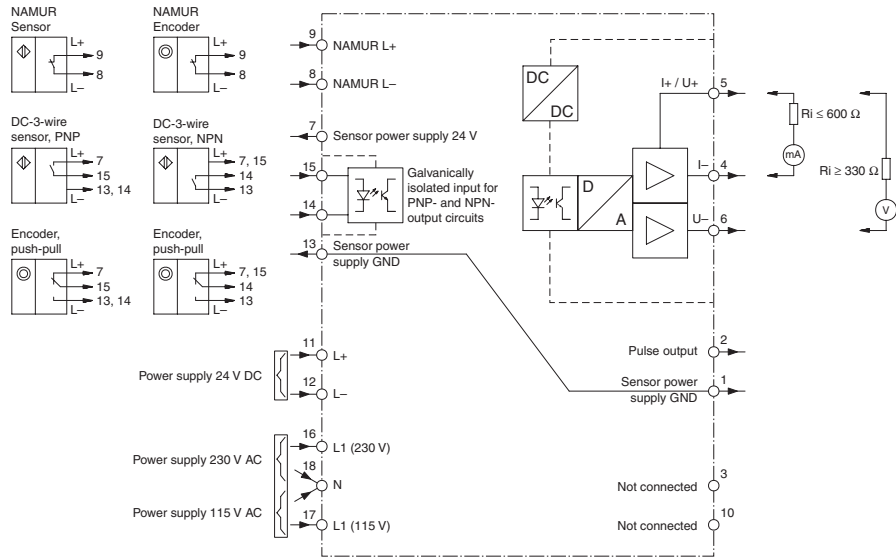


- Limit frequency 40 kHz
- Voltage or current output
- Incrementing output (Spacing factor 1 ... 9999)
- Multi-range power pack
- 2-, 3-, 4-wire and NAMUR sensors as well as rotary encoder connectable
- Auxiliary power output for sensors
- Connection via Power Rail
- Period measurement
- Display: Input in Hz or 1/min, output in V or mA
- adjustable updating of indication (0,001 ... 2,5 s)

Dimensions



Electrical connection



KFU8-FS SP-1.D	
<b>Supply</b>	
Rated voltage	196 ... 264 V AC ; 98 ... 132 V AC; 47 ... 63 Hz 20.4 ... 27.6 V DC
Power consumption	AC: < 5 VA DC: < 5 W
<b>Indicators/operating means</b>	
Type	4-digit 7-segment display, red, 7 mm digit height
Display interval	0.002 ... 9999 Hz or 0,01 ... 9999 min <sup>-1</sup>
Parameter assignment	keypad-driven menu
<b>Input 1</b>	
Connectable sensor types	NAMUR sensors according to DIN EN 60947-5-6
Open loop voltage	8.2 V DC
Short-circuit current	6.5 mA
Switching point	1.2 ... 2.1 mA Switching hysteresis approx. 0.2 mA
<b>Input 2</b>	
Connectable sensor types	2-, 3- or 4-wire proximity switches and incremental rotary encoder
Sensor supply	19 ... 28 V DC non-stabilised; ≤ 30 mA short-circuit proof
Switching point	high: 16 ... 30 V DC; max. 10 mA; R <sub>i</sub> ≥ 3 kOhm low: 0 ... 6 V DC
<b>Output</b>	
Analogue voltage output	0 ... 10 V DC; 2 ... 10 V DC; 30 mA max.; resolution: 12 mV; R <sub>i</sub> ≥ 330 Ω (terminal 5+, 6-)
Analogue current output	0 ... 20 mA; 4 ... 20 mA; resolution: 25 µA; R <sub>i</sub> ≤ 600 Ω (terminal 4-, 5+)
Digital incrementing	≥ (U <sub>b</sub> - 3 V), 20 mA, short-circuit proof (Terminals 1-, 2+) with frequency division F <sub>in</sub> / 1 ... F <sub>in</sub> / 9999
<b>Transfer characteristics</b>	
Input frequency	≤ 40000 Hz, pulse pause/pulse length: ≥ 12 µs
<b>Ambient conditions</b>	
Ambient temperature	-25 ... 60 °C (248 ... 333 K)
<b>Mechanical specifications</b>	
Protection degree	IP20
Connection	coded, removable terminals, max. core cross-section 0.34 ... 2.5 mm <sup>2</sup>

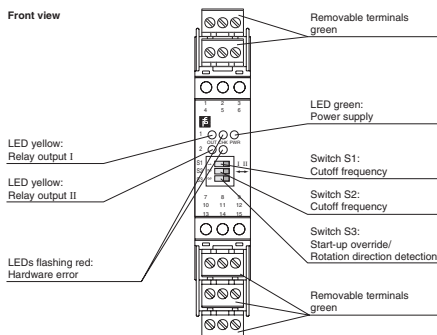
Date of edition 2008-03-20

Evaluation devices

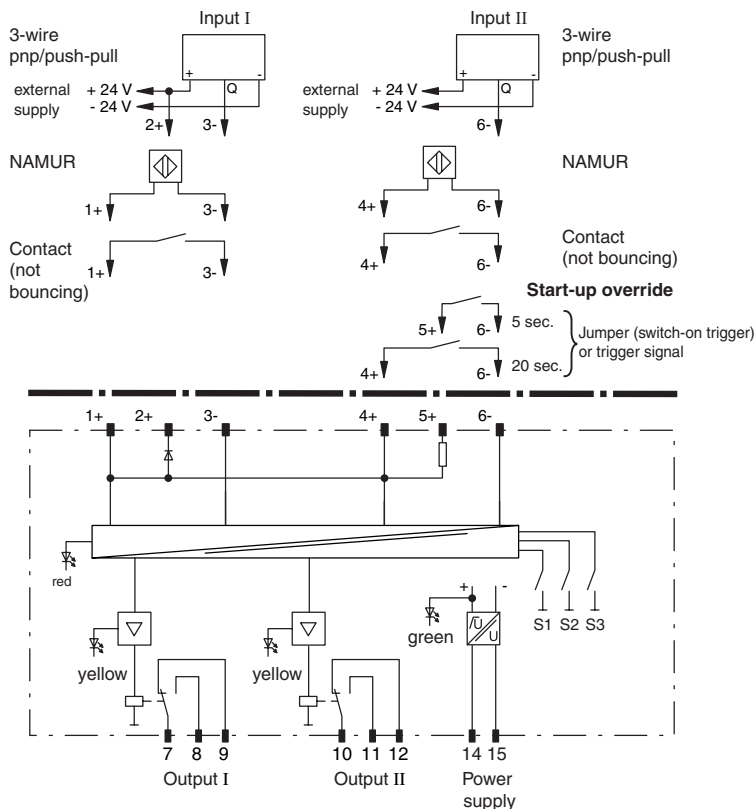
8.1



- 1-channel standstill controller
- Rotation direction detection or start-up override selectable
- 2 relay outputs
- Input frequency  $\leq 2$  kHz
- Diagnosis LEDs for rotation detection, signal below the trip value, operating voltage and hardware error
- Simple setting of function and limiting frequency via DIP switch on the front side
- Plug-in terminals



Electrical connection



KFD2-SR2-2.W.SM	
<b>General specifications</b>	
Pre-selection	single
Programming	via DIP switch and programmable
<b>Supply</b>	
Rated voltage	20 ... 30 V DC
Power consumption	$\leq 1.5$ W
<b>Indicators/operating means</b>	
LED green	Operating voltage
LED yellow	switching state
LED red	Hardware error
DIP-switch	setting the configuration
<b>Input</b>	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Switching point/Switching hysteresis	$x \leq 1,2$ mA oder $x \geq 2,1$ mA / approx. 0.9 mA
Control input	sensor power supply approx. 8.2 V, impedance 1.2 k $\Omega$
Lead monitoring	not available
Pulse duration	> 200 $\mu$ s for standstill monitoring, > 250 $\mu$ s for rotation direction detection
<b>Output</b>	
Relay	2 changeover contacts
Contact loading	253 V AC/2 A / $\cos \phi > 0.7$ ; 40 V DC/2 A resistive load;
Energized/de-energized delay	approx. 20 ms / approx. 20 ms
Mechanical life	$5 \times 10^6$ switching cycles
Trip value	for standstill monitoring: 0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz adjustable via DIP switch (S1 and S2)
<b>Transfer characteristics</b>	
Accuracy	$\pm 5$ %
Start-up override	5 seconds or 20 seconds, programmable
Frequency range	$\leq 2$ kHz
Rotation direction detection	90° phase difference between pulse input signal 1 and 2, overlapping $\geq 125$ $\mu$ s
<b>Electrical isolation</b>	
Input/output	safe electrical isolation per EN 50178, voltage peak value 253 V
Input/power supply	safe electrical isolation per EN 50178, voltage peak value 253 V
Output/power supply	safe electrical isolation per EN 50178, voltage peak value 253 V
Output/output	basic insulation according to DIN EN 50178, rated insulation voltage 253 V <sub>eff</sub>
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
<b>Mechanical specifications</b>	
Protection degree	IP20
Connection	plug-in terminals
Mass	approx. 1.50 g
Dimensions	20 mm x 118 mm x 115 mm

## Mounting aids

In most applications, the installation and mounting costs exceed the material costs. The costs can be reduced considerably by selecting the right mounting system. "Selfmade" mounting brackets to fit an application only appear to be economical at first.

In addition to our proven mounting and installation accessories for the VariKont, VariKont L and VariKont M series, a wide range of mounting systems is available for universal installation. We also have compatible mounting brackets for VariKont

and VariKont L sensors for standard DIN rails, used in electronic overhead conveyor systems. Their advantages include rapid adjustment and highly flexible installation options,

In many cases, the locations where the sensors are to be mounted are hard to reach. We therefore use set screws that do not drop out of their respective components.

*Now that's user friendly!*

## Electrical connection systems

Sensors are available with a variety of connector designs. In the past, sensors with cable were often used in order to reach an as high as possible IP protection class. Today's connectors offer similar features with the additional advantage of simplifying the replacement of sensors. This saves both time and money during maintenance. An O-ring was added to our latest mating connectors herewith increased immunity to vibration is guaranteed according to DIN EN 60068-2-6 and a tighter connection even on vibrating machinery parts is ensured.

On applications involving many sensors in a confined space, splitter boxes are used in order to avoid the requirement for cable looms, the replacement of defective components and to retain as flexible a layout as possible.

*No trouble with your connections*

## Accessories








Using the correct mounting and electrical accessories saves time and effort during set-up, maintenance, and replacement of sensors.

In harsh environments, the appropriate accessories from Pepperl+Fuchs can extend the life of the products.

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## Adjustable mounting brackets for cylindrical sensors

The BF mounting brackets simplify mounting and sensor adjustment and are available for all diameter cylindrical sensors.






Model number	∅ [mm]	Height [mm]	Width [mm]	Length [mm]	suitable cap screws	
<b>BF 4</b> <b>BF 4.5</b> <b>BF 5</b>	4 4.5 5	10	18	15	M3 x 15	
<b>BF 6.5</b> <b>BF 8</b>	6.5 8	13	26	20	M3 x 15	
<b>BF 11</b> <b>BF 12</b>	11 12	19	36	30	M4 x 20	
<b>BF 18</b>	18	24	44	40	M5 x 25	
<b>BF 30</b>	30	36	56	40	M5 x 40	
<b>BF 40</b>	40	45	66	30	M5 x 45	
<b>BF 5-30</b>	The BF 5-30 handles standard cylindrical sensors with diameters of 5, 8, 12, 18, and 30 mm and provides 360° rotation in 2 axes.					

Accessories, mechanical mounting systems

9.1




Adjustable mounting brackets for cylindrical sensors

Model number	Description	
<b>MH01-M18</b>	For mounting 18 mm cylindrical sensors to a 12 mm diameter steel rod, rotatable on 2 axes.	
<b>OMH-04</b>	For mounting 18 mm cylindrical sensors to a 12 mm diameter rod, 360° adjustable in all directions, can be attached to a plate.	
<b>OMH-VL18</b>	Metal bracket for 18 mm cylindrical sensors with precision sensor alignment.	
<b>CPZ18B03</b>	Swivel bracket for mounting 18 mm diameter sensors	
<b>M105</b>	<p>Teflon mounting well for 30 mm diameter sensors. The outer thread of the bracket is 1-1/2" NPT.</p> <ul style="list-style-type: none"> <li>• safe mounting</li> <li>• easy installation</li> <li>• robust construction</li> <li>• chemical-resistant</li> </ul> <p>Material: PTFE (sensor sold separately)</p>	

### Snap lever brackets for cylindrical sensors

Snap lever brackets allow quick installation or replacement of any cylindrical sensor. Shoulder stop maintains proper sensor position and range. Maximum adjustment range is 8 mm.

Model number	∅ [mm]	Height [mm]	Width [mm]	Length [mm]	suitable cap screws
<b>BF 8-F</b>	8				M3 x 12
<b>BF 12-F</b>	12	18	30		M4 x 15
<b>BF 18-F</b>	18	24	30		M4 x 20
<b>BF 30-F</b>	30	35	35		M4 x 35



### Optimum protection with cable protectors

Cable connectors protect the cable against mechanical damage and corrosion.







Cable connectors are available for 8, 12, 18, and 30 mm diameter sensors.

**Model numbers:**

- SM8**
- SM12**
- SM14**
- SM18**
- SM30**



Mounting brackets for limit switches

<p><b>MH 04-2681</b> Adjustable Unistrut bracket. Suitable for use on the C profile rail in accordance with EN 50024 or DIN 43662.</p>		<ul style="list-style-type: none"> <li>• 20 mm adjustment range</li> <li>• 360° rotation</li> <li>• allows adjustment of a sensor after mounting</li> </ul>
<p><b>MH 04-3742</b> Adjustable mounting bracket.</p>		<ul style="list-style-type: none"> <li>• 12 mm adjustment range</li> <li>• allows adjustment of a sensor after mounting</li> </ul>
<p><b>MH 04-2057</b> Adjustable slide bracket</p>		<ul style="list-style-type: none"> <li>• 30 mm adjustment range</li> <li>• allows adjustment of a sensor after mounting</li> </ul>
<p><b>MH 02-L</b> Adjustable mounting bracket Suitable for C profile rails in accordance with EN 50024 or DIN 43662.</p>		<ul style="list-style-type: none"> <li>• 60 mm adjustment range</li> <li>• allows adjustment of a sensor after mounting</li> </ul>
<p><b>MH 03-U1/L</b> Mounting rail <b>MHZ 03-U1/L</b> Installation kit Screws and slot nuts</p>		<ul style="list-style-type: none"> <li>• 1 meter profile rail</li> <li>• easy movement of sensors along the profile slot</li> <li>• can be arranged as needed</li> <li>• installation kit MHZ 03-U1/L required</li> </ul>
<p><b>MHW 01</b> Modular mounting bracket for mounting sensors on DIN rails.</p>		<ul style="list-style-type: none"> <li>• easy attachment to profile rails</li> <li>• flexible mounting and easy adjustment in all 3 axes directions</li> <li>• height: 107 mm, bracket: 155 mm</li> <li>• other dimensions on request</li> </ul>

Accessories, mechanical mounting systems

9.1

Date of issue 2008-03-31

**Model number**

**CPZ18B01**

for cylindrical sensors with a thread of 18 mm

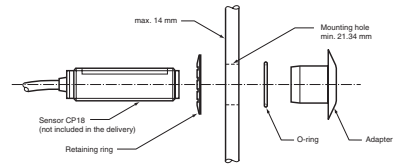


**Technical data**

**Mechanical specifications**

Material	plastic
<b>Suitable series</b>	
Series	CP18

**Dimensions**



**Model number**

**OMH-01**

Mounting aid for round steel  $\varnothing$  12 mm or sheet 1.5 mm ... 3 mm

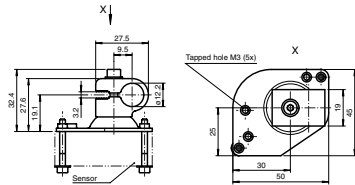


**Technical data**

**Mechanical specifications**

Material	Metal sheet (steel), zinc plated aluminium
Mass	approx. 50 g
<b>Suitable series</b>	
Series	MLV11 MLV12

**Dimensions**



**Model number**

**OMH-02**

Mounting aid for round steel  $\varnothing$  12 mm or sheet 1.5 mm ... 3 mm

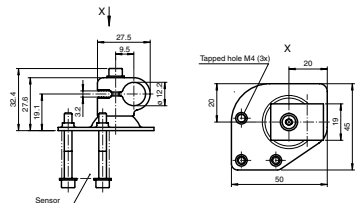


**Technical data**

**Mechanical specifications**

Material	Metal sheet (steel), zinc plated aluminium
Mass	approx. 50 g
<b>Suitable series</b>	
Series	VariKont M

**Dimensions**



**Model number**

**OMH-03**

Mounting aid for round steel  $\varnothing$  12 mm or sheet 1.5 mm ... 3 mm

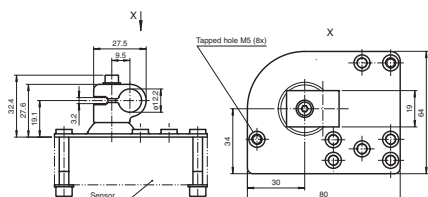


**Technical data**

**Mechanical specifications**

Material	Metal sheet (steel), zinc plated aluminium
Mass	approx. 85 g
<b>Suitable series</b>	
Series	RL 36 RL 39 E DM 3,5 E DM 5 E DM 20

**Dimensions**



9.1 Accessories, mechanical mounting systems

9.1

Date of issue: 03/20/2008





**Model number**

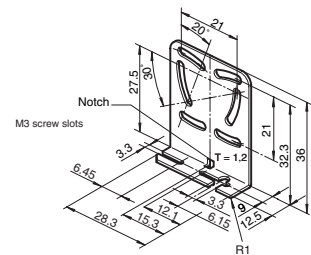
**OMH-ML5**  
Mounting bracket for series ML5 sensors



**Technical data**

Mechanical specifications	
Material	Stainless steel
Mass	approx. 10 g
Suitable series	
Series	ML5

**Dimensions**



**Model number**

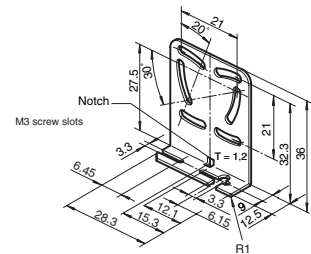
**OMH-ML5**  
Mounting bracket for series ML5 sensors



**Technical data**

Mechanical specifications	
Material	Stainless steel
Mass	approx. 10 g
Mounting	Mounting accessories included
Suitable series	
Series	ML5

**Dimensions**



**Model number**

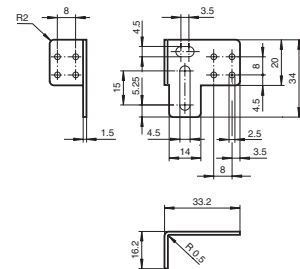
**OMH-ML6**  
Mounting bracket



**Technical data**

Mechanical specifications	
Material	steel, nickel-plated
Mass	approx. 10 g
Suitable series	
Series	ML6 ML4.1 ML4.2

**Dimensions**



**Model number**

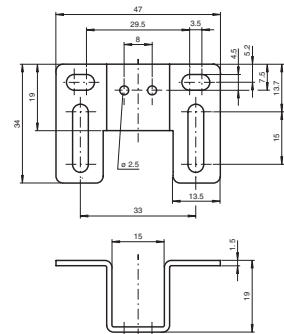
**OMH-ML6-U**  
Mounting bracket



**Technical data**

Mechanical specifications	
Material	steel, nickel-plated
Suitable series	
Series	ML6 ML4.1 ML4.2

**Dimensions**



Date of issue: 03/20/2008

**Model number**

**OMH-ML7-01**

Mounting bracket



**Technical data**

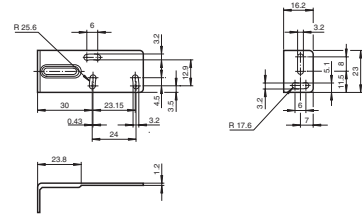
**Mechanical specifications**

Material	Stainless steel
Mass	approx. 15 g
Mounting	Mounting accessories included

**Suitable series**

Series	ML7 ML8
--------	------------

**Dimensions**



**Model number**

**OMH-ML7-02**

Mounting bracket



**Technical data**

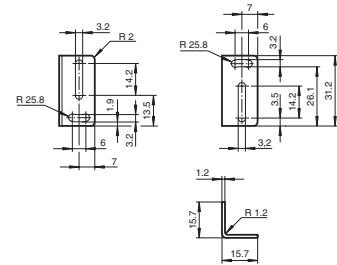
**Mechanical specifications**

Material	Stainless steel
Mass	approx. 8 g
Mounting	Mounting accessories included

**Suitable series**

Series	ML7.1 ML8
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**Dimensions**



**Model number**

**OMH-ML7-03**

Fixing plate



**Technical data**

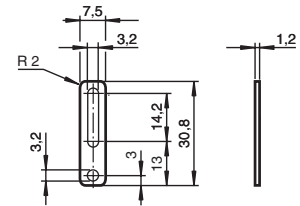
**Mechanical specifications**

Material	Stainless steel
Mass	approx. 5 g

**Suitable series**

Series	ML7 ML7.1 ML8
--------	---------------------

**Dimensions**



**Model number**

**OMH-ML6-Z**

Mounting bracket



**Technical data**

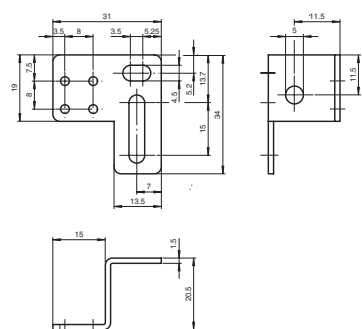
**Mechanical specifications**

Material	steel, nickel-plated
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**Suitable series**

Series	ML6 ML4.1 ML4.2
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**Dimensions**







**Model number**

**OMH-GL**

Mounting bracket for glass fibre optic

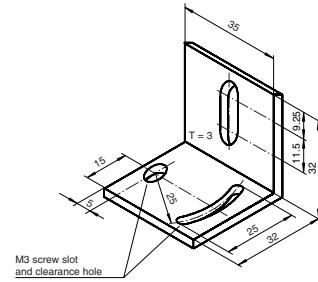


**Technical data**

**Mechanical specifications**

Material	aluminium
Mass	approx. 20 g
<b>Suitable series</b>	
Series	Glas fibre optic

**Dimensions**



**Model number**

**OMH-K01**

Fixation clamp for sensors with dove tail

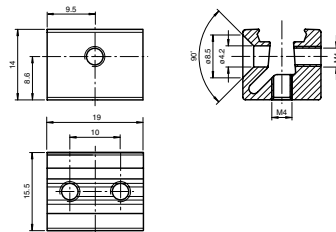


**Technical data**

**Mechanical specifications**

Material	anodised aluminium
Mass	approx. 10 g
<b>Suitable series</b>	
Series	MLV12

**Dimensions**



**Model number**

**OMH-K02**

Fixation clamp for sensors with dove tail

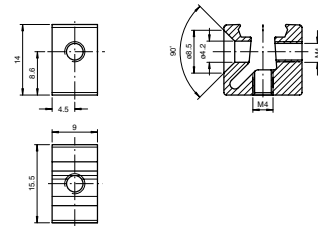


**Technical data**

**Mechanical specifications**

Material	anodised aluminium
Mass	approx. 5 g
<b>Suitable series</b>	
Series	MLV12

