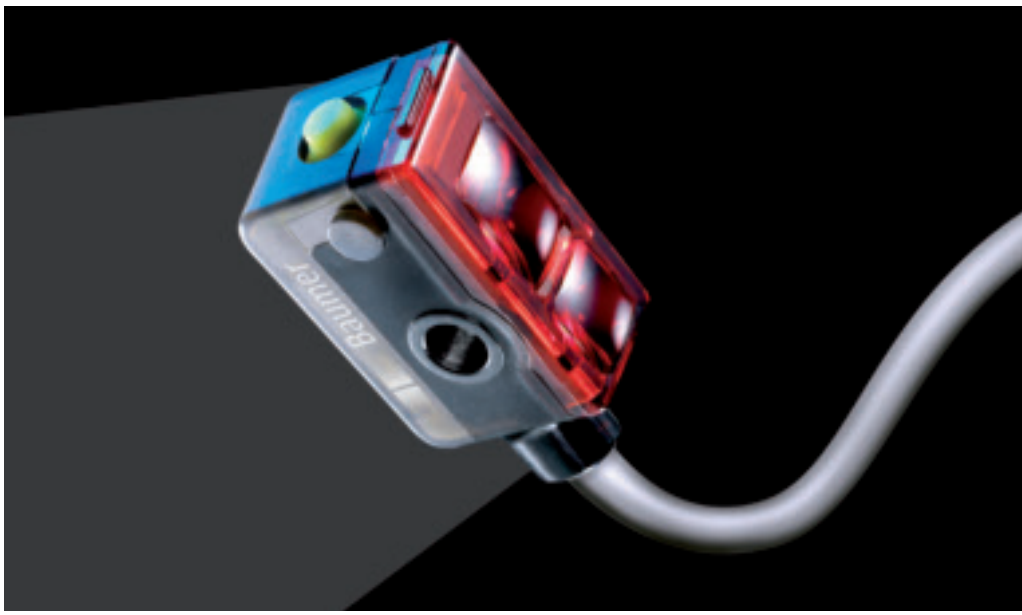
Baumer

Precise, measurably better. Photoelectric sensors. Fiber optics and fiber optic sensors. Vision sensors.



Sensor Solutions
Motion Control
Vision Technologies

No newspaper, no chocolate, no car, no computer, no cell phone could be manufactured today, no letters or parcels would reach their recipients and no bottle of beer could be filled if optical sensors could not detect parts, measure distances, determine colors, count components and detect levels.

State of the art:

Modern technology makes it possible to build compact photoelectric sensors with which objects can be detected reliably and precisely even in rough, industrial environments.

Even easy set up smart vision sensors are capable of solving applications in a 2-dimensional area.

Photoelectric sensors from Baumer:

Baumer provides a large range of photoelectric sensors for many different applications.

- Light barriers and diffuse types and such as with background suppression, available also in the smallest versions on the market
- Almost every sensor is available with visible laser light, even the small ones
- Large range of fiber optic sensors and fibers
- Distance measuring laser sensors with high resolution down to 2 µm and measuring distance up to 1 m provide absolute distance information
- Fully contained line sensors for webcontrol or to detect parts in a 2-dimensional area or providing an absolute distance information
- Compact vision sensors for position control, control of completeness and control of part presence
- Sensors for special applications such as the laser copy counter *SCATEC*

Special custom solutions are available for OEM requirements.

In almost every automation process photoelectric sensors play an essential role.

Baumer is the right partner to provide you with competitive and effective solutions for your photo-electric sensing needs.

Please ask us!

Table of Contents

Introduction

Introduction *Page 198*

Distance and intensity-based

Distance sensors *Page 208*
Difference sensors *Page 232*
Diffuse sensors with background suppression *Page 242*
Diffuse sensors with foreground suppression *Page 284*
Diffuse sensors with intensity difference *Page 298*
Level monitoring and leak detecting sensors *Page 340*

Light barriers

Retro-reflective sensors *Page 354*
Through beam sensors *Page 388*
Fork and angle sensors *Page 422*

Fiber optics and fiber optic sensors

Plastic fiber optic sensors *Page 446*
Plastic fiber optics *Page 466*
Glass fiber optic sensors *Page 475*
Glass fiber optics *Page 482*

Vision sensors, edge / profile recognition

VeriSens vision sensors *Page 496*
ParCon and PosCon line sensors *Page 507*
SCATEC laser copy counters *Page 518*
SpiderScan optical detection and measuring light barriers *Page 530*

Color / contrast recognition

LOGIPAL color sensors *Page 540*
Contrast sensors *Page 546*

Miniature sensors – an enormous part of Baumer's domain!