**Dimensions**



**Model number**

**OMH-K03**

Fixation clamp for sensors with dove tail

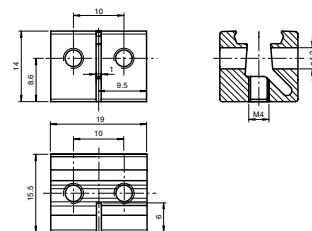


**Technical data**

**Mechanical specifications**

Material	anodised aluminium
Mass	approx. 6 g
<b>Suitable series</b>	
Series	MLV12

**Dimensions**



Accessories, mechanical mounting systems

9.1

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**Model number**

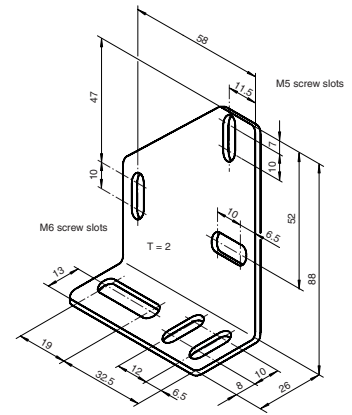
**OMH-RL36**  
Mounting bracket



**Technical data**

Mechanical specifications	
Material	Metal sheet (steel), zinc plated
Mass	approx. 95 g
Mounting	Mounting accessories included
Suitable series	
Series	RL36 ED M3,5 ED M5 ED M20

**Dimensions**



**Model number**

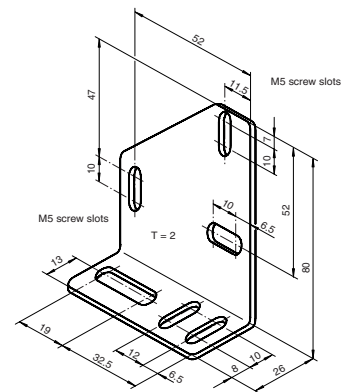
**OMH-RL39**  
Mounting bracket for sensors of RL39 series



**Technical data**

Mechanical specifications	
Material	Metal sheet (steel), zinc plated
Mass	approx. 85 g
Mounting	Mounting accessories included
Suitable series	
Series	RL39

**Dimensions**



**Model number**

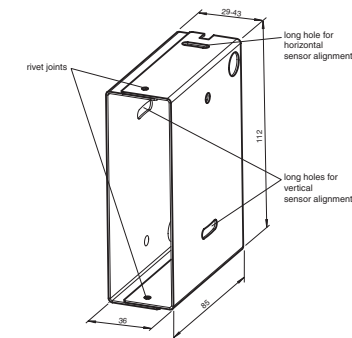
**OMH-RLK29**  
Mounting bracket



**Technical data**

Mechanical specifications	
Material	Stainless steel
Mass	approx. 85 g
Suitable series	
Series	RLK28 RLK29

**Dimensions**



**Model number**

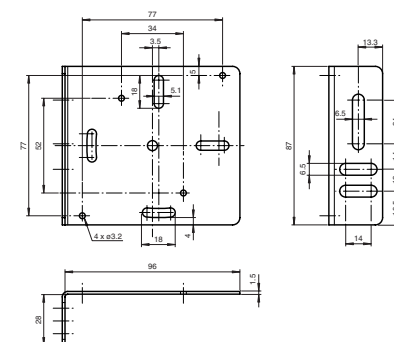
**OMH-RLK29-HW**  
Mounting bracket for rear wall mounting



**Technical data**

Mechanical specifications	
Material	Stainless steel
Mass	approx. 150 g
Dimensions	136 mm x 52 mm x 3 mm
Suitable series	
Series	RL23 RL28 RL29 RL32

**Dimensions**



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**Model number**

**OMH-RL28-C**

Protective cover



**Technical data**

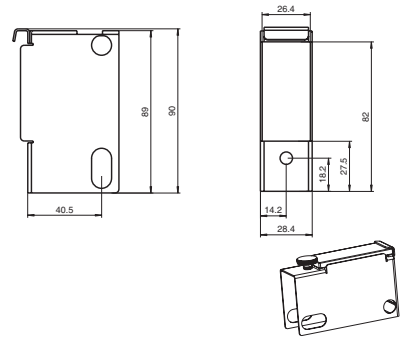
**General specifications**

Accessories provided	glass M 4 x 8 mm thumb screw
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**Mechanical specifications**

<b>Material</b>	
Housing	Metal sheet (steel), black coated
Optical face	glass
<b>Suitable series</b>	
Series	RL28 RL29

**Dimensions**



**Model number**

**OMH-RL31-01**

Mounting bracket



**Technical data**

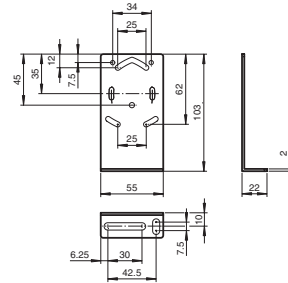
**Mechanical specifications**

Material	Metal sheet (steel), zinc plated
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**Suitable series**

Series	Series 31
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**Dimensions**



**Model number**

**OMH-RL31-02**

Mounting bracket



**Technical data**

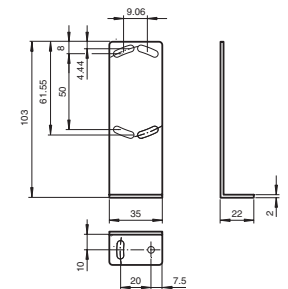
**Mechanical specifications**

Material	Metal sheet (steel), zinc plated
----------	----------------------------------

**Suitable series**

Series	Series 31
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**Dimensions**



**Model number**

**OMH-RL31-03**

Mounting bracket



**Technical data**

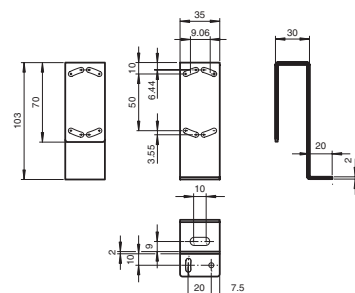
**Mechanical specifications**

Material	Metal sheet (steel), zinc plated
----------	----------------------------------

**Suitable series**

Series	Series 31
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**Dimensions**



Accessories, mechanical mounting systems

9.1

Date of issue: 03/20/2008

**Model number**

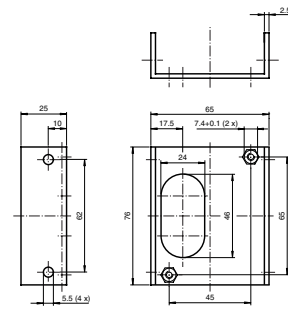
**OMH-DAD10**  
Mounting bracket



**Technical data**

Mechanical specifications	
Material	aluminium
Mass	approx. 50 g
Suitable series	
Series	DAD 10 DAD 15

**Dimensions**



**Model number**

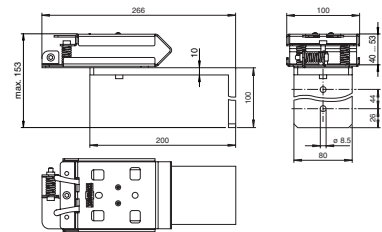
**OMH-LS610-01**  
Mounting bracket for optical data coupler



**Technical data**

Mechanical specifications	
Material	Aluminium, black coated steel, zinc plated black
Mass	approx. 1500 g
Suitable series	
Series	LS 610 LS 611 VDM100

**Dimensions**



**Model number**

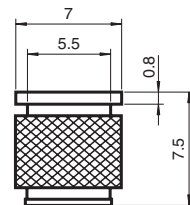
**OMH-LS610-02**  
Direct mounting set consisting of 4xM4 threaded inserts



**Technical data**

Mechanical specifications	
Material	brass
Suitable series	
Series	LS 610 LS 611 VDM100

**Dimensions**



**Model number**

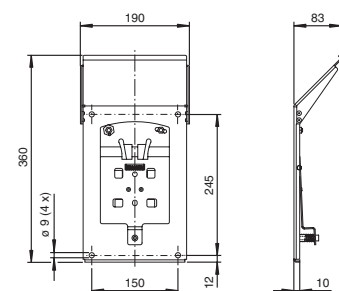
**OMH-LS610-03**  
Mounting bracket with deviation mirror for optical data coupler



**Technical data**

Mechanical specifications	
Material	Stainless steel
Mass	approx. 1580 g
Suitable series	
Series	LS 610 LS 611


















**Dimensions**



Date of issue: 03/20/2008




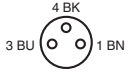
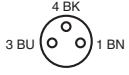





## Field attachable connectors



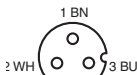
	Model number	Style	Connector type	Number of pins	Cable diameter [mm <sup>2</sup> ]	
M8	V3-GM	Female, straight	Insulation piercing	3 pin	0.25 ... 0.34	
	V3-WM	Female, right-angled	Insulation piercing	3 pin	0.25 ... 0.34	
	V3S-GM	Male, straight	Insulation piercing	3 pin	0.25 ... 0.34	
M12	V1-G	Female, straight	Terminal PG7 cable gland	4 pin	max. 0.75	
	V1-W	Female, right-angled	Terminal PG7 cable gland	4 pin	max. 0.75	
	V1S-G	Male, straight	Terminal PG7 cable gland	4 pin	max. 0.75	
	V1S-W	Male, straight	Terminal PG7 cable gland	4 pin	max. 0.75	
	V1-E/E2-LED	LED board (pnp/npn)	for mounting in V1-G and V1-W			
	V1-G-Q2	Female, straight	Insulation piercing	4 pin	max. 0.75	
	V1S-G-Q2	Male, straight	Insulation piercing	4 pin	max. 0.75	
Rd 24 x 1/8 (Binder series 692)	V16-G	Female, straight	Terminal	6 pin + PE	max. 0.75	
	V16S-G	Male, straight	Terminal	6 pin + PE	max. 0.75	
M18	V18-G	Female, straight	Terminal	4 pin	max. 1.5	
	V18-W	Female, right-angled	Terminal	4 pin	max. 1.5	
with central screw	V-W	Female, right-angled red	Terminal	5 pin	max. 2.5	
	V-W-E2	Female, right-angled red/transparent	Terminal with integrated LED	5 pin	max. 2.5	
	V-W-N	Female, right-angled blue	Terminal	5 pin	max. 2.5	

Date of issue 2008-03-31

## Cordsets with 8 mm receptacles



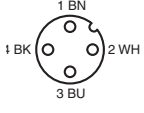
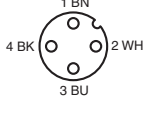
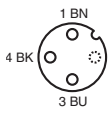
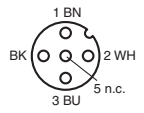
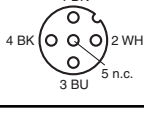
Suitable for 2-, 3-, and 4-wire sensors							
Cable sheath	Length [m]	Number of wires	Ø [mm]	Pin assignment	Straight	Right-angled	Right-angled, with 2 LEDs
PUR, gray	2	3	0.34		<b>V3-GM-2M-PUR</b> <b>V3-GM-3M-PUR</b> <b>V3-GM-5M-PUR</b> <b>V3-GM-10M-PUR</b>	<b>V3-WM-2M-PUR</b> <b>V3-WM-3M-PUR</b> <b>V3-WM-5M-PUR</b> <b>V3-WM-10M-PUR</b>	<b>V3-WM-E2-2M-PUR</b>  <b>V3-WM-E2-5M-PUR</b> <b>V3-WM-E2-10M-PUR</b>
	3	3	0.34				
	5	3	0.34				
	10	3	0.34				
PVC, gray	2	3	0.34		<b>V3-GM-2M-PVC</b> <b>V3-GM-5M-PVC</b> <b>V3-GM-10M-PVC</b>	<b>V3-WM-2M-PVC</b> <b>V3-WM-5M-PVC</b> <b>V3-WM-10M-PVC</b>	<b>V3-WM-E2-5M-PVC</b>
	5	3	0.34				
	10	3	0.34				
PUR, gray	2	4	0.34		<b>V31-GM-2M-PUR</b> <b>V31-GM-3M-PUR</b> <b>V31-GM-5M-PUR</b> <b>V31-GM-10M-PUR</b>	<b>V31-WM-2M-PUR</b> <b>V31-WM-3M-PUR</b> <b>V31-WM-5M-PUR</b> <b>V31-WM-10M-PUR</b>	
	3	4	0.34				
	5	4	0.34				
	10	4	0.34				
PVC, gray	2	4	0.34		<b>V31-GM-2M-PVC</b> <b>V31-GM-5M-PVC</b> <b>V31-GM-10M-PVC</b>	<b>V31-WM-2M-PVC</b> <b>V31-WM-5M-PVC</b> <b>V31-WM-10M-PVC</b>	
	5	4	0.34				
	10	4	0.34				
	2	3	0.34		<b>V3S-GM-2M-PUR</b> <b>V3S-GM-5M-PUR</b> (connector)		
	5	3	0.34				



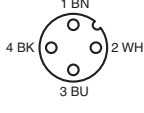
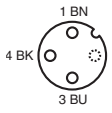
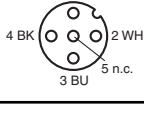
## Cordsets with 12 mm receptacles for AC sensors

Suitable for 2-wire sensors						
Cable sheath	Length [m]	Number of wires	Ø [mm]	Pin assignment	Straight	Right-angled
PUR, gray	5	3	0.34		<b>V13-G-5M-PUR</b>	<b>V13-W-5M-PUR</b>





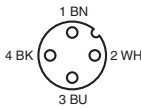
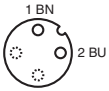
Cordsets with 12 mm receptacles for DC sensors

Suitable for 2-, 3-, and 4-wire sensors						
Cable sheath	Length [m]	Number of wires	ø [mm]	Pin assignment	Straight	Right-angled
PVC, gray	2	4	0.34		<b>V1-G-2M-PVC</b> <b>V1-G-3M-PVC</b> <b>V1-G-5M-PVC</b> <b>V1-G-10M-PVC</b>	<b>V1-W-2M-PVC</b> <b>V1-W-3M-PVC</b> <b>V1-W-5M-PVC</b> <b>V1-W-10M-PVC</b>
	3	4	0.34			
	5	4	0.34			
	10	4	0.34			
PUR, gray 1)	2	4	0.34		<b>V1-G-2M-PUR</b> <b>V1-G-3M-PUR</b> <b>V1-G-5M-PUR</b> <b>V1-G-10M-PUR</b>	<b>V1-W-2M-PUR</b> <b>V1-W-3M-PUR</b> <b>V1-W-5M-PUR</b> <b>V1-W-10M-PUR</b>
	5	4	0.34			
	10	4	0.34			
	4	4	0.34			
PVC, gray	2	3	0.34		<b>V11-G-2M-PVC</b> <b>V11-G-3M-PVC</b> <b>V11-G-5M-PVC</b> <b>V11-G-10M-PVC</b>	<b>V11-W-2M-PVC</b> <b>V11-W-3M-PVC</b> <b>V11-W-5M-PVC</b> <b>V11-W-10M-PVC</b>
	3	3	0.34			
	5	3	0.34			
	10	3	0.34			
PVC, gray	2	5	0.34		<b>V15-G-2M-PVC</b> <b>V15-G-5M-PVC</b> <b>V15-G-10M-PVC</b>	<b>V15-W-2M-PVC</b> <b>V15-W-5M-PVC</b> <b>V15-W-10M-PVC</b>
	5	5	0.34			
	10	5	0.34			
PUR, gray 1)	2	5	0.34		<b>V15-G-2M-PUR</b> <b>V15-G-5M-PUR</b> <b>V15-G-10M-PUR</b>	<b>V15-W-2M-PUR</b> <b>V15-W-5M-PUR</b> <b>V15-W-10M-PUR</b>
	5	5	0.34			
	10	5	0.34			





Suitable for 2-, 3-, and 4-wire DC sensors						
Transparent handle with 2 LEDs					Straight	Right-angled
Cable sheath	Length [m]	Number of wires	ø [mm]	Pin assignment	Straight	Right-angled
PUR, gray 1)	2	4	0.34		<b>V1-G-A2-2M-PUR</b> <b>V1-G-A2-5M-PUR</b>	<b>V1-W-A2-2M-PUR</b> <b>V1-W-A2-5M-PUR</b> <b>V1-W-A0-5M-PUR</b> <b>V1-W-E-5M-PUR (npn)</b> <b>V1-W-E2/E3-5M-PUR</b> <b>V1-W-A2-10M-PUR</b>
	5	4	0.34			
	5	4	0.34			
	5	4	0.34			
	5	4	0.34			
	10	4	0.34			
PUR, gray 1)	2	3	0.34		<b>V1-G-E2-2M-PUR</b> <b>V1-G-E2-5M-PUR</b> <b>V1-G-E2-10M-PUR</b>	<b>V1-W-E2-2M-PUR</b> <b>V1-W-E2-5M-PUR</b> <b>V1-W-E2-10M-PUR</b>
	5	3	0.34			
	10	3	0.34			
PUR, gray 1)	5	5	0.34		<b>V15-G-A2-5M-PUR</b>	<b>V15-W-A2-5M-PUR</b>

1) Halogen free and crosslinked sheathing available as ...-PUR H/S



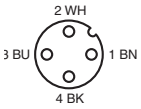
**Cordsets with 12 mm receptacles for NAMUR sensors**

Suitable for NAMUR sensors, Grip and cable sheath in blue						
Cable sheath	Length [m]	Number of wires	ø [mm]	Pin assignment	Straight	Right-angled
PVC, gray	5 10	4 4	0.34 0.34			V1-W-N4-5M-PVC V1-W-N4-10M-PVC
PUR, gray	2 5 10	2 2 2	0.34 0.34 0.34		V1-G-N-2M-PUR V1-G-N-5M-PUR V1-G-N-10M-PUR	V1-W-N-2M-PUR V1-W-N-5M-PUR V1-W-N-10M-PUR

**Extension cables with 12 mm receptacles, 4 x 0.34 mm<sup>2</sup>**

Suitable for 2-, 3-, and 4-wire DC sensors						
Male, straight	Length [m]	Female, straight	Female, right-angled			
	PUR, gray	0,6 1 2 3 5 10	V1-G-0,6M-PUR-V1-G V1-G-1M-PUR-V1-G V1-G-2M-PUR-V1-G V1-G-3M-PUR-V1-G V1-G-5M-PUR-V1-G V1-G-10M-PUR-V1-G	V1-W-0,6M-PUR-V1-G V1-W-1M-PUR-V1-G V1-W-2M-PUR-V1-G V1-W-3M-PUR-V1-G V1-W-5M-PUR-V1-G V1-W-10M-PUR-V1-G		
		PVC, gray	0,6 1 2 3 5 10	V1-G-0,6M-PVC-V1-G V1-G-1M-PVC-V1-G V1-G-2M-PVC-V1-G V1-G-3M-PVC-V1-G V1-G-5M-PVC-V1-G V1-G-10M-PVC-V1-G	V1-W-2M-PVC-V1-G  V1-W-5M-PVC-V1-G V1-W-10M-PVC-V1-G	

**Cordsets with 12 mm receptacles for DC sensors**

Suitable for 2-, 3-, and 4-wire DC sensors for connections to multi-port junction boxes and AS-Interface distributors						
Cable sheath	Length [m]	Number of wires	ø [mm]	Pin assignment	Straight	Right-angled
PUR, gray	2 5	4 4	0.34 0.34		V1S-G-2M-PUR V1S-G-5M-PUR	V1S-W-2M-PVC V1S-W-5M-PVC






Date of issue 2008-03-31

Accessories, electrical connection systems

9.2

### Multi-port junction blocks with 12 mm receptacles

Junction boxes offer a fast, cost-effective and space-saving means of installing several sensors. They reduce installation and maintenance costs by simplifying your wiring requirements. Versions are available with cable, terminal block, or M23 quick disconnect with 4 or 8 12 mm receptacles. All types are suitable for PNP sensors. Models with dual ports allow 2 sensors to be connected on one 12 mm receptacle.

<p><b>Multi-port junction block with cable connection,</b> with LEDs, one signal per port, with 4 and 8 ports</p> <p>dimensions (L x W x H) in mm 82 x 54 x 18.5 (4 ports) 126.5 x 54 x 18.5 (8 ports)</p>		<p>4 port: <b>V1-4A-E2-5M-PUR</b> <b>V1-4A-E2-10M-PUR</b></p> <p>8 port: <b>V1-8A-E2-5M-PUR</b> <b>V1-8A-E2-10M-PUR</b></p> <p>other cable lengths available on request</p>
<p><b>Multi-port junction block with terminal block connection,</b> with LEDs, two signals per port, with 4 and 8 ports</p> <p>dimensions (L x W x H) in mm 116.5 x 54 x 32 (4 ports) 155 x 54 x 32 (8 ports)</p>		<p>4 ports: <b>V1-4/8A-E2</b></p> <p>8 ports <b>V1-8/16A-E2</b></p>
<p><b>Multi-port junction block with M23 quick disconnect,</b> with LEDs, one signal per port, with 4 and 8 ports</p> <p>dimensions (L x W x H) in mm 110 x 54 x 33.5 (4 ports) 163 x 54 x 33.5 (8 ports)</p>		<p>4 ports: <b>V1-4A-E2-M23</b></p> <p>8 ports <b>V1-8A-E2-M23</b></p>
<p><b>Mounting bracket</b> for multi-port junction boxes on DIN rail</p>		<p>for multi-port junction block with 4 ports: <b>MH05-SACB-4</b></p> <p>for multi-port junction block with 8 ports: <b>MH05-SACB-8</b></p>
<p><b>Protective cover</b> for unused M12 x 1 ports</p>		<p><b>VAZ-V1-B</b></p>

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## Test devices for initiators

On-site troubleshooting can be a problem without the proper testing equipment. With Pepperl+Fuchs hand-held tester, proximity sensors can be tested without having to remove the sensor from its installation.

### Advantages:

- Easy operation
- Optical and acoustic signalling
- Battery operated
- Initiator Sensor can be adjusted before installation is completed
- Locates wiring errors
- Test function check/battery test
- Includes two 9-volt block batteries

### ST 03



- 2 LED displays
- 3 connection terminals for 0 V, 18 V, and test output
- For testing all DC sensors with 2-, 3-, or 4-wire configuration and all sensors built according to DIN 19234 NAMUR (not for use under hazardous conditions)
- Maximum load current 100 mA
- Includes two 9-V block batteries

### 1-1350



- 5 LED displays
- 4 connection terminals for 0 V, 18 V (pulsed, test output 1 and 2)
- For testing all 2-, 3-, and 4-wire DC sensors and all 2- and 3-wire AC sensors
- Test function check/battery test
- Includes two 9-V block batteries

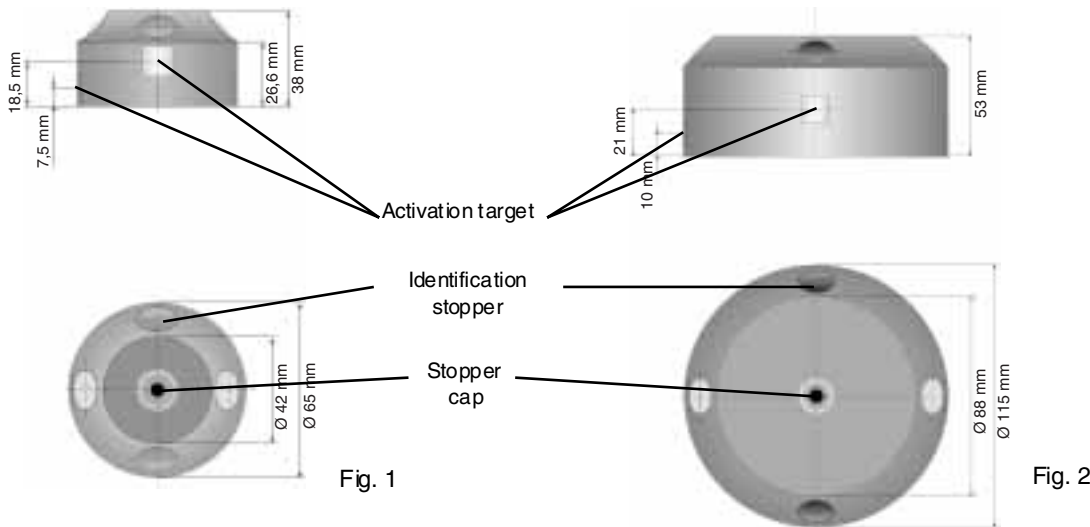
### Accessories for valve positioners

Suitable valve positioning pucks and mounting brackets are available for the F31 and F25 series sensors.