Miniaturization is an unstoppable trend. Faster processes, better quality and highly integrated machines demand more and more efficient miniaturized sensors.
Our unique miniature sensors have solved many applications where it seemed impossible to detect the object in its position.

No space is too small; no application is too difficult to be solved by a miniature sensor from Baumer.

- FHDK 04: smallest diffuse sensor with background suppression on the market (4x5x45mm)
- The sensor family with the smallest housing and adjustable sensing distance (*MINOS*)
- Smallest laser sensor with adjustable background suppression (OHDK 10)
- Series F10: widest product range with best performance

- Either a Teach-in facility or an adjusting button, even on the smallest sensor, makes it possible to adjust the sensor easily and accurately to your application

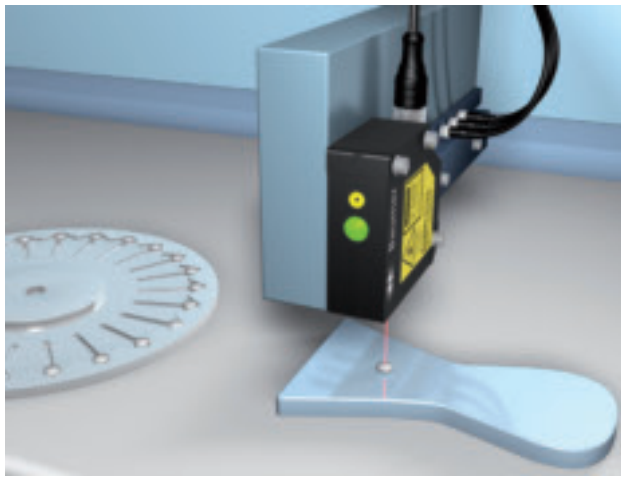
- Beam size of 0,1 mm to detect very small parts or detect larger objects very precisely independent of any background
- Smallest fully contained distance measuring laser sensor with a resolution down to +/- 2 µm (OADM 12) and measuring distance up to 550mm (OADM 13)

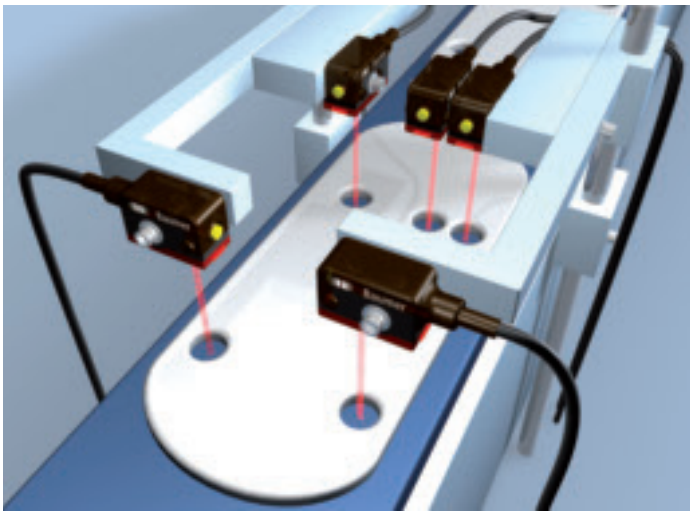
- Large range of plastic and glass fiber optics to solve even the most difficult applications
- Customized fibers
- Broad range of amplifiers: From the easy adjustable to the teachable, high performance one

Miniature sensor applications

Laser distance sensor

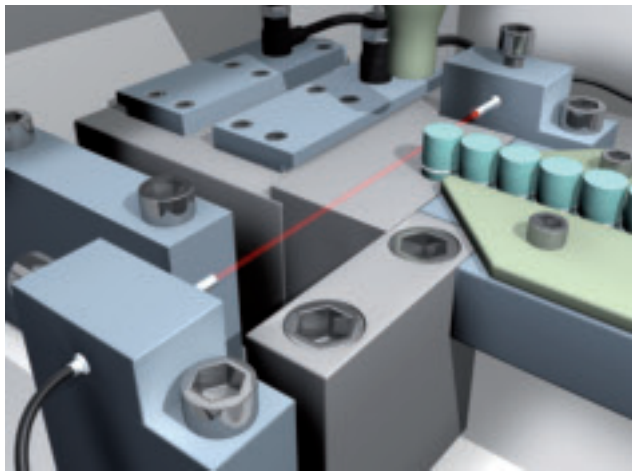
- Thickness measurement of tablets.





Diffuse sensor with background suppression

- Drill hole inspection.



Small fiber optic head

- Detection of small parts in an automatic handling machine.

Distance measuring sensors

In many applications more information is needed than just object presence. Our sensors measure in the micron, millimeter or, depending on the application, in the meter range. They measure distances, width, heights and diameters with great accuracy and are not deterred by difficult surfaces.

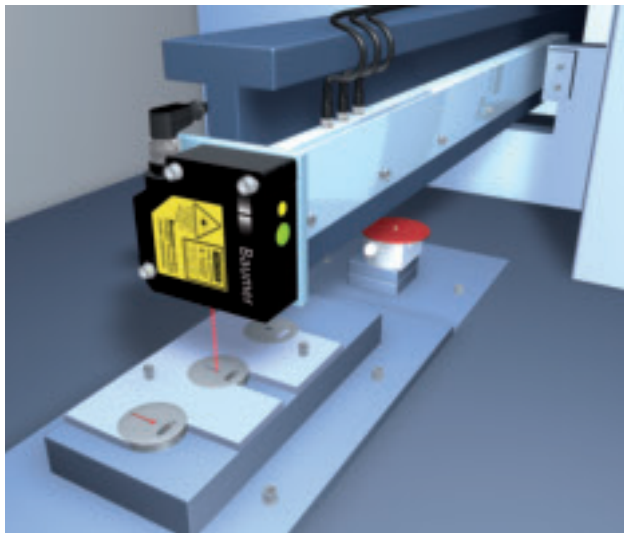
- Fully contained CCD line sensors in a compact housing
- *ParCon* measures position or size of an object in a range of 24 mm
- *PosCon* measures the edge of a web in ranges from 50 mm up to 350 mm
- *PosCon* with key pads for simple set-up for your application
- Highest resolution 0,03 mm

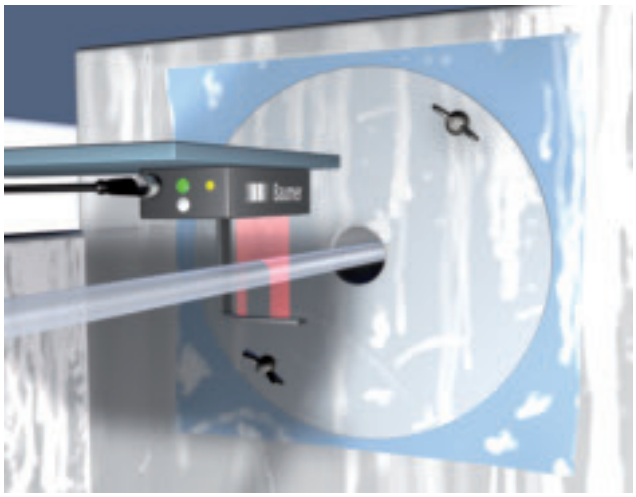
- Laser distance measuring sensors are fully contained in compact housings
- Measuring distances from 0,02 m up to 1 m
- Highest resolution ±0,002 mm
- Shortest response time 0,9 ms
- Teachable measuring ranges for optimized resolution
- Measures distances independent of colors or surfaces

Distance measuring sensor applications

Laser distance sensor (OADM 12)

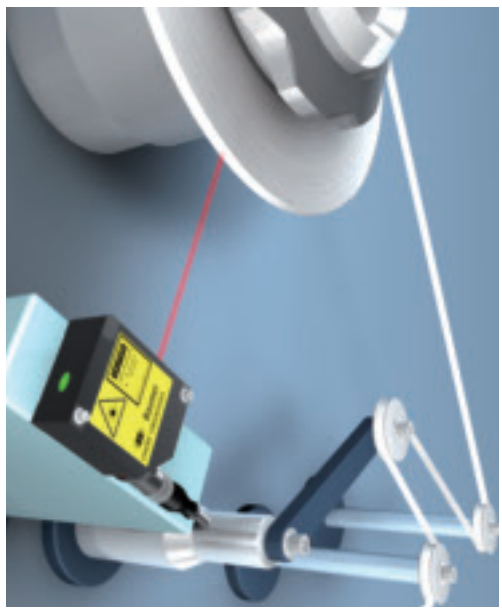
- Distance measurement on the face of a clock to determine the correct pressing depth of the hands.