#### Valve positioning pucks for the F31 series sensors with fixed switching positions

Part	Shaft diameter	Shaft height	Mounting hole configuration	Notes	Fig.
BT65A*	< 58 mm	20 + 30 mm	30 x 80 mm	Ring diameter max. 65 mm, snap ring height max. 6 mm	1
BT65X**					3
BT115A*	< 90 mm	30 + 50 mm	30 x 130 mm	Ring diameter max. 110 mm, snap ring height max. 7 mm	2
BT115X**					4

\* for clockwise and counter-clockwise rotating valves with 180° rotation



\*\* The outer surfaces of the BT65X and BT115X positioning pucks are made of stainless steel with openings at the activation target. This results in an inverted operation.



Fig. 3



Fig. 4

Included in delivery:	BT 65	BT 115	Material
Spacer	1 off (10 mm thick)	2 off (10 mm thick)	PBT
Stopper cap black	x 1	1 off	PBT
Identification stopper yellow	x 2	2 off	PBT
Identification stopper black	x 2	2 off	PBT
Activation target	integrated	integrated	V2A***
Attachment screw for F31	2 x M5 x 12	2 x M5 x 12	V2A***
Attachment screw for F31K	2 x M5 x 16	2 x M5 x 16	V2A***
Attachment screw for puck	1 x M6 x 25	1 x M6 x 25	V2A***

The BT65 and BT115 positioning pucks are made of a conductive plastic material which prevents static charges and allows installation in potentially explosive environments.

\*\*\* V2A = stainless steel 304

Date of issue 2008-04-01

## Valve positioning pucks for the F31 series sensors with adjustable switching positions

Part	Shaft diameter	Shaft height	Mounting hole configuration	Notes	Fig.
BT65B	< 58 mm	20 + 30 mm	30 x 80 mm	Ring diameter max. 65 mm, snap ring height max. 6 mm	1
BT115B	< 90 mm	30 + 50 mm	30 x 130 mm	Ring diameter max. 110 mm, snap ring height max. 7 mm	2

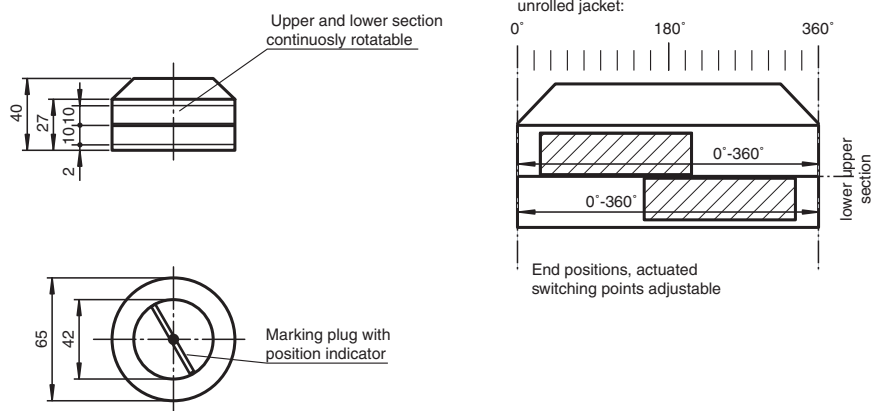


Fig. 1: BT65B

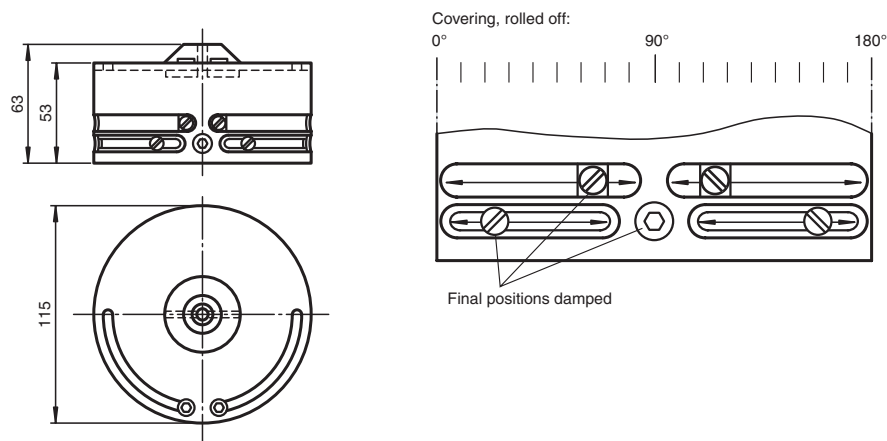
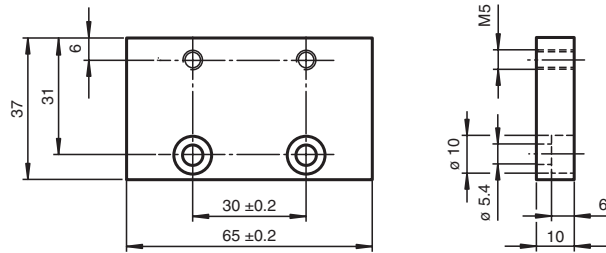
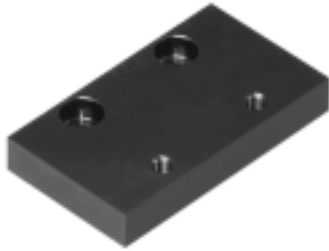


Fig. 2: BT115B

F31 series accessories

MH-BT65B

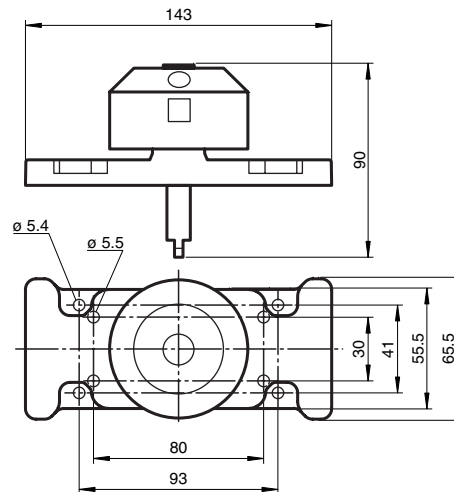


Mounting plate for use with the BT65B positioning puck in drives with:

hole dimension  $80 \text{ mm} \times 30 \text{ mm}$   
hole dimension  $130 \text{ mm} \times 30 \text{ mm}$

and shaft height  $30 \text{ mm}$

MH-BT65-Tyco



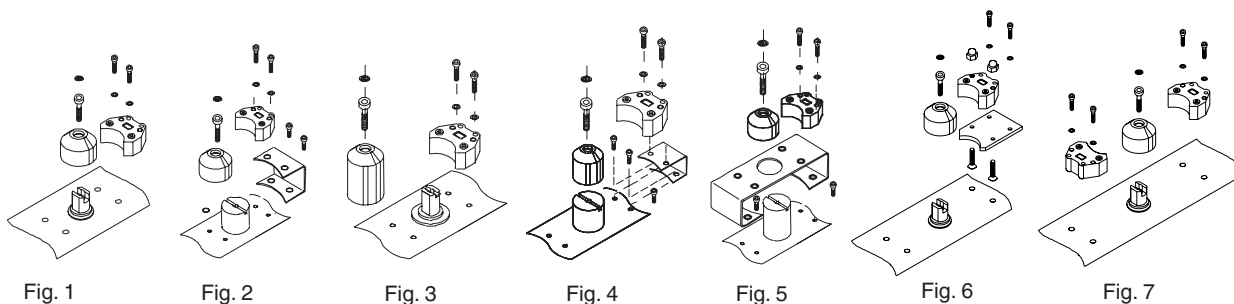
Mounting plate with shaft and BT65 positioning puck for use in drives made by Tyco with hole dimensions  $30 \text{ mm} \times 80 \text{ mm}$ .

The positioning puck has been fitted to the shaft.  
Can be used in potentially explosive environments.

## Accessories for the F25 series

Installation kit	Shaft diameter <sup>1)</sup>	Shaft height	Mounting hole configuration	consisting of:		Fig.
				Puck	Plate	
BT32-F25-0	< 34 mm	20 mm	30 x 80 mm	BT32	–	1
BT33-F25-0	< 34 mm	30 mm	30 x 80 mm	BT33	–	3
BT34-F25-2	preferably > 34 mm	20/30 mm	30 x 80 mm	BT34	K2	2
BT34-F25-3	preferably > 34 mm	30 mm	30 x 130 mm	BT34	K3	4
BT34-F25-4	preferably > 34 mm	50 mm	30 x 130 mm	BT34	K4	5
MH5-F25-Y43089	< 34 mm	20/30 mm	30 x 130 mm	–	Metal plate	6
MH20-F25-Y43090	Height compensation for additionally mounted controller			–	F25 fully encapsulated	7

<sup>1)</sup> If the ring height is > 3 mm then the snap ring height is the determiner, not the shaft diameter.



### MH... F25 mounting plates

### K... Mounting plates

Part	Shaft diameter	Mounting hole configuration	Notes	Fig.
<b>Puck</b>				
BT32	≤ 34 mm	–	Height of active surface: 28 mm	8
BT32X	≤ 34 mm	–	as BT32, but with reversed direction of action	–
BT33	≤ 34 mm	–	Height of active surface: 38 mm	9
BT34	≥ 34 mm	–	Height of active surface: 28 mm, sitting on the shaft	10
BT37	≥ 34 mm	–	Puck BT37 with 4 mm groove for regulator attachment	–
<b>Mounting plate</b>				
K2	–	30 x 80 mm	–	2
K3	–	30 x 130 mm	–	4
K4	–	30 x 130 mm	–	5

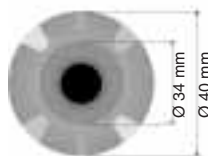


Fig. 8

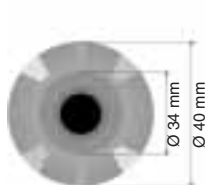
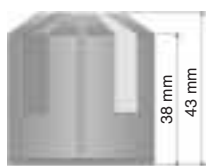


Fig. 9

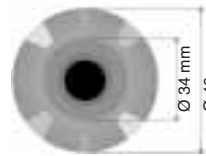


Fig. 10



## Accessories for magnetic field sensors

### Clamping straps

according to DIN 3017, stainless steel, strap width 9 mm, strap thickness 0.70 mm, hexagonal screw size 6

Clamping strap	Designation	suitable for hydraulic cylinders with
SB 40-60 09R	Clamping strap	Ø30 ... 48 mm
SB 50-70 09R	Clamping strap	Ø40 ... 58 mm
SB 60-80 09R	Clamping strap	Ø50 ... 68 mm
SB 70-90 09R	Clamping strap	Ø60 ... 78 mm

### Clamping strap with screw

Stainless steel, 10 mm wide clamping strap, strap thickness 0.5 mm

Model number	Designation	suitable for hydraulic cylinders with
SB 10M 10R	Clamping strap, 10 m roll	Ø > 70 mm
SBS 100 R	Screw	–

## Permanent magnets

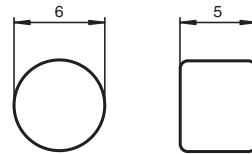
### Magnetic characteristics

Ring magnets made of sintered neodymium-iron-boron material with a zinc coating for corrosion protection.

Characteristic		Value	Unit
Energy product	(W x H) max	225 ... 280	kJ/m <sup>3</sup>
Remanence	B <sub>r</sub>	1100 ... 1250	mT
Coercive field strength	H <sub>c</sub>	720 ... 930	kA/m
Remanence temperature coefficient	α	-0.10	%/°C
Permeability	μ <sub>0</sub> μ <sub>r</sub>	1.07	mT/kA/m
Curie temperature	T <sub>c</sub>	310	°C
max. operating temperature	T <sub>max</sub>	approx. 100 ... 150	°C
Density	ρ	7.5	g/cm <sup>3</sup>

The following magnets are recommended:

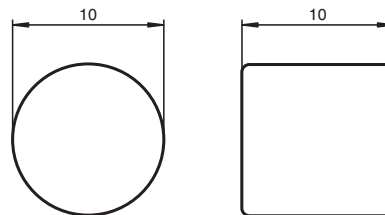
**DM 06-05 NDFEB**



Material: NdFeB  
 Coating: Ni + Sn  
 Ambient temperature: max. 120 °C

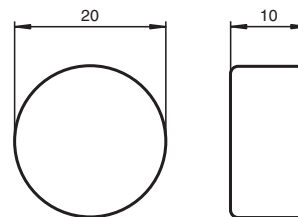
Packing unit 20 off

**DM 10-10 NDFEB**



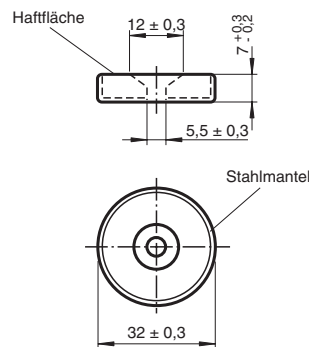
Material: NdFeB  
 Coating: Ni + Sn  
 Ambient temperature: max. 120 °C

**DM 20-10 NDFEB**



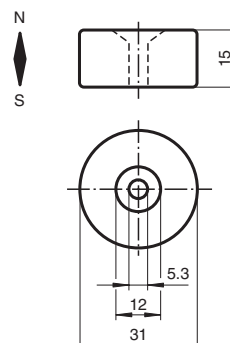
Material: NdFeB  
 Coating: Ni + Sn  
 Ambient temperature: max. 120 °C

**DM 25-32-07**



Material: BaFe with steel casing  
 Ambient temperature: -40 ... 85 °C

**DM 60-31-15**



Material: SrFe  
 Ambient temperature: max. 200 °C

DM ... NDFEB magnets are intended for installation in the cylinder piston.

Accessories, for magnetic field sensors

## The MagCalc program

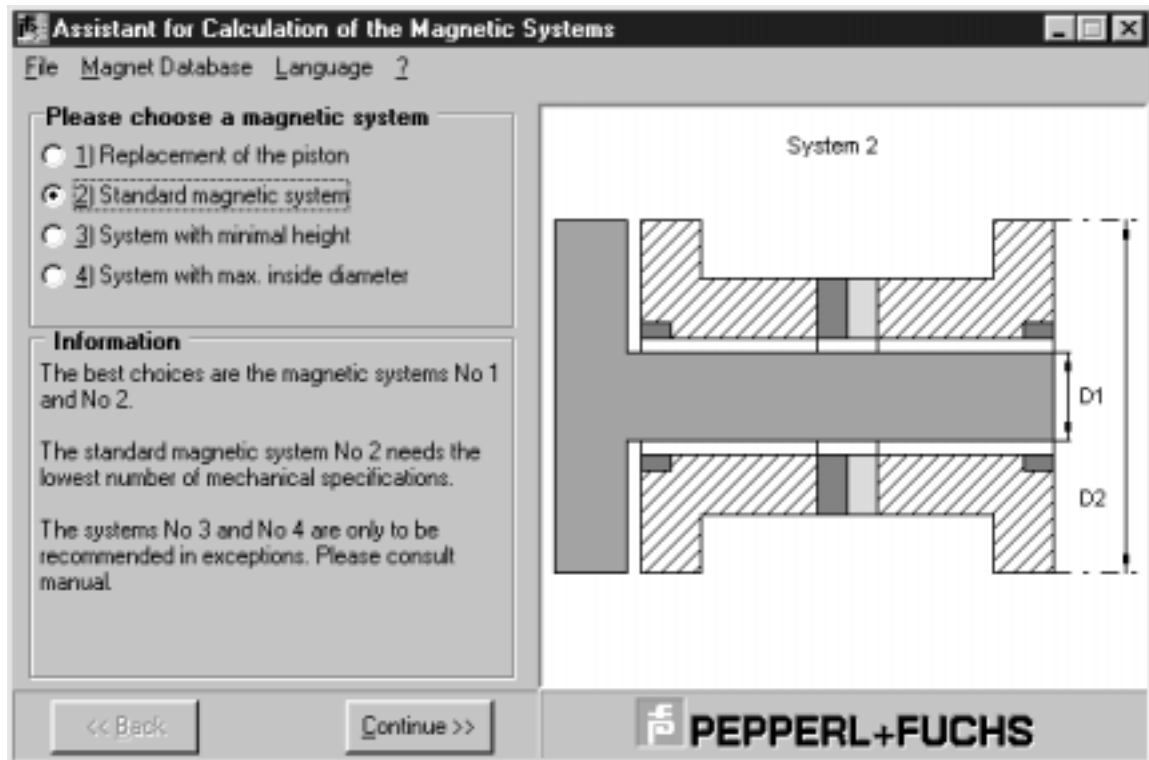
The MagCalc program is used to design magnetic systems for detecting piston positions in hydraulic cylinders with the MBF32- A2-(V1) sensor. Depending on the geometry and magnetic properties of the cylinder, pistons, and magnets, MagCalc supplies the dimensions of a magnetic system as well as the minimum number of magnets needed. Also, the piston speed and the ambient temperature are taken into account when designing the magnetic systems.

## MagCalc

## Requirements for MagCalc

- Operating system: Windows 3.11, Windows 95 or Windows NT
- Computer: Windows 3.11 compatible
- Graphics card: VGA graphics card with 256 colors
- Memory requirement: 5 MB for installation with manual, 1 MB for installation without manual

**Model number: MagCalc**



**Model number**

**REFLEKTOR H32**

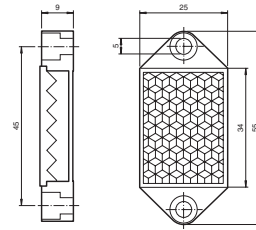
Reflector, hexagonal 55 mm x 25 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	hexagonal
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	55 mm x 25 mm x 9 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR H48**

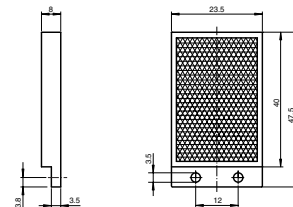
Reflector, rectangular 47.5 mm x 23.5 mm, mounting holes, fixing strap



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	47.5 mm x 23.5 mm x 8 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR H48**

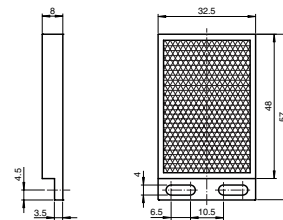
Reflector, rectangular 32.5 mm x 57 mm, mounting holes, fixing strap



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	32.5 mm x 57 mm x 8 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR H50**

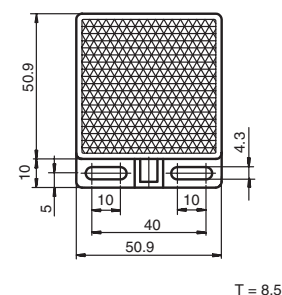
Reflector, rectangular 50.9 mm x 50.9 mm, mounting holes, fixing strap



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	50.9 mm x 50.9 mm x 8.5 mm
Mounting	mounting holes

**Dimensions**



Accessories, for photoelectric sensors: reflectors

9.5

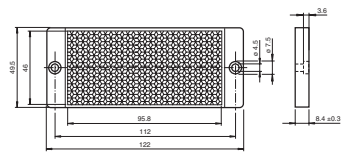
Date of issue: 03/20/2008

**Model number**  
**REFLEKTOR H50x100**  
 Reflector, rectangular 122 mm x 49.5 mm, mounting holes



Technical data	
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-40 ... 70 °C (253 ... 343 K)
<b>Mechanical specifications</b>	
Dimensions	122 mm x 49.5 mm x 8.4 mm
Mounting	mounting holes

**Dimensions**

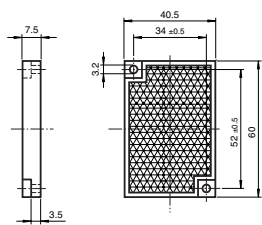


**Model number**  
**REFLEKTOR H60**  
 Reflector, rectangular 40.5 mm x 60 mm, mounting holes



Technical data	
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	60 mm x 40.5 mm x 7.5 mm
Mounting	mounting holes

**Dimensions**

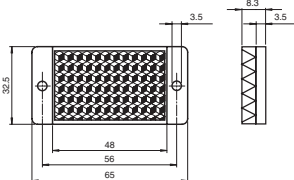


**Model number**  
**REFLEKTOR H65**  
 Reflector, rectangular 65 mm x 32.5 mm, mounting holes



Technical data	
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	65 mm x 32.5 mm x 8.3 mm
Mounting	mounting holes

**Dimensions**

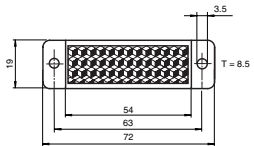


**Model number**  
**REFLEKTOR H72**  
 Reflector, rectangular 72 mm x 19 mm, mounting holes



Technical data	
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	72 mm x 19 mm x 8.5 mm
Mounting	mounting holes

**Dimensions**



Date of issue: 03/20/2008

**Model number**

**REFLEKTOR H75**

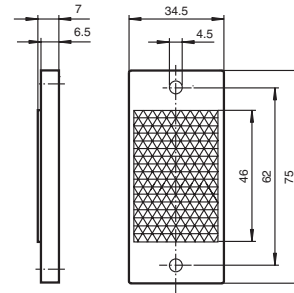
Reflector, rectangular 75 mm x 34.5 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	75 mm x 34.5 mm x 7 mm
Mounting	mounting holes

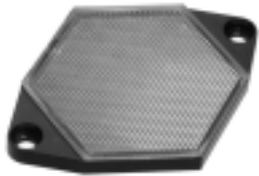
**Dimensions**



**Model number**

**REFLEKTOR H78**

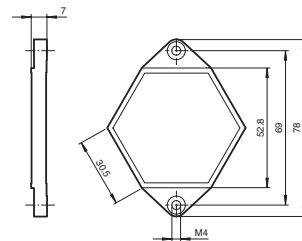
Reflector, hexagonal 78 mm x 61 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	hexagonal
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	78 mm x 61 mm x 7 mm
Mounting	mounting holes

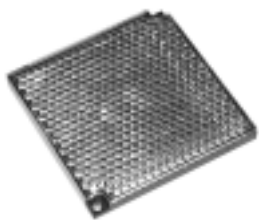
**Dimensions**



**Model number**

**REFLEKTOR H85-2**

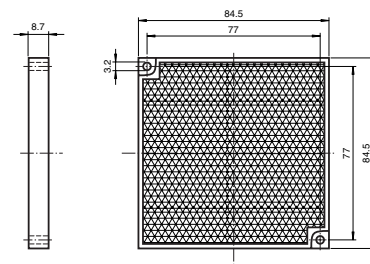
Reflector, rectangular 84.5 mm x 84.5 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	84.5 mm x 84.5 mm x 8.7 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR H100**

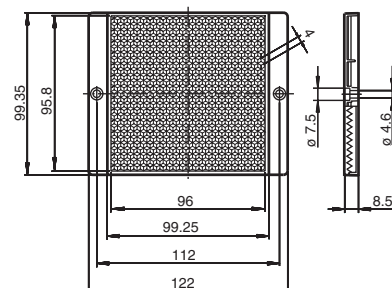
Reflector, rectangular 122 mm x 99.35 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-40 ... 70 °C (233 ... 343 K)
<b>Mechanical specifications</b>	
Material	P MMA
Dimensions	122 mm x 99.35 mm x 8.5 mm
Mounting	mounting holes

**Dimensions**



Accessories, for photoelectric sensors: reflectors

9.5

Date of issue: 03/20/2008

**Model number**

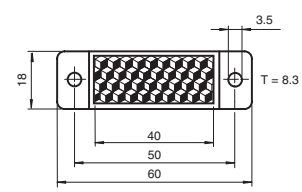
**REFLEKTOR H160**  
 Reflector, rectangular 60 mm x 18 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	60 mm x 18 mm x 8.3 mm
Mounting	mounting holes

**Dimensions**



**Model number**

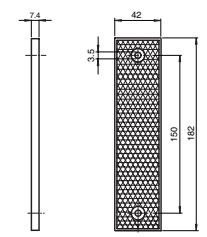
**REFLEKTOR H180**  
 Reflector, rectangular 180 mm x 40 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	180 mm x 40 mm x 7.4 mm
Mounting	mounting holes

**Dimensions**



**Model number**

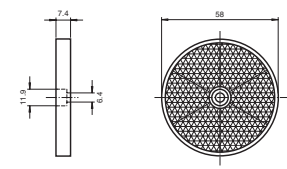
**REFLEKTOR C60**  
 Reflector, round ø 58 mm, central mounting hole



**Technical data**

<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diameter: 65 mm
Mounting	mounting hole

**Dimensions**



**Model number**

**REFLEKTOR C65**  
 Reflector, round ø 65 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diameter: 65 mm
Mounting	mounting hole

**Dimensions**



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Subject to reasonable modifications due to technical advances.