Line sensor *(ParCon)*

- Inspection of the diameter directly after the extruder.



Laser distance sensor (OADM 20)

- Measurement of the quantity remaining on a paper reel.

Laser sensors – fast and accurate!

You want to detect very fine and thin objects? Or should the sensor be guided through a small hole or aperature? The small and energetic laser spot allows large sensing distances with diffuse, through-beam and retro-reflective laser sensors.

- Small, visible light spot
- Laser class 1 or 2
- Laser diodes with a lifetime up to 100'000 hours

- Smallest diffuse laser sensor with adjustable background suppression (OHDM 10)
- Single optic retro-reflective laser sensors
- Smallest, fully contained distance measuring sensor (OADM 12)
- Large range of distance measuring sensors in different housings

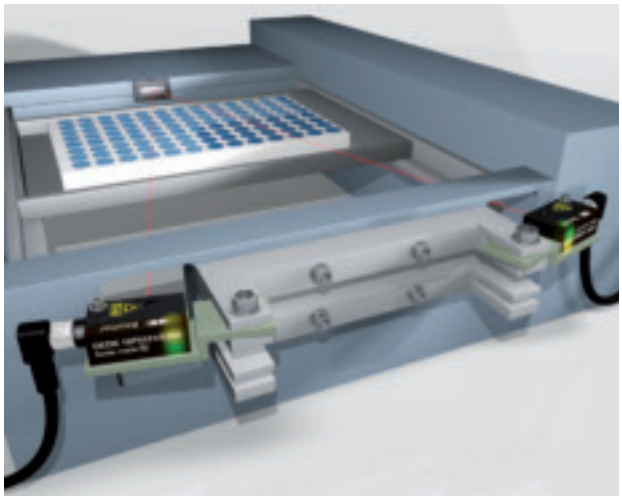
- Fast and precise detection of objects
- High repeatability in detecting and measuring
- Best in class diffuse laser sensor with background suppression (OHDM 12)

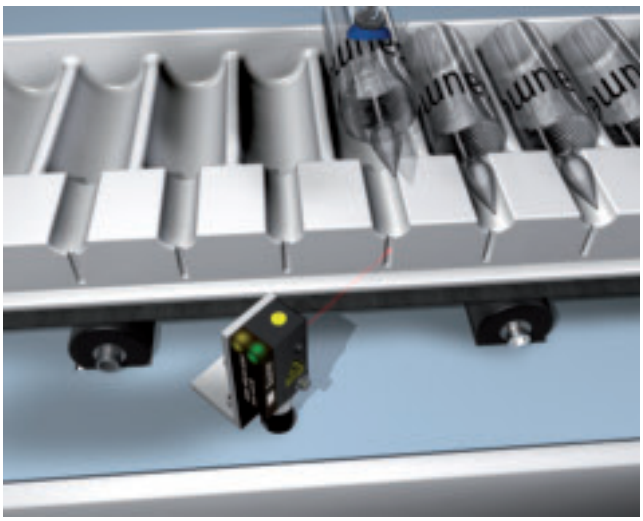
- Laser copy counter (*SCATEC*) counts up to 3 million copies per hour
- Counting single sheets down to 0,1 mm thickness
- Available with CAN and serial interfaces

Laser sensor applications

Through beam laser sensor
(OSDK/OEDK 10 with deflector mirror)

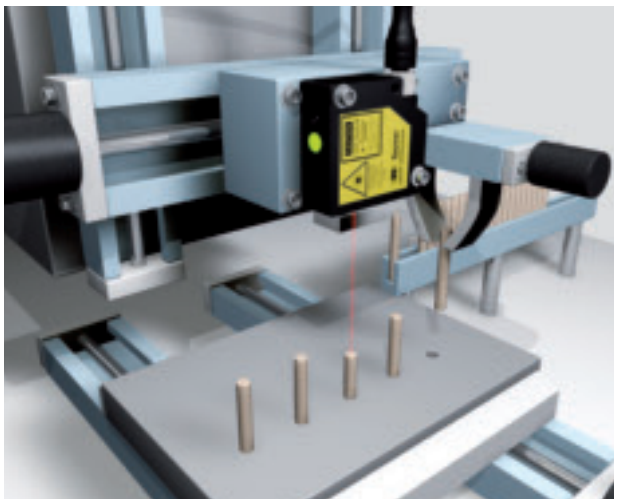
- Position checking of the test tube holder.