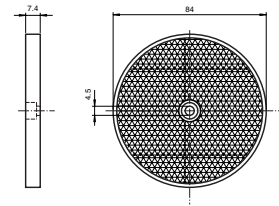
Copyright Pepperl+Fuchs, Printed in Germany

**Model number****REFLEKTOR C110-2**

Reflector, round  $\varnothing$  84 mm, central mounting hole

**Technical data**

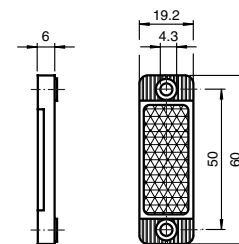
<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / ABS
Dimensions	Diameter: 84 mm
Mounting	mounting hole

**Dimensions****Model number****REFLEKTOR VR10**

Reflector, rectangular 60 mm x 19 mm, mounting holes

**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / ABS
Dimensions	60 mm x 19 mm x 6 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR A17**

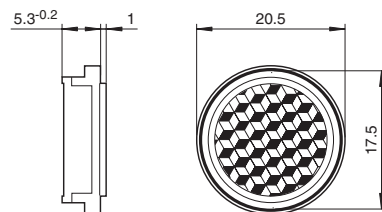
Reflector, round  $\varnothing$  20.5 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 20.5 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

**REFLEKTOR A25**

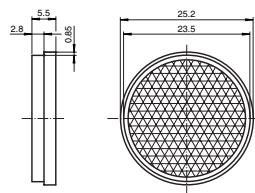
Reflector, round  $\varnothing$  25 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 25 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

**REFLEKTOR A35**

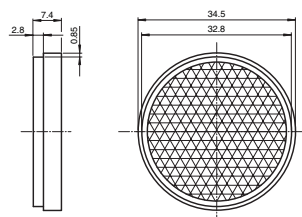
Reflector, round  $\varnothing$  35 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 35 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

**REFLEKTOR A46**

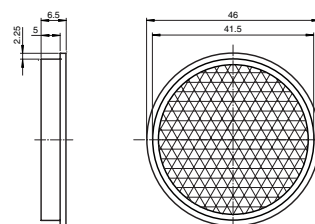
Reflector, round  $\varnothing$  46 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 46 mm
Mounting	self-adhesive

**Dimensions**



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**Model number**

**REFLEKTOR A48**

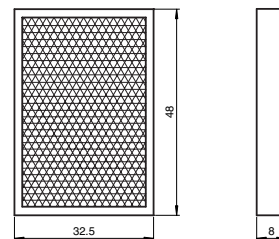
Reflector, rectangular 48 mm x 32.5 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	48 mm x 32.5 mm x 8 mm
Mounting	self-adhesive

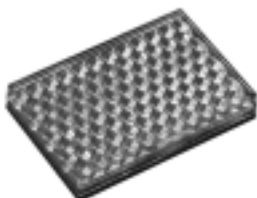
**Dimensions**



**Model number**

**REFLEKTOR A80**

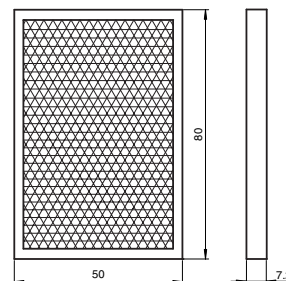
Reflector, rectangular 80 mm x 50 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	80 mm x 50 mm x 7.2 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

**REFLEKTOR CA24**

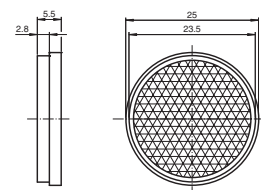
Reflector, round ø 25 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	Diameter: 25 mm
Mounting	self-adhesive

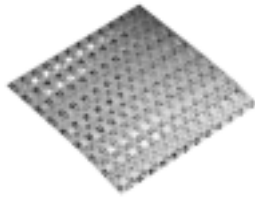
**Dimensions**



Accessories, for photoelectric sensors: reflectors

**Model number**

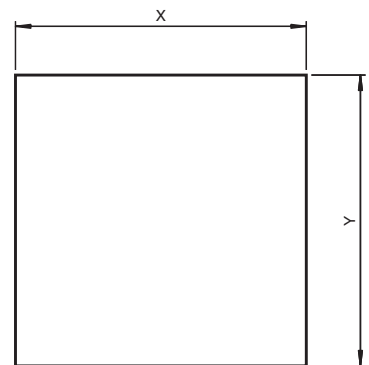
**OFR-600/200**  
**OFR-800/200**  
 Reflective tape 600 mm x 200 mm  
 Reflective tape 800 mm x 200 mm



**Technical data**

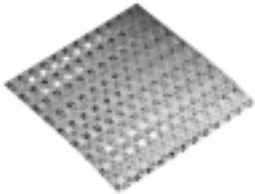
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	IRF6000
Dimensions	600 mm x 200 mm 800 mm x 200 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

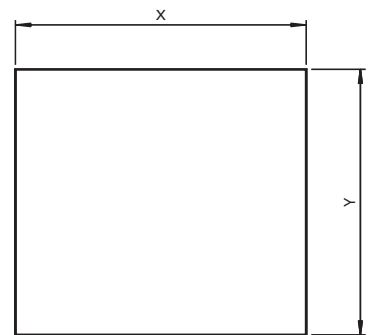
**OFR-3870-A4**  
**OFR-3870-45700/76**  
 Reflective tape A4 (297 mm x 210 mm)  
 Reflective tape 47500 x 76 mm  
**Suitable for fibre optics sensor without polarisation filter**



**Technical data**

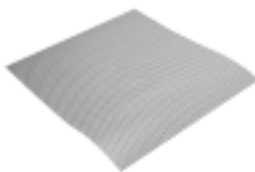
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	IRF6000
Dimensions	297 mm x 210 mm 47500 mm x 76 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

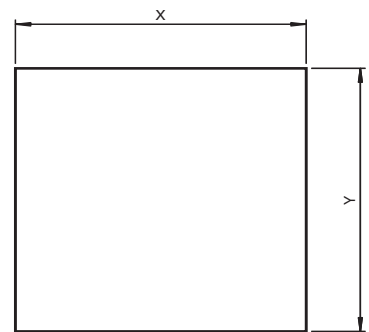
**OFR-100/100**  
**OFR-1000/1000**  
 Reflective tape 100 mm x 100 mm  
 Reflective tape 1000 mm x 1000 mm



**Technical data**

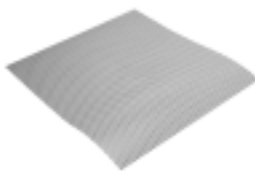
<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
<b>Mechanical specifications</b>	
Material	Typ 3870
Dimensions	100 mm x 100 mm 1000 mm x 1000 mm
Mounting	self-adhesive

**Dimensions**



**Model number**

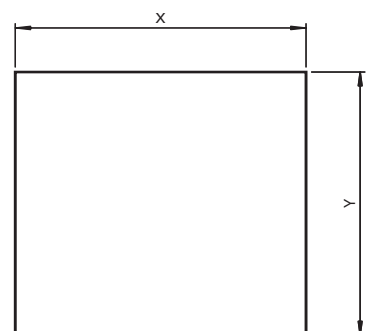
**OFR-A4**  
**OFR70-2**  
 Reflective tape A4 (297 mm x 210 mm)  
 Reflective tape 70 mm x 70 mm



**Technical data**

<b>General specifications</b>	
Construction type	roll
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
<b>Mechanical specifications</b>	
Material	Typ 3870
Dimensions	297 mm x 210 mm 70 mm x 70 mm
Mounting	self-adhesive

**Dimensions**



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**Model number**

**REFLEKTOR Clip25**

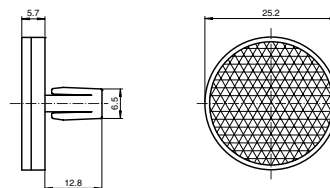
Reflector, round ø 25.2 mm, snap-in



**Technical data**

General specifications	
Construction type	circular
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	P MMA / A BS
Dimensions	Diameter: 25.2 mm
Mounting	Snap-in

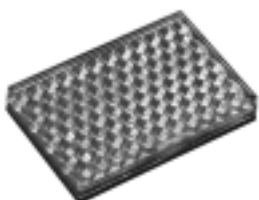
**Dimensions**



**Model number**

**REFLEKTOR Clip40**

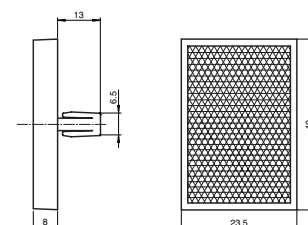
Reflector, rectangular 40 mm x 23.5 mm, snap-in



**Technical data**

General specifications	
Construction type	rectangular
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	P MMA / A BS
Dimensions	40 mm x 23.5 mm x 8 mm
Mounting	Snap-in

**Dimensions**



**Model number**

**REFLEKTOR Clip42**

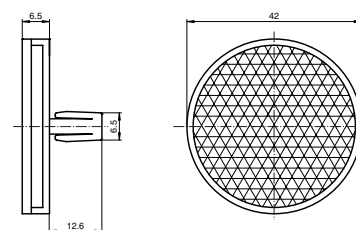
Reflector, round ø 42 mm, snap-in



**Technical data**

General specifications	
Construction type	circular
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	P MMA / A BS
Dimensions	Diameter: 42 mm
Mounting	Snap-in

**Dimensions**



Accessories, for photoelectric sensors: reflectors

**Model number**

**REFLEKTOR S25**

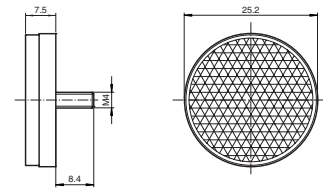
Reflector, round  $\varnothing$  25 mm, screw fixing M4



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 25 m m
Mounting	screw fixing

**Dimensions**



**Model number**

**REFLEKTOR S42**

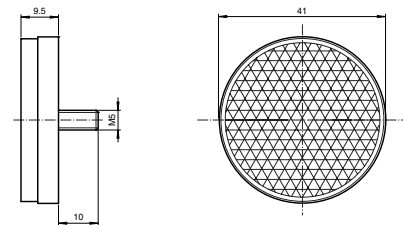
Reflector, round  $\varnothing$  42 mm, screw fixing M5



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	PMM A/ABS
Dimensions	Diam eter: 42 m m
Mounting	screw fixing

**Dimensions**



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**Model number**

**REFLEKTOR MA21**

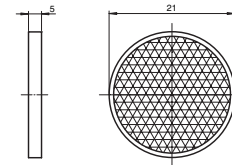
Reflector with Micro-structure, round  $\varnothing$  21 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	circular
Tripe l height	approx. 1.2 mm
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA /A BS
Dimensions	Diameter : 21 mm
Mounting	self adhesive

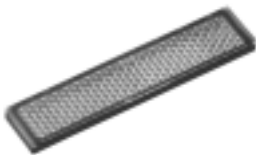
**Dimensions**



**Model number**

**REFLEKTOR MA50**

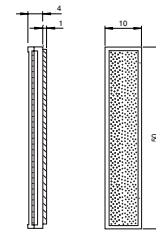
Reflector with Micro-structure, rectangular 10 mm x 50 mm, self-adhesive



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
Tripe l height	approx. 1.2 mm
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA /A BS
Dimensions	10 mm x 50 mm x 5 mm
Mounting	self adhesive

**Dimensions**



**Model number**

**REFLEKTOR MCLIP 21**

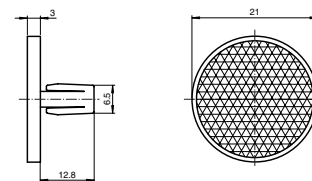
Reflector with Micro-structure, round  $\varnothing$  21 mm, snap-in



**Technical data**

<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA /A BS
Dimensions	Diameter : 21 mm
Mounting	Snap-in

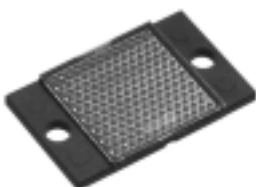
**Dimensions**



**Model number**

**REFLEKTOR MH20**

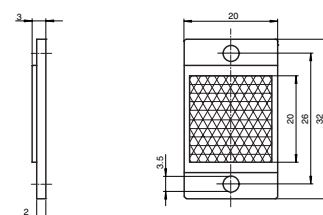
Reflector with Micro-structure, rectangular 32 mm x 20 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
Tripe l height	approx. 1.2 mm
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA /A BS
Dimensions	32 mm x 20 mm x 3 mm
Mounting	mounting holes

**Dimensions**



Accessories, for photoelectric sensors: reflectors

9.5

Date of issue: 03/20/2008

**Model number**

**REFLEKTOR MH23**

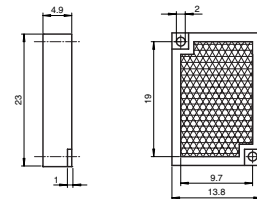
Reflector with Micro-structure, rectangular 23 mm x 13.8 mm, diagonal mounting hole



**Technical data**

General specifications	
Construction type	rectangular
Tripel height	approx. 0.9 mm
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	PMM A/ABS
Dimensions	23 mm x 13.8 mm x 4.9 mm
Mounting	mounting holes

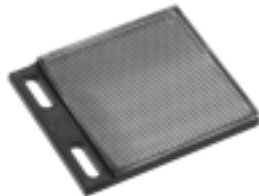
**Dimensions**



**Model number**

**REFLEKTOR MH50**

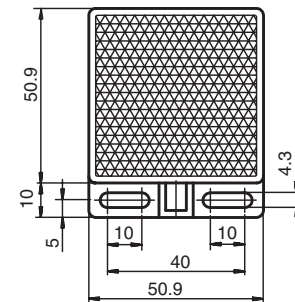
Reflector with Micro-structure, rectangular 50.9 mm x 50.9 mm, mounting holes, fixing strap



**Technical data**

General specifications	
Construction type	rectangular
Tripel height	approx. 0.9 mm
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	PMM A/ABS
Dimensions	50.9 mm x 50.9 mm x 8.5 mm
Mounting	mounting holes

**Dimensions**



T = 8.5

**Model number**

**REFLEKTOR MH56**

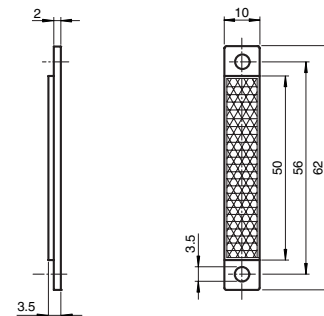
Reflector with Micro-structure, rectangular 62 mm x 10 mm, mounting holes



**Technical data**

General specifications	
Construction type	rectangular
Tripel height	approx. 1.2 mm
Ambient conditions	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
Mechanical specifications	
Material	PMM A/ABS
Dimensions	62 mm x 10 mm x 3.5 mm
Mounting	mounting holes

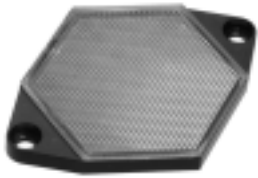
**Dimensions**



**Model number**

**REFLEKTOR MH78**

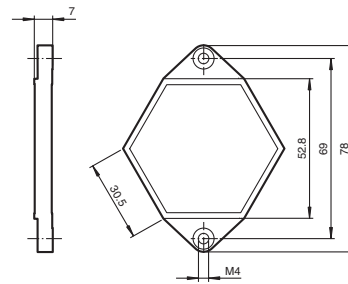
Reflector with Micro-structure, hexagonal 78 mm x 61 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	hexagonal
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	78 mm x 61 mm x 7 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR MH82**

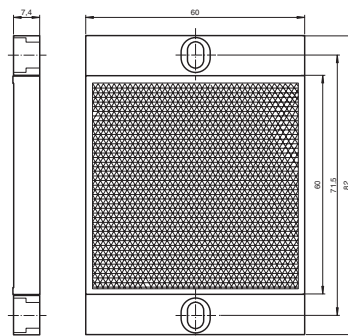
Reflector with Micro-structure, rectangular 82 mm x 60 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	82 mm x 60 mm x 7.4 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR MS21**

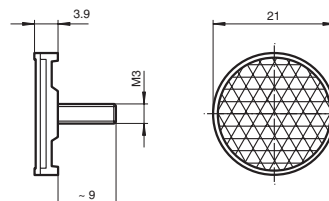
Reflector with Micro-structure, round ø 21 mm, screw fixing M3



**Technical data**

<b>General specifications</b>	
Construction type	circular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	Diameter: 21 mm
Mounting	screw fixing

**Dimensions**



**Model number**

**REFLEKTOR MVR10**

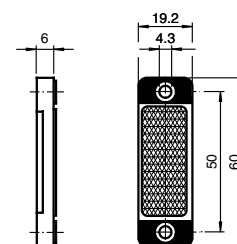
Reflector with Micro-structure, rectangular 60 mm x 19 mm, mounting holes



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 85 °C (253 ... 358 K)
<b>Mechanical specifications</b>	
Material	P MMA / A BS
Dimensions	60 mm x 19 mm x 6 mm
Mounting	mounting holes

**Dimensions**



Accessories, for photoelectric sensors: reflectors



**Model number**

**REFLEKTOR H85HT**

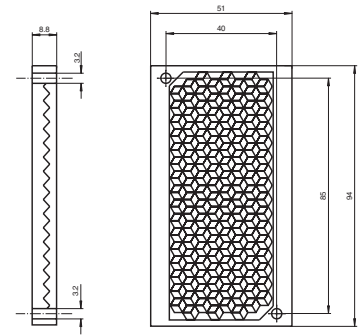
Reflector, rectangular 51 mm x 94 mm, mounting holes, high temperature resistant up to 500 °C



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-50 ... 500 °C (223 ... 773 K)
<b>Mechanical specifications</b>	
Material	Borosilicate glass
Dimensions	51 mm x 94 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR H116HT**

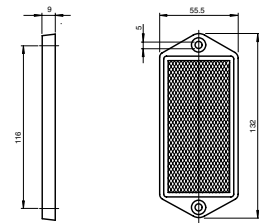
Reflector, rectangular 55.5 mm x 132 mm, mounting holes, high temperature applications



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 110 °C (253 ... 383 K)
<b>Mechanical specifications</b>	
Dimensions	55.5 mm x 132 mm x 9 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR Clip 50HT**

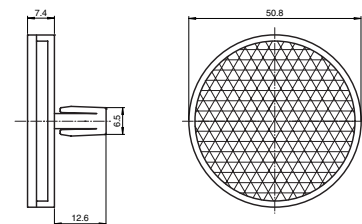
Reflector, round ø 50 mm, snap-in, high temperature applications



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 110 °C (253 ... 383 K)
<b>Mechanical specifications</b>	
Dimensions	Diameter: 50 mm
Mounting	Snap-in

**Dimensions**



**Model number**

**REFLEKTOR MCLIP 15HT**

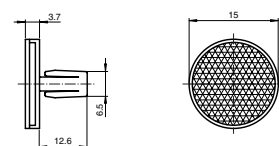
Reflector with Micro-structure, round ø 15 mm, snap-in, high temperature applications



**Technical data**

<b>General specifications</b>	
Construction type	circ ular
Tripel height	approx. 0.8 mm
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 110 °C (253 ... 383 K)
<b>Mechanical specifications</b>	
Dimensions	Diameter: 15 mm
Mounting	Snap-in

**Dimensions**



Date of issue: 03/20/2008

**Model number**

**REFLEKTOR HEATER 120**

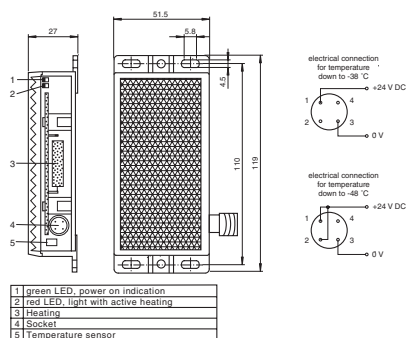
Reflector, rectangular 120 mm x 51 mm, mounting holes, heatable 24 V DC



**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Electrical specifications</b>	
Operating voltage	24 V DC
Operating current	200 mA
Power consumption P <sub>0</sub>	max. 4.8 W
<b>Ambient conditions</b>	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
<b>Mechanical specifications</b>	
Connection	connector M 12 x 1, 4-pin
Dimensions	119 mm x 51,5 mm x 27 mm
Mounting	mounting holes