Diffuse sensor (OZDK 10)

- Position checking, detected by the notches.



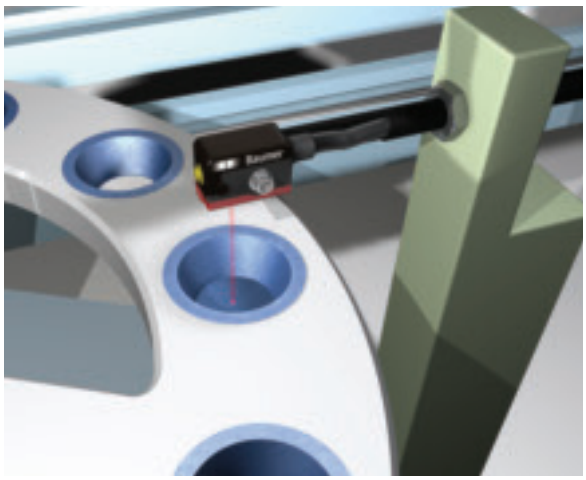
Difference sensor (OBDM 12)

- Height comparison of the inserted shafts.

Successful in many industries

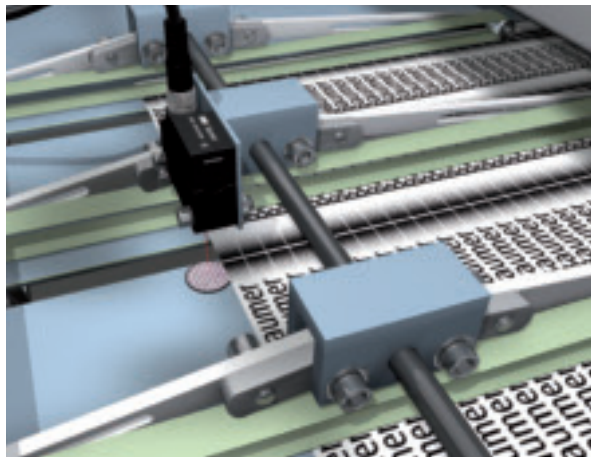
The Baumer product range has grown consistantly through the years. To provide a suitable solution to every measuring problem, the standard range of photoelectric sensors has become almost as diverse as the applications of our customers.

Our diffuse sensors and retro-reflective sensors have proved their value many times in the graphic, semiconductor, textiles, packaging and special machine industries as well as in laboratory automation or electronic manufacturing.



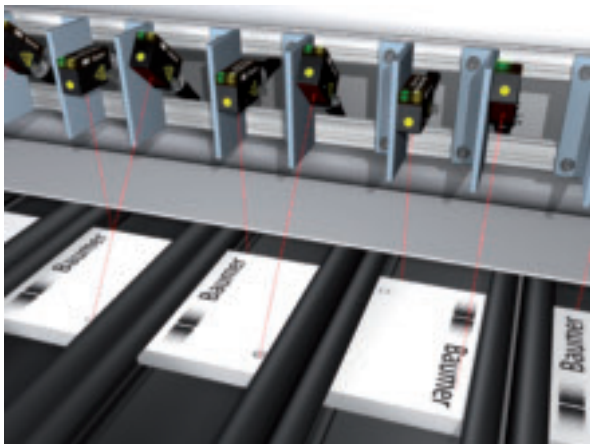
Diffuse sensor *(MINOS)*

- Placement verification for filter papers.