**Dimensions**



**Model number**

**REFLEKTOR ORR50G**

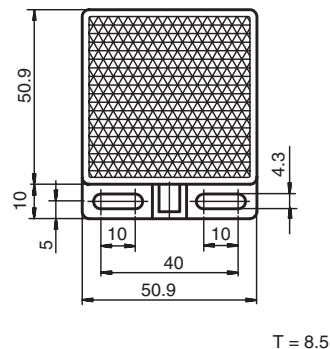
Reflector, rectangular 50.9 mm x 50.9 mm, mounting holes, fixing strap and Polarisation filter




**Technical data**

<b>General specifications</b>	
Construction type	rectangular
<b>Ambient conditions</b>	
Ambient temperature	0 ... 50 °C (273 ... 323 K)
<b>Mechanical specifications</b>	
Material	P MMA /A BS
Dimensions	50.9 mm x 50.9 mm x 8.5 mm
Mounting	mounting holes

**Dimensions**

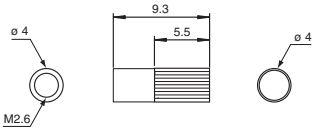


**Model number**  
**K-LA01**  
 Auxiliary lens




Technical data	
<b>Ambient conditions</b>	
Ambient temperature	-30 ... 200 °C (243 ... 473 K)
<b>Mechanical specifications</b>	
Material	Stainless steel
Mass	approx. 1 g
<b>Suitable series</b>	
Series	Accessories

**Dimensions**

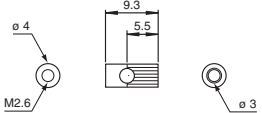


**Model number**  
**K-LA02**  
 Auxiliary lens 90°




Technical data	
<b>Ambient conditions</b>	
Ambient temperature	-30 ... 150 °C (243 ... 423 K)
<b>Mechanical specifications</b>	
Material	Stainless steel
Mass	approx. 1 g
<b>Suitable series</b>	
Series	Accessories

**Dimensions**

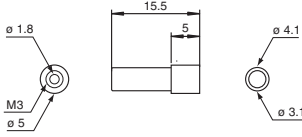


**Model number**  
**K-LA03**  
 Auxiliary lens M3




Technical data	
<b>Ambient conditions</b>	
Ambient temperature	-30 ... 200 °C (243 ... 473 K)
<b>Mechanical specifications</b>	
Material	plastic
Mass	approx. 1 g
<b>Suitable series</b>	
Series	Accessories

**Dimensions**

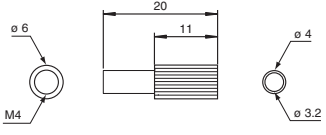


**Model number**  
**K-LA04**  
 Auxiliary lens M4



Technical data	
<b>Ambient conditions</b>	
Ambient temperature	-30 ... 200 °C (243 ... 473 K)
<b>Mechanical specifications</b>	
Material	plastic
Mass	approx. 1 g
<b>Suitable series</b>	
Series	Accessories

**Dimensions**



Date of issue: 03/20/2008

**Model number**

**K-LA06**

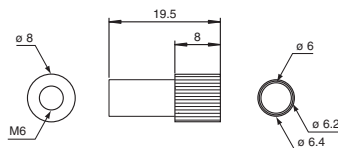
Auxiliary lens M6



**Technical data**

<b>Ambient conditions</b>	
Ambient temperature	- 30 ... 200 °C (243 ... 473 K)
<b>Mechanical specifications</b>	
Material	plastic
Mass	approx. 1 g
<b>Suitable series</b>	
Series	Accessories

**Dimensions**



**Model number**

**KM3-0,5**

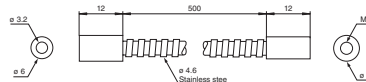
Metal protection for plastic fibre optics  
M3 x 0,5 m



**Technical data**

<b>Mechanical specifications</b>	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



**Model number**

**KM3-1,0**

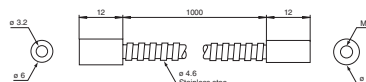
Metal protection for plastic fibre optics  
M3 x 1,0 m



**Technical data**

<b>Mechanical specifications</b>	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



**Model number**

**KM4-0,5**

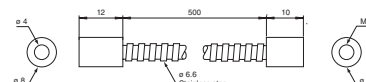
Metal protection for plastic fibre optics  
M4 x 0,5 m



**Technical data**

<b>Mechanical specifications</b>	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



Accessories, for photoelectric sensors: fiber optics

**Model number**

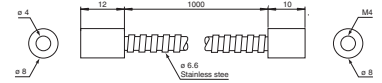
**KM4-1,0**  
Metal protection for plastic fibre optics  
M4 x 1,0 m



**Technical data**

Mechanical specifications	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



**Model number**

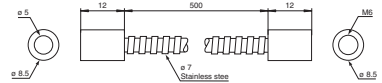
**KM6-0,5**  
Metal protection for plastic fibre optics  
M6 x 0,5 m



**Technical data**

Mechanical specifications	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



**Model number**

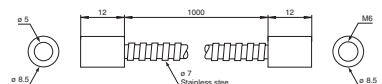
**KM6-1,0**  
Metal protection for plastic fibre optics  
M6 x 1,0 m



**Technical data**

Mechanical specifications	
Material	Stainless steel
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



**Model number**

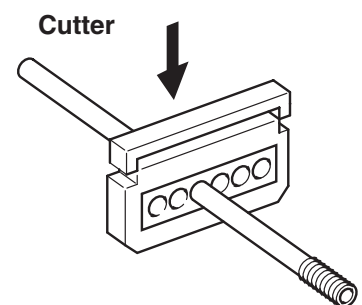
**KL-CUT**  
Cutter for plastic fibre optics



**Technical data**

Mechanical specifications	
Material	plastic
Mass	approx. 8 g
<b>Suitable series</b>	
Series	Plastic fibre optics

**Dimensions**



Date of issue: 03/20/2008

**Model number**

**BF 18-F**

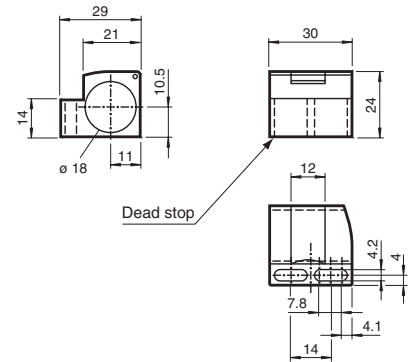
Mounting flange with dead stop, 18 mm



**Technical data**

<b>General specifications</b>	
Inside diameter	18 mm
<b>Ambient conditions</b>	
Ambient temperature	-25 ... 85 °C (248 ... 358 K)
<b>Mechanical specifications</b>	
Material	Polycarbonate (PC), black

**Dimensions**



**Model number**

**OLA 18 Adapter**

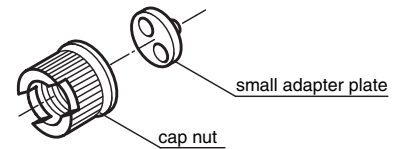
Adaptor for connection of fibre optics to photoelectric sensors



**Technical data**

<b>Mechanical specifications</b>	
Material	
Slotted nut	Stainless steel
Spacer disk	plastic
Mass	5 g
<b>Suitable series</b>	
Series	VL18 18GM60 CP18

**Dimensions**



**Model number**

**OTS 18**

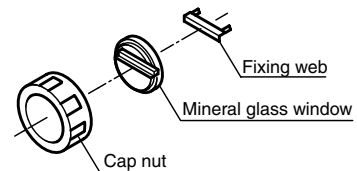
Switch set for VariKont M®



**Technical data**

<b>Mechanical specifications</b>	
Material	plastic
Mass	approx. 2 g
<b>Suitable series</b>	
Series	VariKont M

**Dimensions**



**Model number**

**RL28-GLASS-C**

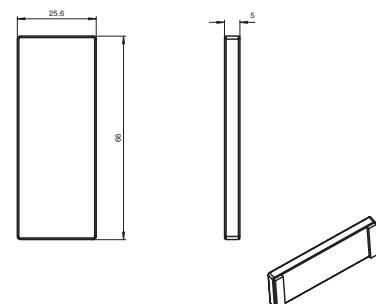
Replacement glass



**Technical data**

<b>General specifications</b>	
Accessories provided	M 4 x 8 mm thumb screw
<b>Mechanical specifications</b>	
Material	glass
<b>Suitable series</b>	
Series	RL28 RL29

**Dimensions**



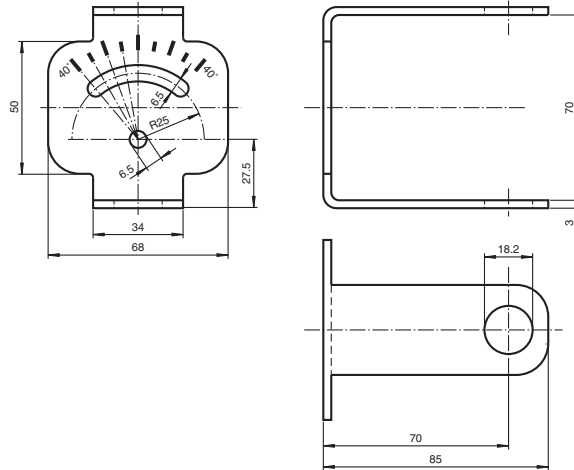
Accessories, for photoelectric sensors: fiber optics

**MH-USB01**



Pivotable mounting bracket with angle scale for ultrasonic double-sheet monitors

Material: Stainless steel



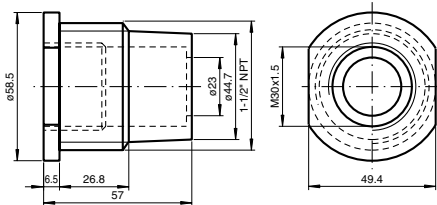
**M 105**



Teflon mounting well for 30 mm diameter sensors (UB/UC300, -500 and -2000).

- safe mounting
- easy installation
- robust construction
- chemical-resistant

Material: PTFE  
(sensors sold separately)



**PA02**

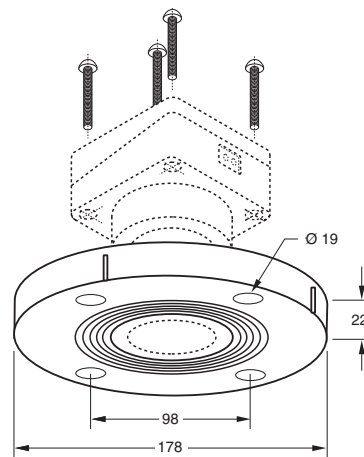


Mounting flange for all FP series sensors

- safe mounting
- easy installation
- robust construction

(sensor sold separately)

Material: PVC



Date of issue 03.04.2008

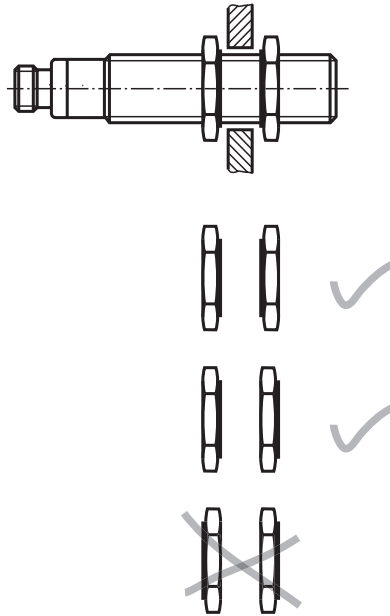
**Nut M12K-VE**  
**Nut M18K-VE**  
**Nut M30K-VE**



Plastic nuts with centering ring for the vibration-free mounting of 12, 18, and 30 mm diameter cylindrical sensors.

These plastic nuts must be used in applications where a sensor is to be screwed into the front third of the housing sleeve and operated at temperatures of  $< 0\text{ }^{\circ}\text{C}$ .

Material: PA  
 (Packaging unit: 1 pair)



**UVW90-K18**  
**UVW90-K30**



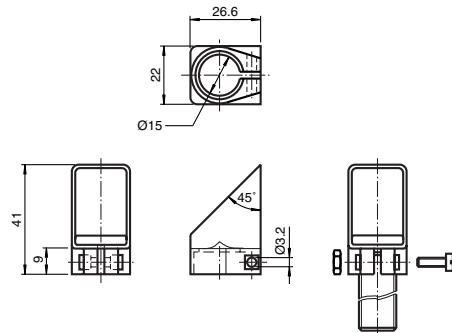
Ultrasonic profile reducers for 18 and 30 mm diameter sensors

- **clamp installation**
- **90° sound deflection for difficult installation conditions**
- **universal installation position**

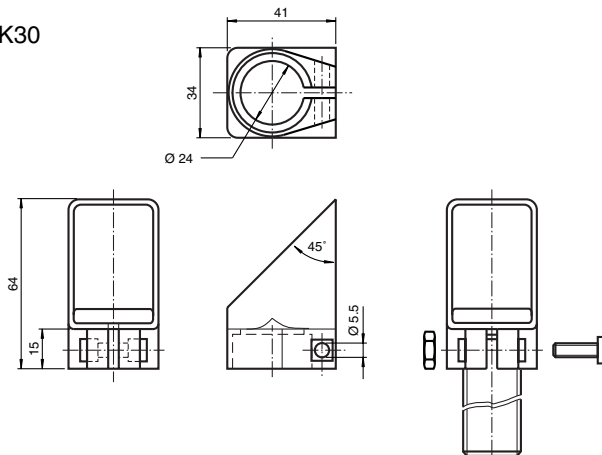
By deflecting the ultrasonic beam 90° from the sensing plane, profile reducers allow low profile mounting of 18 mm or 30 mm diameter ultrasonic sensors on tanks, conveyors etc. The design also prevents falling dust particles from collecting at the sensor face, ensuring accuracy in dusty environments.

Material: PMMA

UVW90-K18



UVW90-K30





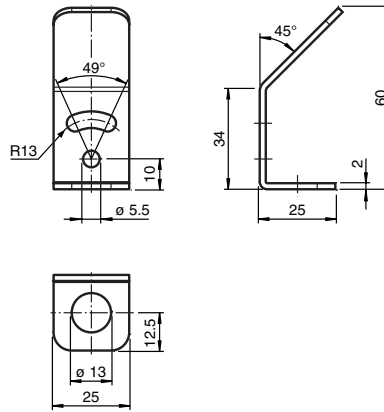
**UVW90-M12**



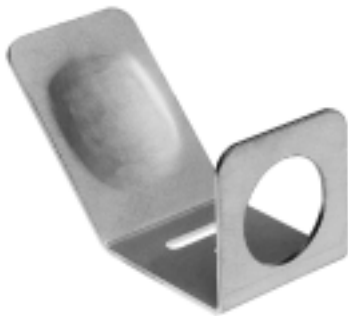
Ultrasonic profile reducers for 12 mm diameter sensors

- universal installation option
- 90° sound deflection for difficult installation conditions
- universal installation position

Material: Stainless steel



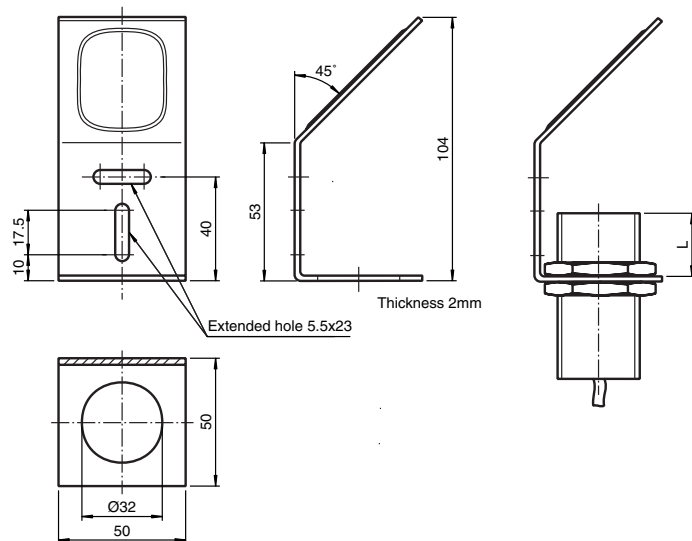
**UVW90-M30**



Ultrasonic profile reducers for 30 mm diameter sensors

- universal installation option
- 90° sound deflection for difficult installation conditions
- universal installation position
- focusing effect
- detection range increase (through focusing)
  - approx. 40 % at UB/UC500 (with dimension L = 10 mm)
  - approx. 20 % at UB/UC2000 (with dimension L = 35 mm +/- 5 mm)

Material: Stainless steel



## UC-30GM-TEMP



External temperature probe

- For ultrasonic sensors of the UC...-30GM-... and LUC4T-... series
- 8 mm plug connector
- Single-hole mounting with position locking

## LUC4-Z30-G2V LUC4-Z30-N2V



External temperature probe

- For ultrasonic level sensors of the LUC4T-... and UC...-30GM-... series
- 8 mm plug connector.
- Single hole mounting in thread:  
G $\frac{1}{2}$ A (LUC4-Z30-G2V)  
 $\frac{1}{2}$ NPT (LUC4-Z30-N2V).

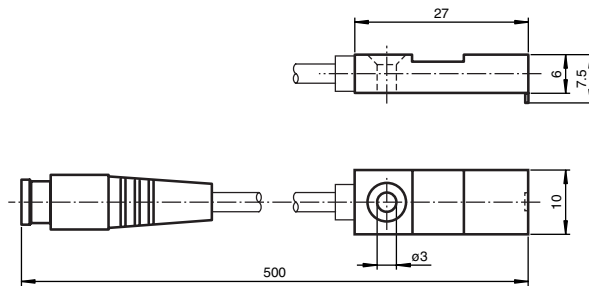
## FP100



Remote potentiometer

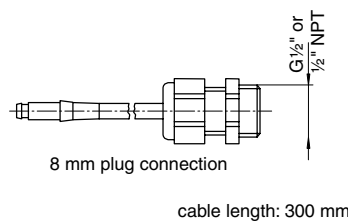
Potentiometer for the adjustment of the sensing range of the ultrasound thru-beam sensor UBE4000-30GM-SA2-V15.

The potentiometer connection is on the transmitter.



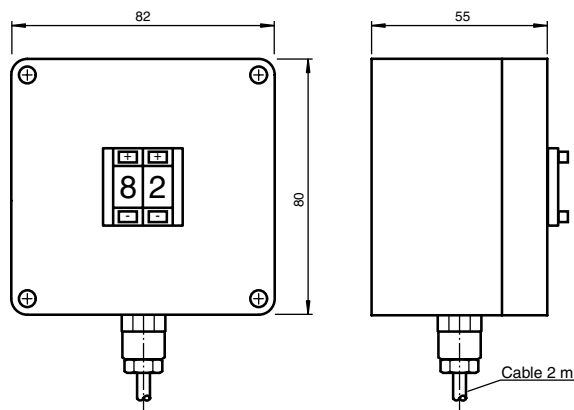
The external UC-30GM-TEMP temperature probe may be connected to ultrasonic sensors of the UC...-30GM-... and LUC4T-... series as an alternative to the supplied temperature plug.

The use of the UC-30GM-TEMP permits the ambient temperature of the measuring area to be monitored independently of the installation conditions of the sensor in order to minimize temperature influences as effectively as possible.



The external LUC4-Z30-G2V (with G $\frac{1}{2}$ A thread) or LUC4-Z30-N2V (with  $\frac{1}{2}$ NPT thread) temperature probes may be connected to ultrasonic sensors of the LUC4T-... and UC...-30GM-... series as an alternative to the supplied temperature plug.

The use of the LUC4-Z30-... permits the ambient temperature of the measuring area to be monitored independently of the installation conditions of the sensor in order to minimize temperature influences as effectively as possible.



**USB-0.8M-PVC ABG-SUBD9**



Interface adapter USB/RS\_232

Modern notebooks and PCs are often not equipped with a standard RS 232 serial interface.

Anyhow, to allow the use of the multiple functions of the service program ULTRA 3000, the interface adapter USB-0,8M-PVC ABG-SUBD9 offers a simple solution.

The interface converter USB-0.8M-PVC ABG-SUBD9 provides a RS 232 serial interface at a free USB port.

It can be connected to the USB port either directly or via the 800 mm USB cord, which is included.

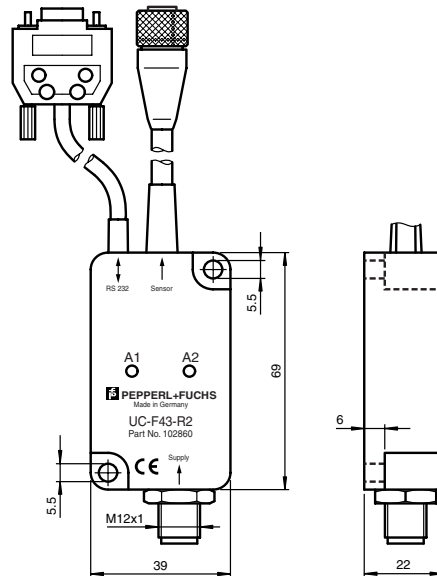
Our interface cables can be connected to the 9-pin Sub-D connector in the accustomed way.

**UC-F43-R2**



RS 232 interface

- For sensors UC300-F43-2KIR2-V17 and UC2000-F43-2KIR2-V17.
- Easy insertion into the sensor connection lead.

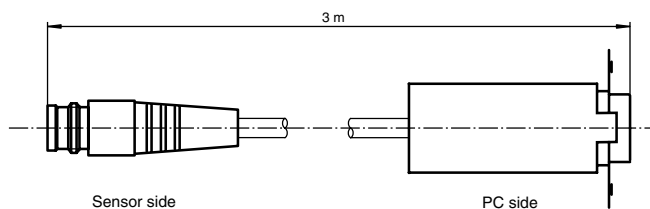


The unit can be inserted between the V17 cable connection socket and the V17 plug connection on the sensor for the TEACH-IN procedure. The programmed functions are retained when the programming unit is removed and/or the power is switched off.

## UC-30GM-R2



Interface cable

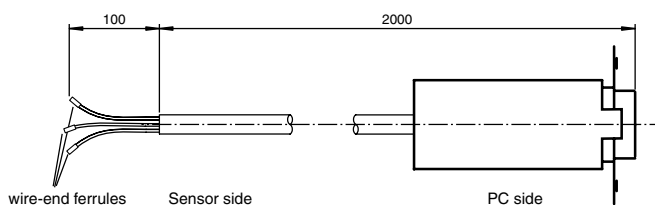


The UC-30GM-R2 interface cable enables the programming of the UC...-30GM-.R2-V15 ultrasonic sensors using the ULTRA 2001 software. The cable creates a connection between the PC's RS 232 interface and the connector of the temperature/programming plug on the sensor.

## UC-FP/U9-R2



Interface cable

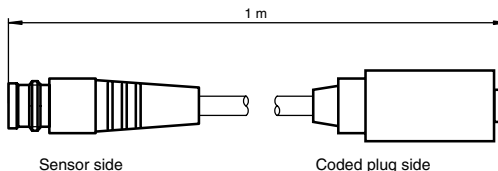


The UC-FP/U9-R2 interface cable enables the programming of limit switch and FP series ultrasonic sensors using the ULTRA 2001 software. The cable creates a connection between the PC's RS 232 interface and the interface connections in the terminal space of the sensor.

## UC-30GM-PROG



Extension cable



The UC-30GM-PROG extension cable permits the UC...-30GM-... and LUC... series sensors to be taught-in at inaccessible installation locations. The sensor side end of the extension cable is connected to the sensor's temperature plug socket. The sensor can be programmed with the temperature plug at the other end of the cable.