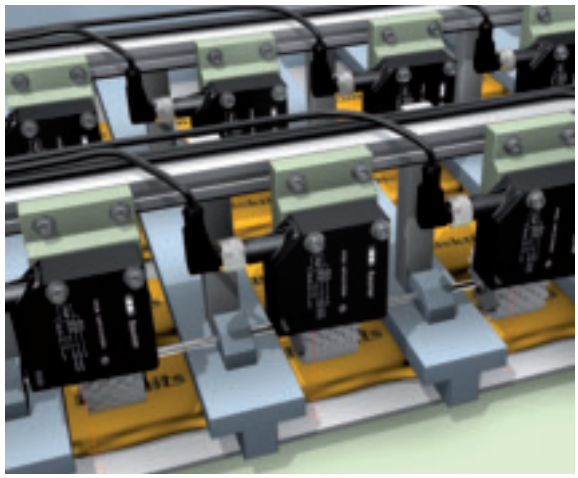
Retro-reflective sensor (FPDK 14)

- Detection of the front edges of paper sheets.



Diffuse sensor with background suppression (FHDK 10)

- Position checking of tablet packages.



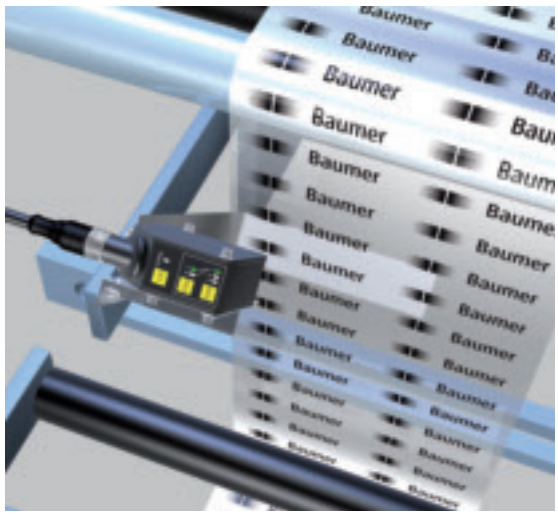
Diffuse sensor with foreground suppression

- Counting biscuit packages on a conveyor belt.

Special requirements demand special solutions

Line sensor *(PosCon)*

- Web edge control of a transparent film.

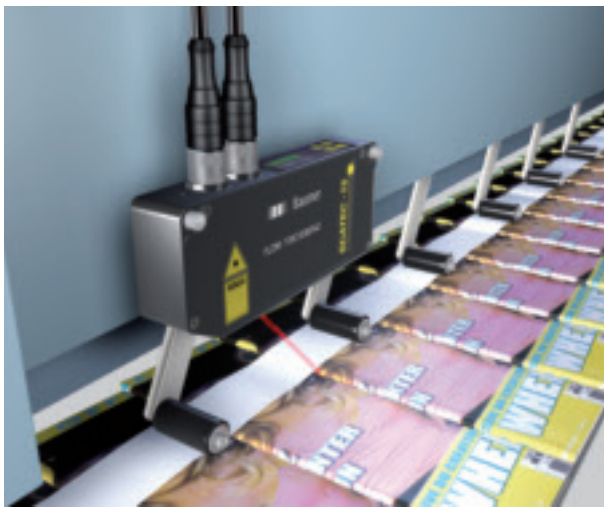


Color sensor *(LOGIPAL)*

- Detection of color codes on plugs.

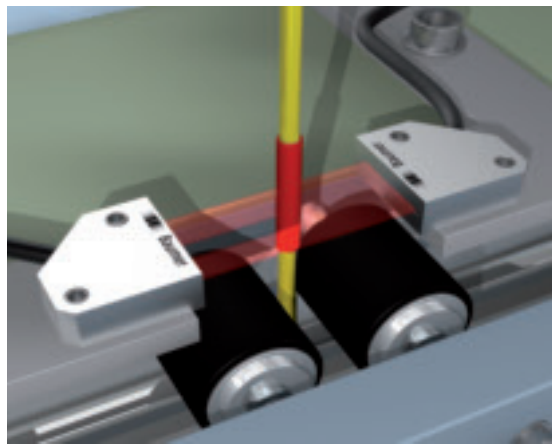
High-power LEDs, laser diodes, CCD receivers, FPGAs, ASICs, SMD, flip-chips – innovative components and technology which we rigorously employ in modern sensors and systems. This makes applications viable which were previously impossible.

In our search to always find the best solution for the customer many special sensors are created, from which standard sensors for specific industries are then developed.