**UB-PROG2**



Programming device

- For ultrasonic sensors

UB300				
UB400	-12GM			
UB500	-18GM40	-E4		
UB800	-18GM75	-E5		
UB1000	-30GM	-I		
UB2000	-F42(S)	-U		
UB4000	-F54			
UB6000				

... whose teach-in input is on pin 2.

- Easy teach-in of the switching points A1/A2 or the measuring window.
- Easy selection of the output function: Window mode, NO/NC function. One switching point, NO/NC function. Monitoring of the detection range.

**UB-PROG3**



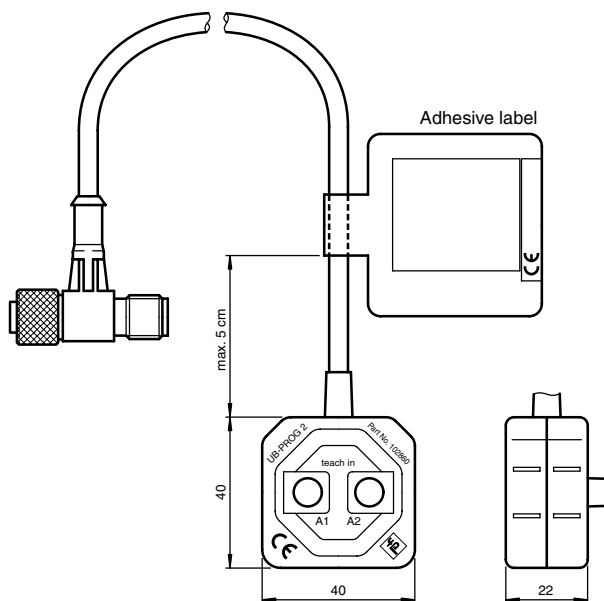
Programming device

- For ultrasonic sensors

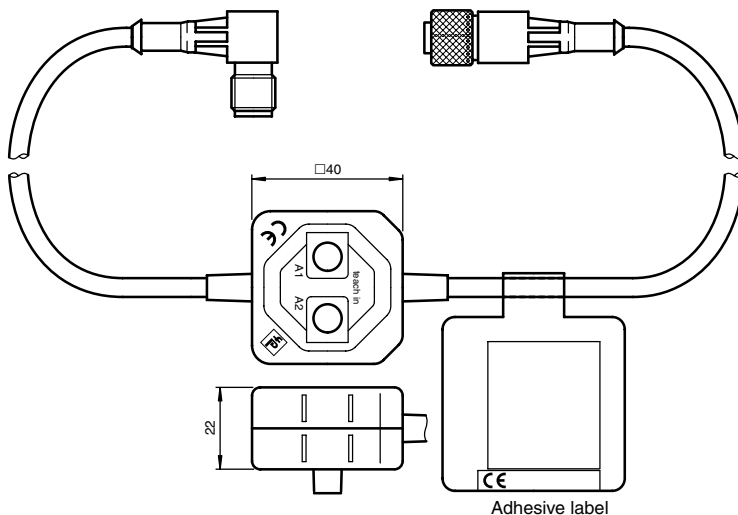
UB500		-E01		
UB1000	-18GM75	-E23		
		-E6		
		-E7		

... whose teach-in input is on pin 5.

- Easy teach-in of the switching points A1/A2 or the measuring window.
- Easy selection of the output function: Window mode, NO/NC function. One switching point, NO/NC function. Monitoring of the detection range.



The unit can be switched from the V15 cable connection socket and the V15 plug connection on the sensor for the TEACH-IN procedure. The switch points/measuring window and output function can be taught in using the A1 and A2 buttons. The taught-in switch points and functions are retained when the programming unit is removed and/or the power is switched off.



The unit can be switched from the V15 cable connection socket and the V15 plug connection on the sensor for the TEACH-IN procedure. The switch points/measuring window and output function can be taught in using the A1 and A2 buttons. The taught-in switch points and functions are retained when the programming unit is removed and/or the power is switched off.

## ULTRA 3000



### Service program

- WINDOWS™ user interface with up to 5 independent windows.
- For all ultrasonic sensors with RS 232 interface.
- Convenient parameterization of all relevant sensor functions, such as:
  - evaluation method
  - switching behavior
  - switch points
  - analog output
  - measuring window
  - filter functions
  - fault management
  - etc.
 to optimally adapt the sensor to its current application.
- Logging functions for sensor parameter settings and recorded series of measurements.

### Software and manual as free download:

<http://www.pepperl-fuchs.com>

### Procedure:

- select the Factory Automation business unit.
- click Downloads.
- type **ULTRA3000** into the Product Search field
- select the desired download
  - click the link to the file with the extension .zip to download the ULTRA3000 software.

Use the appropriate interface or interface cable for the communication between the PC and sensor (see Page 705)

## Why use PC software for parameterization ?

Commands and parameters can be transferred to sensors via an RS 232 interface, if present. These commands can be used to output measured values, configure the evaluation process, switch outputs and/or analog output, set and query parameters, and control the general unit functions. This provides the user with an aid in optimally adapting the sensor to its specific application and visualizing parameters or measured results.

### Programmable sensors

#### Series:

-30GM	UC...-30GM-..R2-V15
Limit switch	UC...+U9+E6/E7+R2 and UC...+U9+IUE0/E2+R2 UJ3000+U1+...+RS
-FP	UC6000-FP-...-R2-P5 and UJ6000-FP-...+RS
-F43	UC...-F43-2KIR2-V17

### Brief description

The program features a multilingual, menu-based user interface with comprehensive help. It supports up to 5 independent windows. The windows can be displayed or hidden, and their size and position on the screen can be adjusted as needed. The size and position of the windows is retained by the program.

**Show It:** Graphical display of the measured distance. The set switch points are marked. Simulated LEDs display the switching states of the outputs.

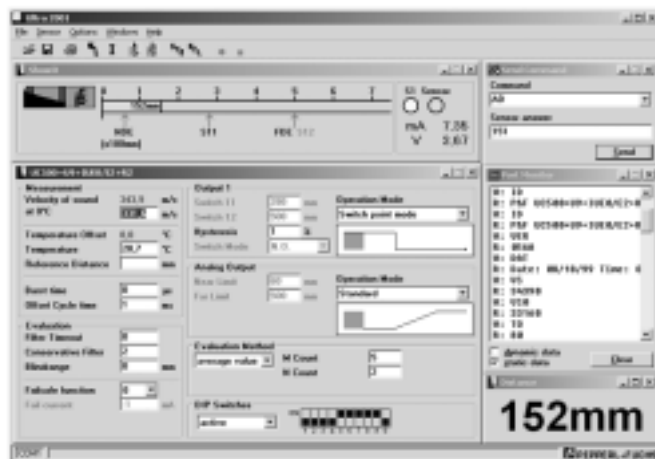
**Parameters:** All parameters can be edited here. Display and input fields permit commands or parameters to be changed at the click of the mouse without detailed knowledge of the relevant commands or their syntax.

**Send command:** Sensor parameters are set and queried here in the same manner as with a terminal program (alternative to the programming window).

**Port Monitor:** Display of the commands sent to the sensor and received from it.

**Distance:** Display of the currently measured distance in mm.

The program and sensor parameters read out by the program can be saved to the hard drive or a disk. Measurement series can be started, the measurement data queried periodically and sent to a printer or saved to the hard drive/disk.



### System requirements

The Ultra 300 application will run on any PC or laptop. Windows 95/98/ME/NT4/2000 or XP, an EGA or VGA graphics card, and an available RS 232 or USB port are required.

## Accessories for rotary encoders

### Mounting brackets

- Synchro clamping elements (set of 3)  
9310-3 for series 58  
9312-3 for series RVI50, RVI78 and RVI84  
9313-3 for series RVI50
- Mounting bracket for clamping flange  
9203 and 9213 for **series 58**  
9250 for series RVI50  
9278 for series RVI78
- Mounting bracket for servo flange  
9300 for series 58  
9311 installation kit for 9300



### Couplings

- Spring steel coupling  
9401 (shafts Ø: 6 mm, 8 mm, 10 mm, 12 mm)  
9402 (shafts Ø: 6 mm, 8 mm)
- Spring disk coupling  
9404 (shafts Ø: 6 mm, 10 mm, 12 mm)
- Bellow coupling  
9409 (shafts Ø: 6 mm, 10 mm, 12 mm)  
9460 (shafts Ø: 6 mm, 10 mm, 12 mm)
- Precision coupling  
9410 (shafts Ø: 6 mm, 10 mm, 12 mm)
- Spiral coupling  
KW (shafts Ø: 6 mm, 8 mm, 10 mm)



### Measuring wheels

- Circumference 200 mm  
9108, 9109, 9110, 9113 (shafts Ø: 8 mm, 10 mm)
- Circumference 500 mm  
9101, 9102, 9103, 9112  
(shafts Ø: 8 mm, 10 mm, 12 mm)
- Hytrel  
9101 and 9108
- Dimpled rubber  
9102 and 9109
- Knurled aluminum  
9103 and 9110
- Knurled hytrel  
9112 and 9113



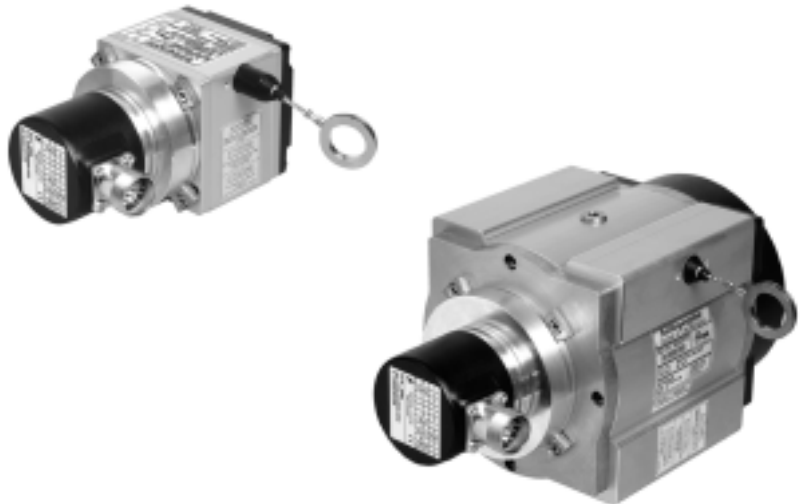
## Connectors and cordsets

- Amphenol
- Conivers
- SUB-D
- Souriau
- Binder



## Cable pulls

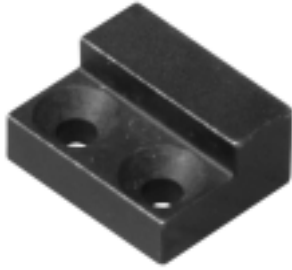
- SL3001-X1/GS80-200  
Measuring range 1,000 mm
- SL3002-X1/GS80-200  
Measuring range 2,000 mm
- SL3003-X1/GS80-200  
Measuring range 3,000 mm
- SL3005-X1/GS130-333  
Measuring range 5,000 mm
- SL3010-X1/GS130-333  
Measuring range 10,000 mm
- SL3015-X1/GS130-333  
Measuring range 15,000 mm





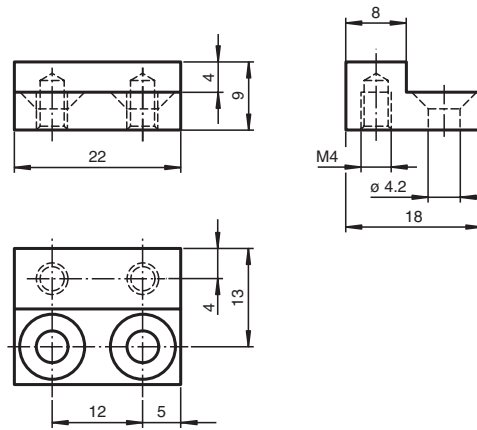
Accessories for inductive positioning systems PMI

**BT-F90-G**



Target for F90 linear position sensor

Material: Steel ST37 / 1.0037

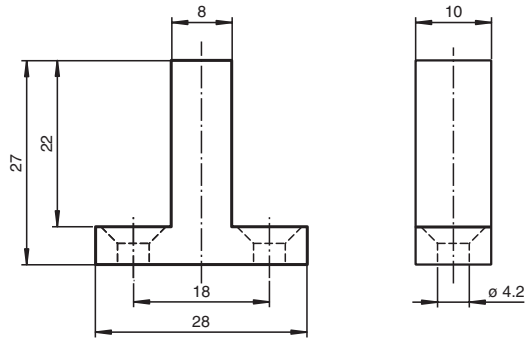


**BT-F90-W**



Target for F90 linear position sensor

Material: Steel ST37 / 1.0037

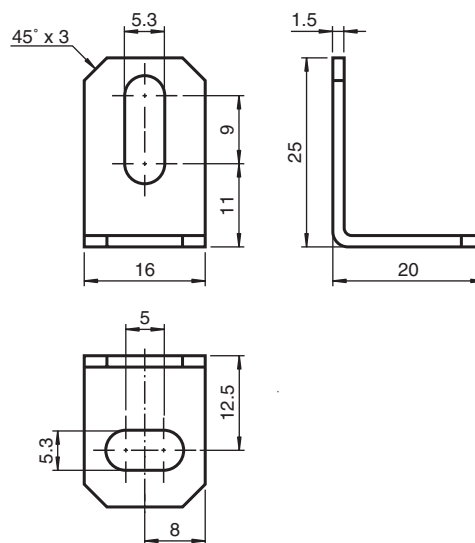


**MH-F90**



Mounting bracket for F90 linear position sensor

Material: Zinc-plated metal  
Supplied quantity: 2

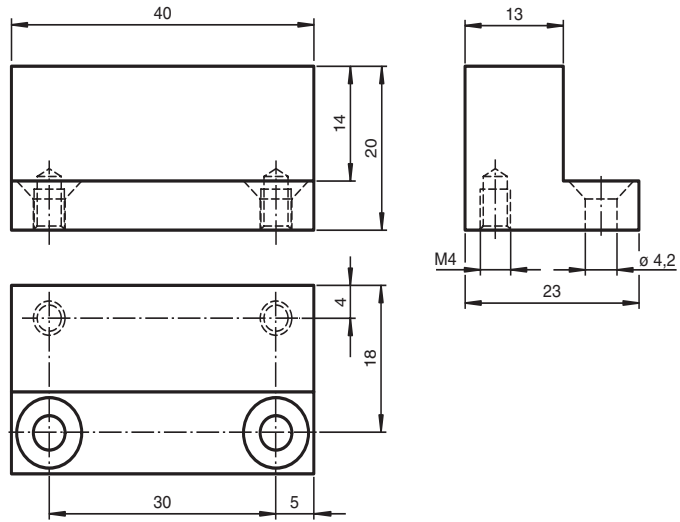


**BT-F110-G**



Target for F110 linear position sensor

Material: Steel ST37 / 1.0037

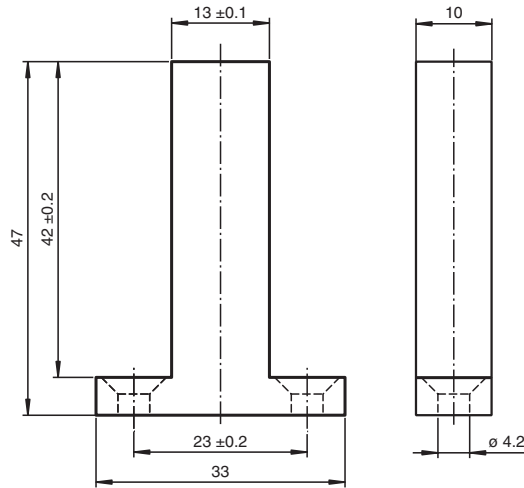


**BT-F110-W**



Target for F110 linear position sensor

Material: Steel ST37 / 1.0037

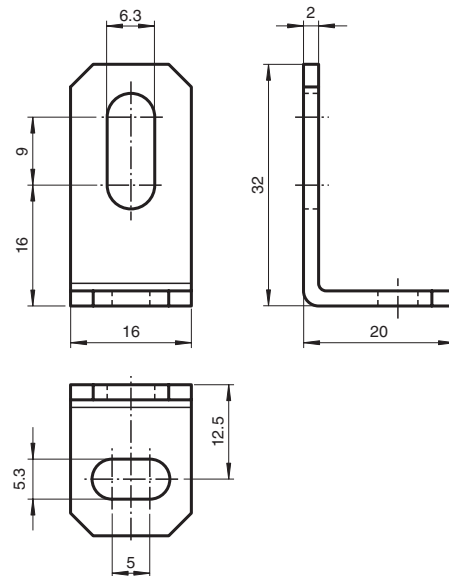


**MH-F110**

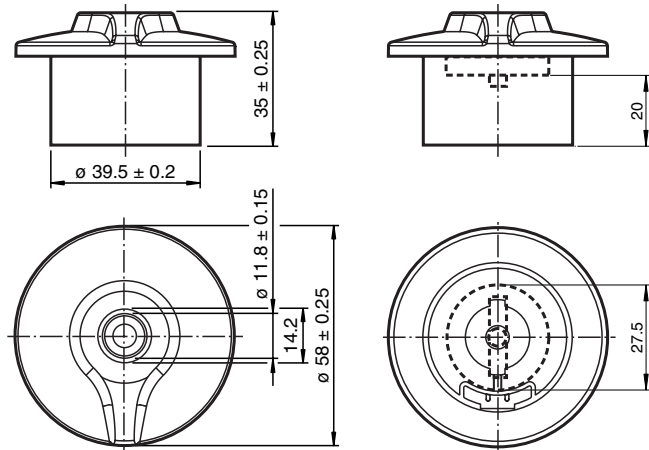


Mounting bracket for F110 linear position sensor

Material: Zinc-plated metal  
Supplied quantity: 2



**BT-F130-A**



Target for F130 circular position sensor

- Direct attachment to standard drives
- Suitable for right and left rotating drives.

Shaft diameter: < 27.5 mm

Shaft height: 20 mm

Material:

Housing: PBT

Spacer: PP

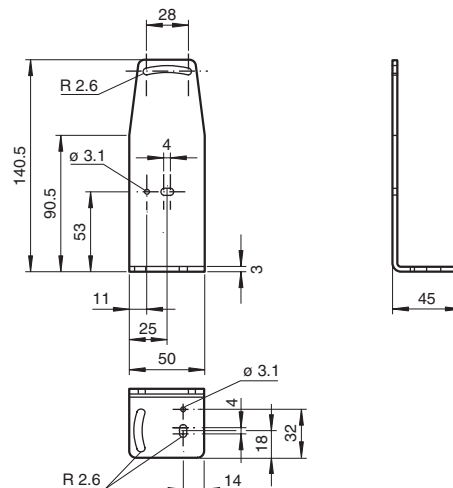
Cap plug: PBT

Mounting screw: V2A

Weight: 25 g

**Accessories for Laser displacement sensors**

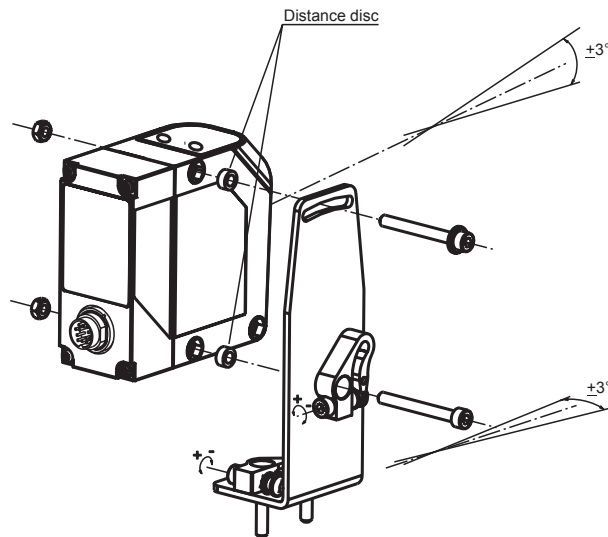
**OMH-VDM35**



Mounting bracket for the VDM35 and VDM70 series sensors

Material: Zinc-plated metal

**OMH-VDM35-01**

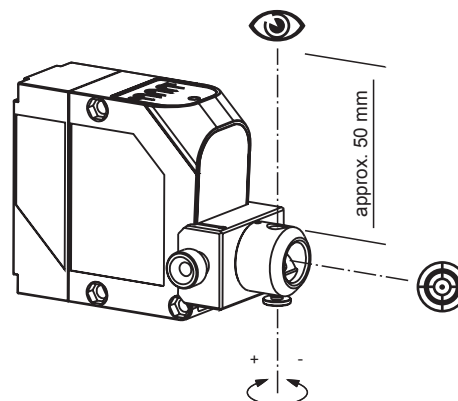


Fine adjustment aid for the VDM35 and VDM70 series sensors

Material: Black anodized aluminum

Mounting bracket OMH-VDM35 sold separately.  
Hardware included.

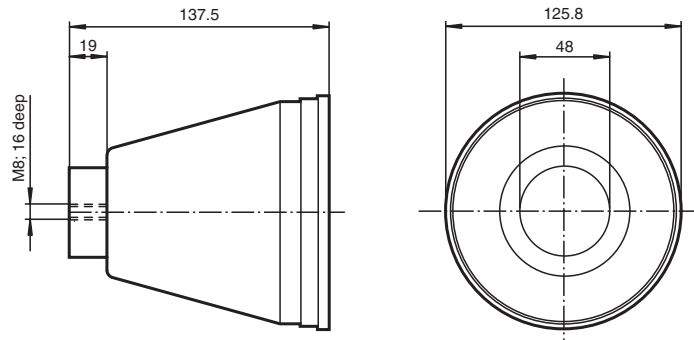
**VDM35-AR**



Alignment aid for the VDM35 and VDM70 series sensors

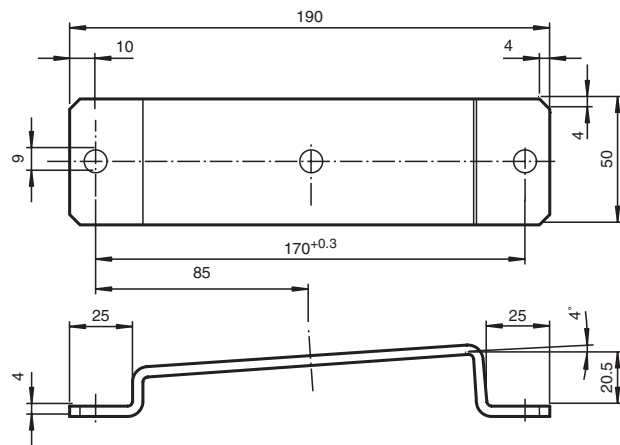
- Operating voltage: 3 V DC
- Battery: 2 micro cells AAA / LR03
- Operating temperature: 0... 40 °C
- Storage temperature: -40 ... 85 °C
- Protection degree: IP20
- Material: Aluminum
- Housing: PA 6
- Weight: 250 g

**Lens reflector 140**



Lens reflector for the EDM and VDM series sensors

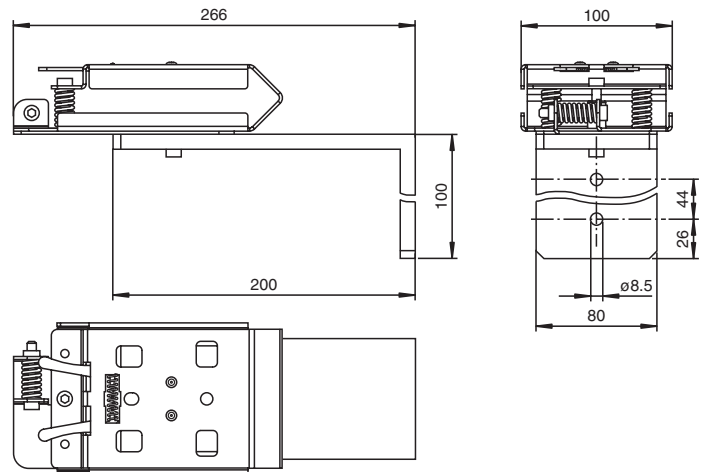
**Support bracket R140 EDM**



Mounting bracket for the lens reflector R140

Material: Black, zinc-plated metal

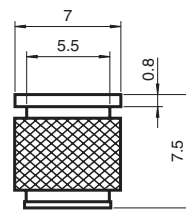
**OMH-LS610-01**



Mounting bracket for VDM100 series sensors

Material: Black anodized aluminum  
Black, zinc-plated steel

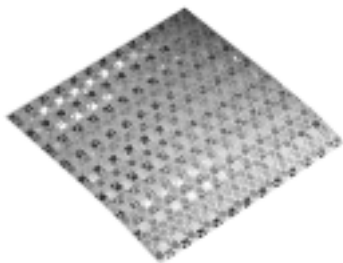
**OMH-LS610-02**



Direct installation kit for VDM100 series sensors. Contains four, 4 mm threaded inserts.

Material: Brass

**OFR-100/100**

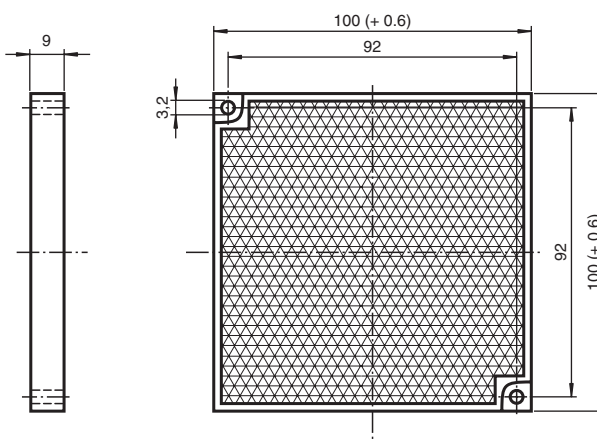
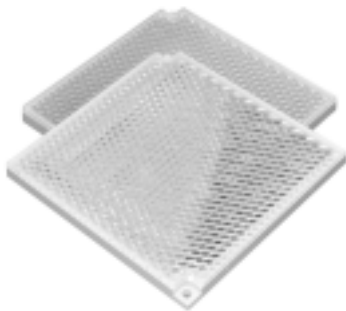


Reflective tape, 100 mm x 100 mm for VDM35 and VDM70 series sensors.

Self-adhesive

Ambient temperature: -20 ... 85 °C

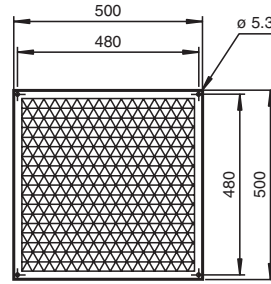
**Reflector H100-2R**



Reflector, 100 mm x 100 mm for VDM54 sensors.

Ambient temperature: -20 ... 85 °C

Material: PMMA

**Reflector 500 mm x 500 mm**

Reflective tape, 500 mm x 500 mm for VDM100 series sensors.

Self-adhesive

Ambient temperature: -20 ... 85 °C

**Protective cap LS610**

For VDM100 series sensors

**Functional grounding LS610**

For VDM100 series sensors





## Standards

Pepperl+Fuchs sensors are consistently developed and manufactured according to the applicable standards. Furthermore, proposed standards are taken into account in the development of new products and the revision and modification of existing ones.

### German standards

DIN VDE 0660	Part 208 Low voltage switchgear and controlgear, control circuit devices and switching elements - additional requirements for proximity sensors
DIN VDE 0660	Part 209 Low-voltage switchgear and controlgear, control switches - additional requirements for proximity sensors used in safety-related applications
DIN VDE 0660	Part 212 (replaces DIN 19234) Instrumentation and control technology - electrical position sensors - DC interface for position sensors and switching amplifiers

### European standards

EN 60947-5-2	Low-voltage switchgear and controlgear Part 5: Control circuit devices and switching elements Section 2: Proximity sensors
EN 60947-5-6	Control circuit devices and switching elements, proximity sensors - DC interface for proximity sensors and switching amplifiers (NAMUR)

### International standards

IEC 60947-5-2	Low-voltage switchgear and controlgear Part 5 Control circuit devices and switching elements - Section 2: proximity sensors
Draft IEC 61934	Control circuit devices and switching elements - DC interface for proximity sensors and switching amplifiers (NAMUR)

## Electromagnetic compatibility standards

EN 50081	Basic standard emission Part 1: Residential areas Part 2: Industrial areas
EN 50082	Basic standard immunity Part 1: Residential areas Part 2: Industrial areas
EN 61000-4	EMC, testing and measuring techniques Parts 2, 3, 4, 5, and 6

## Explosion protection standards

DIN EN 50014	Electrical apparatus for potentially explosive environments General requirements
DIN EN 50020	Electrical apparatus for potentially explosive environments
	Intrinsic safety "i"
EN 60079-10	Electrical apparatus for potentially explosive environments
	Classification of hazardous areas
EN 60079-14	Electrical apparatus for potentially explosive environments
	Electrical apparatus for potentially explosive environments (other than mines)

## Quality assurance standards

DIN ISO 9000-9004	EN 29000-29 004) Quality assurance (QA) for products and services
DIN ISO 9001	QA in development - production, installation, and servicing

Pepperl+Fuchs is certified according to DIN ISO 9001.

**The CE symbol**

The CE symbol represents the manufacturer's confirmation that the identified product conforms to the applicable standards and directives throughout Europe. The following regulations apply to Pepperl+Fuchs products:

89/336/EEC	EMC Directive (EN 60 947-5-2)
73/23/EEC	Low voltage directive (see also VDE 0160, product standard EN 60947-5-2)
Directive 94/9/EC	Devices and protection systems for intended use in potentially explosive environments

Pepperl+Fuchs certifies the conformity of its products with the respective applicable directives in a manufacturer's declaration.

**ALPHA**

Pepperl+Fuchs GmbH is a member of ALPHA, a registered organization for testing and certifying low-voltage equipment. ALPHA promotes a system of self-regulation among manufacturers based on uniform test procedures according to applicable standards in order to ensure a high level of product quality. Nationally recognized product certificates issued by ALPHA under specified conditions are also recognized in other European countries through ALPHA's membership in LOVAG (Low Voltage Agreement Group).

**Resistance of housing materials to chemical substances**

The following table summarizes the protection our housing materials provide when our sensors are used in aggressive environments (next page).

## Chemical resistance

Chemically resistant to	V2A	ABS	Epoxy	PBT	PC	POM	PP	PPS	PS	PVC	Nickel-plated brass
Acetone	+	-	-	+	-	+	+	+	-	-	+
Formic acid	20 °C	40%	+	10%	-	-	85%	O	40%	50%	+
Ammonia	+	25%	O	10%	-	+	+	+	+	O	O
Petrol	+	25%	+	+	O	+	-	+	-	+	+
Benzene	+	-	+	+	-	+	-	+	-	-	+
Brake fluid	-	O	-	-	-	+	+	-	-	-	
Butane	-	+	+	-	+	+	+	+	-	+	+
Butanol	-	-	-	-	-	+	+	-	-	40 °C	+
Calcium chloride	-	+	-	10%	+	+	+	+	+	60 °C	+
Chlorobenzene	20 °C	-	+	-	-	+	-	-	-	-	□
Diesel oil	-	+	+	+	O	+	60 °C	+	-	-	□
Acetic acid	20 °C	25%	O	+	10%	10%	70%	+	50%	40 °C	O
Formaldehyde	+	30%	50%	30%	-	+	40%	37%	40%	+	+
Frigen 113	-	-	-	-	+	-	-	+	-	+	□
Fruit juice	+	-	+	-	+	+	+	-	-	+	+
Glycerine	+	+	+	+	O	+	+	+	+	60 °C	+
Fuel oil	-	O	+	+	O	+	60 °C	+	-	-	+
Hydraulic oil	-	-	-	-	+	+	60 °C	-	-	+	□
Potassium hydroxide	-	50%	O	3%	-	+	50%	-	50%	60 °C	□
Potassium chloride	+	-	-	-	+	+	+	-	+	60 °C	+
Potassium hydroxide	+	-	-	-	-	-	+	-	-	-	+
Linseed oil	+	+	-	-	+	+	+	-	+	+	+
Methanol	+	-	+	+	-	+	+	+	-	+	+
Methylene chloride	+	-	-	-	-	O	O	+	-	-	-
Lactic acid	20 °C	80%	+	-	+	+	+	-	80%	O	-
Mineral oils	+	-	+	+	-	+	+	+	-	+	+
Engine oils	+	+	-	+	-	+	+	+	O	-	□
Sodium carbonate	+	+	-	-	+	+	+	-	+	-	+
Sodium chloride	+	+	-	-	+	+	+	-	+	+	+
Sodium hydroxide	20 °C	+	-	-	-	-	+	-	-	-	+
Caustic soda	20 °C	50%	-	3%	-	+	+	-	50%	+	□
Nitric acid	66%	-	-	-	10%	-	25%	-	10%	+	-
Hydrochloric acid	-	O	-	10%	20%	-	+	-	10%	O	-
Lubricating oil	+	-	+	-	+	O/+	+	-	-	-	□
Carbon bisulphidef	+	-	-	-	-	+	+	-	-	O	□
Sulphuric acid	-	50%	-	28%	50%	-	80%	50%	50%	70%	-
Sea water (cold)	+	-	+	+	-	+	+	+	-	+	+
Soapsuds	+	-	+	-	O	+	+	-	-	+	+
Rinsing agent	+	-	-	-	-	-	+	-	-	-	□
Spirit of Turpentine	+	-	+	-	O	-	+	-	-	+	+
Carbon tetrachloride	+	-	-	-	O	-	-	-	-	O	+
Toluene	+	-	+	+	-	+	-	+	-	-	+
Trichlorethylene	+	-	-	+	-	-	-	O	-	-	+
Water	+	+	68 °C	68 °C	+	+	+	+	+	60 °C	+
Tartaric acid	20 °C	+	+	-	+	10%	+	-	+	60 °C	+
Xylene	+	-	-	+	-	+	-	+	-	-	□
Zinc sulphate	-	+	-	-	+	-	+	-	-	-	□
Citric acid	20 °C	+	+	-	10%	+	+	-	+	-	+

## Legend:

+ : stable / O : relatively stable / - : non-stable / □ : no information

.. °C: to ... °C resistant / ..%: to ...% solution resistant

## General specifications for explosion protection

	European Union	North America
Division of hazards	Explosive mixtures in Group I: mines susceptible to firedamp Group II: other areas outside of mines	Explosive mixtures of air with CLASS I: gases and vapors CLASS II: dust CLASS III: fibers
Ignition hazards due to sparks	Classification of the protection types intrinsic safety/ flame-proof enclosure according to minimum ignition current/limit gap with reference to the minimum ignition energy of representative gases: Group I Methane Group IIA Propane IIB Ethylene IIC Hydrogen, Acetylene This classification also partially applies to the type of protection "n" (Zone 2 equipment)	Division of CLASS according to ignition energy: CLASS I Group A Acetylene B Hydrogen C Ethylene D Methane CLASS II Group E Metal dust F Carbon dust G Grain dust CLASS III no grouping
Ignition hazards due to hot surfaces	Classification into temperature classes according to IEC 79-8 for maximum surface temperatures at an ambient temperature of 40 °C under failure conditions: T1 ≤ 450 °C T2 ≤ 300 °C T3 ≤ 200 °C T4 ≤ 135 °C T5 ≤ 100 °C T6 ≤ 85 °C	
Division of hazard areas	The following are classified according to the probability of the occurrence of an explosive atmosphere:  For gases, vapors, mists: (EN 60079-10) Zone 0 constant or long-term 1 occasional 2 rare and short term for dust: (EN 1127-1) Zone 20 constant or long-term or frequent 21 occasional 22 short-term or accumulation or layers of dust  Note (see IEC 79-10): constant or long term > 1000 h/year, occasional represents 10 ... 1000 h/year, rare or short-term <10 h/year	
Safety data	For the ratings of combustible gases and vapors as a basis for classification according to ignition energy, ignition temperature, and flash point see:	
	Redeker, Nabert, Schön/Safety technology characteristics of flammable gases and vapors	NFPA 497 M CSA No. C22-1
Certificate authorities	Physikalisch-Technische Bundesanstalt DMT Deutsche Montan Technologie GmbH BASEEFA British Approvals Service for Electrical Equipment in Flammable Atmosphere and others	UL Underwriters Laboratories, USA FM Factory Mutual Research, USA CSA Canadian Standards Association
Installation requirements	DIN EN 60079-14 (VDE 0165 Part 1) for explosive gas environments DIN EN 50281-1-2 (VDE 0165 Part 2) for environments with flammable dust	NFPA 70 National Electrical Code Art. 500 NFPA 493 Standard for Intrinsically safe operations ...

## Approval authorities for electrical equipment

This table contains test agencies certifying the products of Pepperl+Fuchs GmbH (extract).

Safety-relevant control components

Firedamp underground excavations

Other explosive environments

PTB	German Federal Physical/Technical Institute (Physikalisch-Technische Bundesanstalt)	x		
DMT	Deutsche Montan Technologie GmbH	x	x	
ZELM Ex	ZELM Ex testing and certification center	x		
BIA	Professional insurance association institute for occupational safety			x
TÜV	Technischer Überwachungsverein Bavaria and South West	x		x
TÜV	Technischer Überwachungsverein Hannover/Sachsen-Anhalt e.V.	x		
GL	Germanic Lloyd (ocean-going and inland ships)	x		
TÜV	Technischer Überwachungsverein Vienna	x		x
SEV	Swiss association for electrotechnology/Schweizerischer elektrotechnischer Verein	x		
SUVA	Swiss accident insurance institute/Schweizerische Unfallversicherungsanstalt			x
BASEEFA	British Approvals Service for Electrical Equipment in Flammable Atmospheres	x		
SMRE	Safety in Mines Research Establishment (GB)		x	
FM	Factory Mutual Research (USA)	x		
UL	Underwriters Laboratories Association (USA)	x		
CSA	Canadian Standards Association	x		
KBI	Központi Banyaszati Fejlesztési Intézet Budapest (Hungary)	x		
FTZU	Fyzikálne Technický Zkusební Ústav Ostrava (Czech Republic)	x		
VNIIVE	Explosion protection test center Donezk (Ukraine)	x	x	

## Protection class provided by housing

(DIN VDE 0470 Part 1, EN 60529)

IP 6 7

Degree of protection against contact and foreign bodies	Degree of protection against water
0 - Not protected	0 - not protected
1 - Protection against accidental contact by hand with hazardous components - Protection against large foreign bodies with a size and diameter of 50 mm and above	1 - Protection against drops of condensed water
2 - Protection against access to hazardous components with one finger - Protection against medium-sized foreign bodies with a size and diameter of 12.5 mm and above	2 - Protection against dripping water when housing is tilted up to 15°
3 - Protection against contact by most tools, wires, and small objects - Protection against solid foreign bodies with a size and diameter of 2.5 mm and above	3 - Protection against sprayed water
4 - Protection against contact with hazardous components with a wire - Protection against small foreign bodies with a size and diameter of 1.00 mm and above	4 - Protection against splash water
5 - Protection against contact with energized or moving parts - Protection against dust	5 - Protection against water jets
6 - Protection against energized or moving parts - Protection against dust	6 - Protection against strong water jets
	7 - Protection against immersion in water for the stated conditions
	8 - Protection against continuous submersion in water
	9 - Protection against high pressure, high temperature washdown

### Notes:

Wherever a code number is not required, the letter "X" must be used in its place.

Devices identified with a second digit 7 or 8 do not have to fulfill the requirements of the second digits 5 or 6 unless they have a double identification (e.g. IPX6/IPX7).

The conditions of Pepperl+Fuchs, Inc. for IPX8 are:

- 1 m water column above the test subject
- 24 h operation under water with cyclical dampening and amplification under rated load
- Cycle time 2 h
- Water temperature = room temperature  $\pm 5^\circ\text{C}$

## Glossary

### ABS

Acrylnitril-Polybutadien-Styrol

### Absolute value encoder

Absolute encoders provide a distinctly coded numerical value for each shaft position. The internal material measure permits the read-out of an absolute measured value after a supply voltage has been applied. A reference run is not required.

### Accuracy of measurement

Maximum value of deviation from the ideal characteristic. It is specified for measuring sensors and refers to the maximum measurement range.

### Adjuster

Operating element, mostly potentiometer or rotary switch, used for adjusting the response sensitivity, operating distance, operating mode of the output, time functions, etc.

### Adjustment aid

The pre-fault indicator can be used as an adjustment aid. Sensors which work with visible red light can be visually adjusted. The mounting aids listed in the catalog ensure optimal adjustment.

⇒ also mounting aids

### Adjustment range

Range inside of which the switch point of a sensor can be adjusted.

### Air temperature

The ultrasonic speed is greatly dependent on the air temperature. This fact can result in a greater dependency on the output values of an ultrasonic sensor, provided there is no temperature compensation.

⇒ Temperature compensation

### Alarm output

Signals a failure, e.g.. short circuit of an output, LED failure, supply voltage drop.

### Alarm

⇒ Error message display

⇒ Pre-fault indicator

### Alternating light

Light with a periodically alternating intensity of illumination (e.g. fluorescent tubes).

### Ambient conditions

The functioning of Pepperl+Fuchs ultrasonic sensors is not impaired by dust, mist, rain, snow, and audible interference. Deposits on the sensor surface are normally prevented by the self-cleaning effect of the vibrating decoupling layer.

### Ambient temperature

To meet industrial standards, photoelectric sensors must be capable of operating between temperatures of -5 °C to +55 °C.

The standard temperature range of Pepperl+Fuchs sensors is between -25 °C to +70 °C. The valid values are given in the data sheets.

### Barometric pressure

With the common atmospheric fluctuations, ( $\pm 5\%$ ) at a fixed location, the ultrasonic speed fluctuates by approximately  $\pm 0.6\%$ . Normally, the resulting operating distance change can be ignored.

### Beaming

The sound cone has a beam angle of approximately  $5^\circ$  at -6 dB sound pressure. An additional beaming of the ultrasound, e.g. by placing a tube before the converter, cannot be achieved.

### Binary code

Code based on binary digits which is also used by absolute encoders.

### Blind area

Zone in front of an ultrasonic sensor in which an object or reflector is not detected.

⇒ Chapter "Detection range"

⇒ Adjustment range

### Blind range for retro reflector

Zone in front of a retro-reflective photoelectric sensor in which the retro-reflector is not detected.

### Cable length

Sensors that have internal evaluation can have cable lengths up to 300 m. If the line is used for communication purposes via the RS 232 interface, their maximum length is reduced to 100 m.

The line should be shielded if interference is high.

The length of the line for sensors without evaluation (H1/2/3 sensors) should not exceed 50 m.

### Cam 1, 2

(A\*\*58 parameterizable)

The encoder AVE/AVM58 contain sequential circuitry with two cams. The cam signals are output via the outputs or the SSI special bit.

### CE symbol

The CE symbol represents the manufacturer's confirmation that the identified product conforms to the applicable international or European standards and directives.

### Changeable code frequency

Maximum number of measuring step changes per second.

### Channel

Signal trace of the incremental rotary encoder.

### Code formation

In the case of multiturn encoders with a singleturn resolution, not equal to a power of two, and if the tree format is used, it is possible to choose between open and closed code formation, provided no misalignment of the measuring range has occurred. In this case open code formation means that the position within a revolution and the number of revolutions picked up are arranged separately. In all other cases, only closed code formation is possible. This means that the resulting position value is calculated in the encoder as a single value.

### Code progression

⇒ See direction of count.

### Cross-talk

Ultrasonic sensors working in parallel, whose detection ranges overlap, can affect each other mutually (cross-talk).

Therefore, the minimum distance between sensors must be maintained:

- If the sensors transmit the sound in the same direction, then the lateral safety distance is equal to approximately half the detection range.

- However, if the sensors are positioned opposite each other, the distance must be slightly more than the addition of the two detection ranges.

If it is not possible to maintain these safety distances, sensors that can be synchronized should be used.

**Dark ON**

The photoelectric sensor switches on if no light beam is detected by the receiver optics. With diffuse photoelectric sensors, this happens when no target is present. With retro-reflective and thru-beam photoelectric sensors, this happens when an object interrupts the beam path.

**Detectable object**

⇒ Standard measuring plate

**Detection range**

Maximum usable distance between sensor and object. The detection range depends on the intensity of the transmitted signal, the relationships in the measuring area, but mostly from the reflective capability of the object.

⇒ Detection range

**Detection range**

Range inside of which an object or reflector is detected with certainty or the operating range can be adjusted. According to EN 60947-5-2, the terms range and detection are replaced by the term detection range.

This range is determined with application of the rated operational voltage  $U_e$  at an environment temperature of 20 °C and a rel. humidity of 50 %. With thru-beam photoelectric sensors, the receiver (with diffuse mode sensors, the measuring plate) is moved axially towards the sensor. In the detection range  $s_d$  the switching element must switch safely.

**Detection width hysteresis**

This describes the distance of the switch points between the lateral approach and removal of the measuring plate, i.e. between approach and removal in the right angle to the reference angle.

**Deviation of the characteristic curve**

⇒ Accuracy of measurement

**Diffuse mode**

⇒ Reflection

**Diffuse photoelectric sensor**

Consist of an active device with an integrated light emitter and receiver. The light is reflected diffusely from the object (target).

⇒ Chapter "Engineering and function principle of optical sensors"

**Diffuse sensors**

⇒ Direct detection sensor  
⇒ Διφφυσε πηοτοελεχτριχ σενσορ

**Direction of actuation**

The objects can be directed towards the sound cone from any direction. All the specifications relating to the switch points made in the catalog also apply to the axial approach of the objects.

**EMC classification**

**ElectroMagnetic Compatibility** is the ability of devices (or systems) to function as intended within their electromagnetic environment, without interfering with other devices, and without being susceptible to interference from other devices. The EMC classification is based on tests for emission and resistance to interference with different test gradings. For example, severity 3 corresponds to a standard industrial environment (see EN 60947-5-2 Annex X).

**Explosion protection**

Measures taken to prevent (primarily) the formation or (secondarily) the ignition of a potentially explosive atmosphere

**Extraneous light limit**

This indicates the extraneous intensity of radiation above which an optical sensor no longer works.

⇒ Lux

**Extraneous light**

Extraneous light is defined as the optical radiation which is received by the receiver of a photoelectric sensor but which was not emitted by its sensor.

This may consist of thru beam particles (sun, incandescent lamps) and/or pulsating light particles (fluorescent tubes, other sensors).

**Fall time**

Duration for an electrical signal to change from high to low level.

**Fault display (alarm)**

Many ultrasonic sensors from Pepperl+Fuchs feature a red indicator LED to signal a fault. A fault occurs primarily due to misadjustment of the sensor or if the interference level is high. This is signaled by the red flashing LED.

If a fault occurs, the last valid output states are "frozen". The output states are kept until the fault has been corrected and the sensor resumes normal operation.

**Gray code**

Higher data safety due to one-unit-distance and cyclical code. Only one bit changes from step to step. This code has to be converted into the binary code for data processing.

**Gray excess code**

This code is an extract of Gray code, which is used for the representation of angular steps.

Example: 360 steps

In this case 9 bits are required, which corresponds to 512 steps. The extract of the code is symmetrical. It starts at 76 and ends at 436. The difference between the beginning and end is 360 steps.

**Humidity**

Ultrasonic speed increases from dry to saturated air by 2 %. As a result, the operating distance decreases by a maximum of 2 %. Normally, this is negligible.

**Hysteresis**

⇒ Range hysteresis  
⇒ Detection width hysteresis

**Incremental encoders**

These encoders supply a frequency proportional to the speed or a number of electrical pulses proportional to the angle. A reference run should be carried out after a loss of voltage.

**Infrared light (IR or IRED)**

Radiation having a longer wavelength than visible light ( $\lambda = 780 \text{ nm}$  to  $1 \text{ mm}$ ). Examples of IR transmitter diode emitted wavelengths are 880, 940, and 950 nm.

**Insensitivity to adjustment**

Retro reflectors permit mounting and adjustment to deviate by  $\pm 25^\circ$  from the reference axis.

**Interface**

Electrical or mechanical interface.



**Laser (Light Amplification by Stimulated Emission of Radiation)**

Lasers feature some characteristics which differ greatly from traditional light sources. The use of lasers in photoelectric sensors is noted for their excellent focussing properties.

Laser beam sensors/photoelectric sensors from Pepperl+Fuchs are characterized by a focused beam profile for the detection of small objects or edges. They are eye-safe due to their technical design.

Lasers in photoelectric sensors work in the red or infrared spectral range.

**LATCH**

Storage function: By activating this input of the absolute encoder the present value measured is "frozen". The output will not change despite the shaft rotating.

If the input is deactivated, every new step measured is output (transparent latch).

**LED lifetime**

The lifetime of an LED is defined as the duration in which the luminous power drops to 50 % of the original value. This period of time is specified for an operating temperature of +25 °C.

**LEDs**

Most Pepperl+Fuchs sensors feature LEDs for indicating different states:

The meaning of the individual LEDs is explained in the respective data sheets.

**LED (Light Emitting Diode)**

The light emitting diode is a semiconductor radiation source with good modulation capabilities and with a long lifetime. LEDs in photoelectric sensors typically work in the red or infrared spectral range.

**Light guide**

(also referred to as Fibre Optics, FO)

Glass light guides consist of several glass fibres grouped to form a bundle. Each of these glass fibres has an optically thicker glass core and an optically thinner glass covering. The light is guided along the longitudinal axis of the light guide due to the total reflection, even if this is curved. Plastic light guides work according to the same basic principle, but only consist of a single fibre.

⇒ Chapter "Engineering and function principle of optical sensors"

**Light ON**

The sensor output switches on if light is detected by the receiver optics. With diffuse photoelectric sensors, this happens when an object is detected by the sensor. With retro-reflective and thru-beam photoelectric sensors, this happens when the light path is unobstructed.

**Light outlet**

Transparent window in the housing behind which the emitter or receiver elements are located.

**Light type**

Specification of wavelength of the light source used in the sensor.

**Linearity**

⇒ Accuracy of measurement

**LSB**

**Least Significant Bit.** The bit with the lowest value.

**Lux**

Lux is the unit of radiation intensity, which means a measurement for the luminous flux per receiver area. Sunlight in summer can produce up to 100,000 lux, a cloudy winter sky 1,000 to 2,000 lux, in normal rooms the brightness is 50 lux ... 100 lux.

**Measurement output**

Absolute: the measurement output specifies the distance of the object from the sound migration area in millimeters. The output is analog (4 mA ... 20 mA, or 0V ... 10 V), or digital (parallel 8 bits or serial RS 232).

Relative: the measurement output specifies position of the object within the window range (A1/A2 or lower limit/upper limit).

**Measurement range**

Evaluation range of measuring sensors. The start value of the measurement range is defined by the "lower limit"; the end value of the measurement range is defined by the "upper value".

**Mounting aids**

The catalog lists angles and mounting brackets for use with sensors, which can be adjusted relative to each other. They facilitate adjustment.

**MSB**

**Most Significant Bit.** The bit with the greatest value.

**Multiturn**

In addition to singleturn, the number of revolutions is also monitored.

**N.O. contact**

The output is free of voltage if the sensor does not detect any object. When an object is detected it becomes live (normally open, N.O.).

**NAMUR**

**Normenarbeitsgemeinschaft Mess- und Regeltechnik der chemischen Industrie (Standards Working Group for Control and Instrumentation in the Chemical Industry);** defines directives for devices used in potentially explosive areas.

**NC contact**

If the sensor does not detect any object, the output is live. When an object is detected it becomes free of voltage (normally closed, N.C.).

**Near range (blind zone)**

Range in which a sensor cannot detect an object.

⇒ Chapter "Detection range"

**No load current**

Power consumption of the sensor without load connected.

**Objects**

(for ultrasonic sensors)

The specification of a sensing range is normally based on a flat, standard measuring plate 100 x 100 mm, which is aligned perpendicularly to the sensor axis. The sensing range of sensors for very small distances also refers in part to smaller measuring plates (⇒ data sheets).

Fixed or powdery objects as well as liquids are capable of detection.

With poorly reflecting materials (felt, cotton batting, foam rubber, coarse textiles), the retro-reflective mode is recommended.

Heated materials (>100 °C) are poor reflectors.

⇒ Chapter "Instructions for installation and operation"

**Offset**

Value which is continuously added to a value measured.

**Off-state current**

Current, which flows in the load circuit of the sensor after it has been switched off.

**One shot output function**

Time function for switch outputs which generates an output pulse of a defined length. It is independent of the switch event duration.

⇒ Timer function

**On-load current**

Specifies the permitted current load of an output.

**Open Collector (OC)**

Open collectors are differentiated according to OC-PNP and OC-NPN output stages. The latter inverts the output signals.

OC output stages are replaced by the push-pull output stage in incremental and absolute encoders.

The inverted behavior of the OC/NPN output stage has to be observed in absolute encoders.

**Operating distance difference**

Difference in the detection range depending on the reflective capability of objects to be detected. This specification characterizes diffuse photoelectric sensors with background suppression and ultrasonic sensors in direct detection mode.

**Operating temperature**

Temperature range in which the values and tolerances mentioned in the data sheet are adhered to. If the temperature is exceeded or falls short, the encoder is not destroyed. After the operating temperature has been reached again, the specifications are again met.

**Operating voltage**

The operating voltage is indicated by the maximum and minimum values of the supply voltage, e.g.

$U_B = 10 \dots 60 \text{ V DC}$ . Safe operation of the proximity switch is guaranteed within this range. In the case of NAMUR proximity sensors, the nominal voltage is indicated.

**Output frequency**

The maximum signal frequency of the rotary encoder. This comprises the number of pulses and the rotational speed.

**Parity**

Control bit to recognize failures in data transmission.

**PBT**

Polybutyleneterephthalate

**PC**

Polycarbonate

**Phase correlation**

Measuring method in which the distance to the object is determined via indirect propagation time measurement. The phase shift between the intensity-modulated emitted steady light and the reflected signals is the measurement for the distance.

**Phase position**

Misalignment of the edges of channels A and B of an incremental rotary encoder.

**Photoelectric sensors**

⇒ Diffuse mode sensors

**PMMA**

Polymethylmethacrylate

**Polarity protection**

All Pepperl+Fuchs ultrasonic sensors are protected against incorrect connection of operating voltage.

**Polarity protection**

With polarity protected sensors, the sensor is protected independent of the polarity of the supply voltage.

**Polarization filter**

Filter for creating polarized light.

**Polarized light**

Light, whose characteristic phase does not oscillate in all levels as with natural light, but only in a preferred level.

**Power consumption**

Sensor off-load power input without load.

**Pre-fault indicator (alarm)**

Optical sensors are highly sensitive to contamination. The optical failure warning indicator provides a warning prior to failure. The LED signals contamination, misadjustment, or an incorrectly selected detection range. The switching function of the sensor is still ensured. A pre-fault output enables the remote detection of a pre-fault indication.

The pre-fault indicator can also be used as an adjustment aid.

**PRESET 1**

Reset of the control input. This action is used for electronic adjustment of the absolute encoder.

For parameterizable absolute encoders a value other than zero can be entered.

**PRESET 2**

Control input used to set the value measured to a quarter of the singleturn resolution. This action is used for electronic adjustment of the absolute encoder.

For parameterizable absolute encoders a value other than one fourth of the singleturn resolution can be entered.

**Protection class**

EN 40050 classifies the protection of electrical equipment against contact, ingress of objects or water through housing, covers, or similar. The IP short form consists of the letters IP (International Protection) and two digits:

1st digit:

Degree of protection against contact and foreign bodies

2nd digit:

Degree of protection against ingress of water

⇒ Table "protection classes" through housing"

**Pulse count**

Resolution of the incremental rotary encoder. Specifies the number of pulses per rotation.

**Pulse extension**

Time function used to extend the switching time provided it is shorter than the pulse extension value.

⇒ Timer function

**Pulse frequencies**

Sensors which work with LEDs are not operated with continuous light, but with pulsed light (the pulse frequency has a magnitude of 10 kHz.) If two sensors are used in close proximity to each other, with some sensors it is possible to set a second pulse frequency to prevent mutual interface.

**Push-pull output**

Push-pull automatically sinks or sources current based on the connected load.

This allows it to act as either an NPN or a PNP output.

**Quality Assurance**

The standards DIN ISO 9000-9004 (EN 29000-29004) regulate the quality assurance (QA) of products and services.

Pepperl+Fuchs is certified in accordance with DIN ISO 9001.

**Range hysteresis**

Describes the distance of the switch points between the approach and removal of the measuring plate. The hysteresis is given as a percentage of the operating distance (range).

**Range**

Photoelectric sensors:

Usable distance between light emitter and receiver (thru-beam sensor) or emitter/receiver and reflector (retro-reflective photoelectric sensor).

Ultrasonic sensors:

Usable distance between ultrasonic emitter and receiver (thru-beam sensor), sensor and reflector (retro-reflective), or sensor and object (direct detection).

⇒Detection range

**Rated operating current**

This value indicates the maximum load current during continuous operation.

**Rated operational voltage**

The rated operational voltage is indicated by the maximum and minimum values of the supply voltage, e.g.  $U_e = 10 \text{ V DC} \dots 30 \text{ V DC}$ . Safe operation of the proximity switch is guaranteed within this range.

**Red light**

Visible light with wave lengths between 630 and 780 nm. An example of a red light emitter diode wavelength is 660 nm.

**Reference axis**

Ideal line on which the emitter and receiver (thru-beam sensor) or emitter and object/reflector (diffuse photoelectric sensor or retro-reflective photoelectric sensor) are positioned opposite each other.

Photoelectric sensors:

In the case of thru-beam sensors, the reference axis is equal to the optical axis of the lenses. In the case of diffuse photoelectric sensors or retro-reflective photoelectric sensors, the center line is between the optical axes of emitter and receiver lens.

Ultrasonic Sensors

In the case of single-head systems, the reference axis is equal to the bisecting line of the sound cone. In the case of dual-head systems, the center line is between the sound cone axes of the emitter and receiver.

**Reflection light beam switches (Type R)**

Ultrasonic sensors in thru beam operation.

An object with good reflection characteristics within the sensing range serves as the reference. Objects with poor reflection characteristics which enter the detection range can be detected with certainty in the operating mode.

⇒Chapter "Sensor principle"

**Reflection sensors (Type D)**

Consist of an active device with an integrated ultrasonic emitter and receiver. The sound waves are reflected diffusely from the object (target).

⇒Chapter "Sensor principle"

**Reflection**

In general, a reflection is the reversal of waves on the boundary surface of two media.

Three types of reflection are identified:

- Mirror reflection: reflection during which the total reflection of the radiation power occurs with incident angle = angle of reflection.
- Predominantly directional reflection: mirror reflection with a diffused part, e.g. with rough object surfaces.
- Diffuse reflection: reflection, during which the reflection of the radiation power is reflected equally into all directions in the room.

The way in which an ultrasonic wave is reflected depends on the relation of the sound wave length and the roughness of the object surface.

⇒Chapter "Instructions for installation and operation".

**Reflective capability**

Characteristics of objects, depending on surface structure and texture, to reflect ultrasonic waves in a good or poor, directional or diffuse state. The non-reflected part is absorbed or transmitted. With direct detection, the range that can be achieved can be estimated using reflection tables of common materials.

**Reflector range**

Ultrasonic sensors:

Range inside of which the reflector of an ultrasonic sensor in thru beam operation must be placed in order to be detected with certainty. The reflector range stretches from the end of the blind range for the reflector up to the end of the detection range.

Photoelectric sensors:

Range inside of which the retroreflector of a retro-reflective sensor must be placed in order to be detected with certainty. The reflector range stretches from the end of the blind range for the retroreflector up to the end of the detection range.

**Reflector**

A reflector is understood as a flat plate with good reflection characteristics, which is positioned perpendicularly to the spreading direction of the sound waves within the sensing range.

The reflector serves as a reference object for ultrasonic reflection sensors which are used in thru beam operations.

⇒Sensor principle

**Repeat accuracy**

(also referred to as reproducibility)  
Determined in an 8-hour test at  $23 \pm 5 \text{ }^\circ\text{C}$  and the rated operational voltage. The difference between two switching ranges must not exceed 10 % of the real switching range.

**Reproducibility**

⇒Repeat accuracy

**Residual ripple**

The alternating voltage (peak-peak) overlapping the direct operating voltage and is expressed as a percentage of the arithmetic mean. Pepperl+Fuchs proximity switches conform to EN 50008 with a max. value of 10 %.

**Resolution**

Smallest measured quantity change that can be detected and displayed by a measuring sensor.

**Response time**

This is the shortest possible time between two switching operations. The response time is equal to half the reciprocal of the switching frequency.

**Retro reflectors**

Retro reflectors (also referred to as triple mirror) reflect back the light parallel to the direction of incidence. They can be rotated up to a specific angle relative to the reference axis without limiting the function of a retro-reflective photoelectric sensor as a result.

**Retro-reflective photoelectric sensor**

Consists of an active device with an integrated light emitter and receiver as well as a passive reflector on which light is reflected.

⇒ Chapter "Engineering and function principle of optical sensors"

**Ring register, standard 0 operation**

In many cases, the exact same position value is requested repeatedly from the interface electronics. For example, a 51 bit long clock sequence is transmitted to a multiturn encoder, instead of a 25 bit long clock sequence. If the absolute encoder is in ring register operation mode, the same position value is transmitted twice in succession. An equivalence check is then carried out in the control in order to be able to filter out transmission errors caused, for example, by EMC interference.

In standard 0 operation, zeros are delivered from the 26th clock.

**Ripple**

The alternating voltage (peak-peak) overlapping the direct operating voltage expressed as a percentage of the arithmetic mean. Pepperl+Fuchs sensors conform to EN 50008 with a max. value of 10 % ripple.

**Rise time**

Duration for an electrical signal to change from low to high level.

**Rotation speed monitoring**

The absolute encoder monitors the rotational speed of the shaft. If the maximum permissible rotational speed of  $6000 \text{ min}^{-1}$  is exceeded, the rotary encoder generates an alarm signal.

It is also possible to specify an application specific rotational speed limit, which is also monitored and reported when the set value is exceeded or falls below.

**Rotational speed**

Specifies the mechanical load limit for the rotary encoder. If this limit is exceeded, the lifetime of the encoder can be impaired. Furthermore, interference can occur in the signal acquisition.

**RS 232**

Unsymmetrical, serial, unidirectional interface between PC and parameterizable absolute encoder.

**RS 422**

Symmetric, serial, unidirectional interface. This interface is used in incremental rotary encoders to transmit anti-valent pulse channels:  $A\bar{A}$ ,  $B\bar{B}$ ,  $0\bar{0}$ .

For absolute encoders with SSI interface for the transmission of cycles and data: cycle+, cycle-, data+, data-.

Each signal pair is passed through twisted pair cables.

**RS 485**

Symmetrical, serial, bidirectional interface. Basis for many field bus systems.

**Scaling**

The number of steps per revolution can be set. The number of revolutions of a multiturn can be set to between 1 and 4,096 depending on the type of encoder.

**Scanning range**

Evaluatable angular range which is crossed by the light beam of a scanner.

**Selection of count direction**

This control input can be used to define whether the absolute encoder is to generate increasing values when the shaft rotates clockwise (CW) or counter clockwise (CCW). The shaft is always viewed from the shaft end.

**Sense+**

Is used for the measurement of the effective encoder supply voltage together with Sense-. Permits the automatic compensation of the power drop due to the encoder cable.

**Sense-**

Is used for the measurement of the effective encoder supply voltage together with Sense+. Permits the automatic compensation of the power drop due to the encoder cable.

**Sensor principle**

Physical basis on which the principle of operation of a sensor is based.

**Shaft load**

Specifies the maximum permitted axial and radial force on the encoder shaft. The force application point is the center of the shaft extension. If these forces are exceeded, the lifetime of the encoder can be reduced. Furthermore, there is the danger of causing irreparable damage to the rotary encoder.

**Short circuit protection**

With switched short-circuit protection, which is a feature of most Pepperl+Fuchs proximity switches, the output stage is switched "on" and "off" periodically when the current limit is exceeded until the short-circuit is eliminated.

**Singleturn**

Absolute encoder that delivers a defined number of measuring steps within one revolution. After completion of the revolution the measured value jumps from the maximum to the minimum value.

**SSI**

Synchronous Serial Interface. Is used with absolute encoders.

**Standard designation of switching elements**

6-part coding in which the sensor type, mechanical installation requirements, design and dimensions, switching element function, output type, and connection details are specified with max. 8 letters and numerals (⇒ EN 60947-5-2).

**Standard measuring plate**

Standard measuring plates enable comparative measurements to be made of the operating ranges. The following applies to photoelectric sensors:

Retro-reflective photoelectric sensor:

- Reflector devised by the manufacturer (noted in the data sheets)

Thru-beam sensor:

- Receiver devised by manufacturer (corresponds to the receiver of the two part sensor combination)

Diffuse photoelectric sensor:

- White test card, size 100 x 100 mm (for detection range up to 400 mm), size 200 x 200 mm (for detection range over 400 mm). The white test cards must have a diffuse reflection capability of 90%.

**Starting torque**

Torque required to accelerate the encoder shaft from standstill.

**Start-up signal suppression**

This function, which is a feature of most sensors, suppresses false signals from the output on application of the operating voltage within the period of the time delay before availability

**Storage temperature**

Permissible temperature limit values for a sensor that is neither electrically nor mechanically stressed.

**Switching current**

This value indicates the maximum load current during continuous operation.  
⇒ Rated operating current

**Switching frequency f**

The switching frequency is the maximum number of relevant events per time interval detected by the sensor. It is valid for a pulse-duty factor of 50 % and is expressed in Hertz (Hz).

**Switching hysteresis**

The hysteresis is the distance between the switching points at which the sensor activates as the target approaches the proximity switch and deactivates as the target moves. This value is specified in relation to the actual sensing range  $S_r$  and the rated operating voltage:  $H \leq 0.2 S_r$ .

**Switch-off delay**

Time that the sensor needs to switch off after the object is removed from the sensing range. (The same applies to switch-on delay.)

**Switch-on delay**

Time that the sensor needs to switch on after the object enters into the detection range. (The same applies to switch-off delay).

**Synchronization**

To avoid the mutual interference of neighboring sensors, many models are provided with a synchronization input. If this is unused or set to zero potential, the sensor works independently with its internal clock generator.

A positive synchronization pulse triggers a measuring cycle. It is started with the falling pulse edge.

Pepperl+Fuchs offers UC sensors with synchronization inputs/outputs, which can be linked to each other for a self synchronization.

**Temperature compensation**

To minimize the influence of air temperature on the output parameters, many ultrasonic sensors from Pepperl+Fuchs are provided with temperature compensation.

⇒ Air temperature

**Temperature influence**

Temperature-dependent influence on the output parameters and switch points of a sensor.

The specifications are made in mm/K.

**Thru beam**

Light with a basically constant intensity of illumination (e.g. daylight).

**Thru-beam photoelectric sensor (Type T)**

Thru-beam photoelectric sensors consist of two separate, active devices: emitter and receiver.

⇒ Chapter "Function principle"

**Thru-beam sensor**

Thru-beam photoelectric sensors consist of two separate, active devices: light emitter and light receiver.

⇒ Chapter "Engineering and function principle of optical sensors"

**Tightening torque**

When fastening cylindrical sensors with threaded housing, the recommended tightening torque of 15 Nm must not be exceeded.

**Time delay before availability**

The time delay before availability is the time required for the proximity switch to become operational after the operating voltage is applied.

**Timer function**

Parameterizable time functions for switch outputs of sensors.

⇒ Pulse extension

⇒ One shot output function

**Total reflection**

For the transition from an optically thicker to an optically thinner medium, a material-specific limiting angle of the total reflection is available. Beams, which meet the boundary surface at a greater angle, are not broken, but reflected back to the optically thicker medium.

**Total resolution**

Summary of singleturn and multiturn resolution. Most values are specified in bits.

**Track**

⇒ See channel.

**Transfer rate**

Speed of data transmission of absolute encoders.

**Translation of the characteristic curve**

Adjustable offset by which the output characteristic of a measuring sensor can be moved.

**Triangulation**

Measuring method in which the distance to the object is determined via geometry.

**Type D**

According to EN 60947-5-2 the term for a diffuse photoelectric sensor (derived from: Diffuse Mode).

**Type R**

According to EN 60947-5-2 the term for a retro-reflective photoelectric sensor (derived from: Retro-reflective Mode).

**Type T**

According to EN 60947-5-2 the term for a thru-beam photoelectric sensor (derived from: Thru-beam Mode).

**V/R input**

⇒ Selection of counting direction.

**Voltage drop**

The voltage drop is measured via the active output of the sensor.

**Watchdog function**

In the case of operating voltage interruptions or EMC influences, the watchdog function resets the internal microcontroller of the sensor back to a defined starting condition. In other words, the sensor's internal program is restarted.

**Window range**

The switch output is activated if the object is located in the range defined by the two switch points A1 and A2.

**Working temperature**

Temperature range in which the values and tolerances listed in the data sheet are observed.

**Zero setting**

⇒ See PRESET 1.



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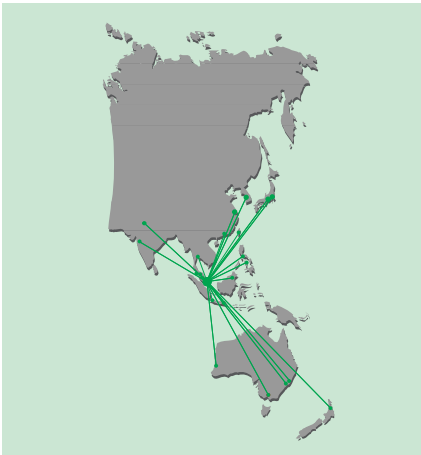
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