Copy counter *(SCATEC)*

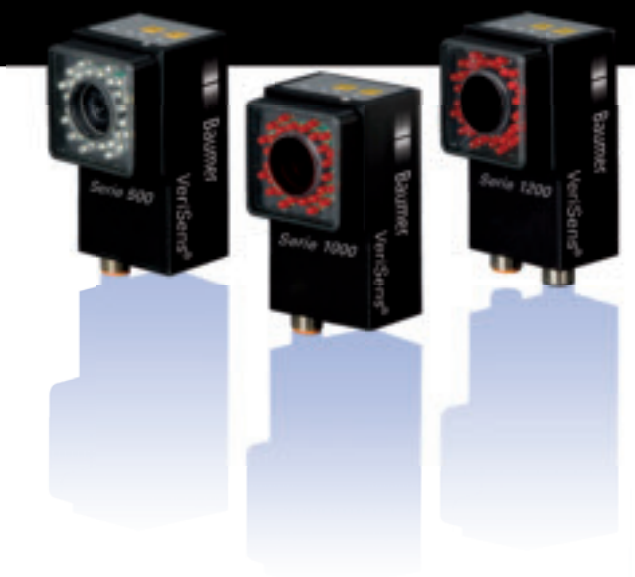
- Counting high-gloss magazines.



Fiber optic array (FSE 200C6)

- Detection of a splice by changes in diameter.

VeriSens® – the vision sensors for automation technology



The new image processing vision sensors *VeriSens®* from Baumer closes the gap between traditional optical sensors and complex vision systems. Their high-resolution image sensor permits 2-dimensional inspection of objects. For this purpose *VeriSens®* vision sensors offer comprehensive functions, thus supporting numerous inspection and acquisition tasks in an automated production:

- Control of part completeness
- Control of part presence
- Control / Acquisition of part location
- Control / Acquisition of correct position

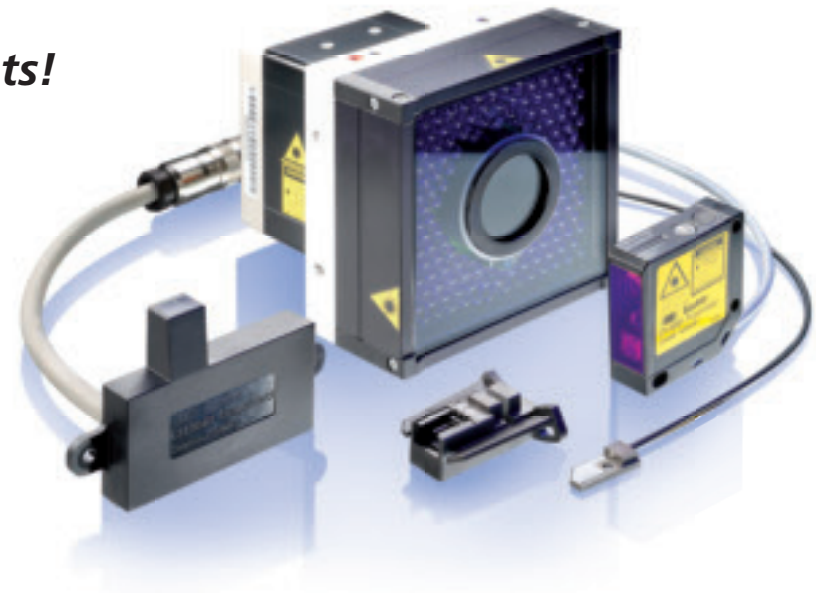
Experience the difference!

Special solutions for individual requirements!

No product range will ever be large enough to provide the optimum solution for every application. Occasionally, requirements exist which cannot be satisfied by available market solutions. For this reason, our development engineers cooperate closely with our customers. In our search for the optimum solution for specific requirements, customer-specific sensors are constantly being created.

Special solutions span from special mechanical shapes to completely new sensor systems. An innovative sensor solution can help you to attain a significant competitive advantage.

We would be happy to advise you!



Distance and intensity-based

product family	OADM 12	OADM 13	OADM 13	OADM 20	OADM 20
					
width / diameter	12,4 mm	13,4 mm	13,4 mm	20,6 mm	20,6 mm
measuring distance Sd	16 ... 26 mm 16 ... 120 mm	50 ... 350 mm 50 ... 550 mm	50 ... 350 mm 50 ... 550 mm	30 ... 50 mm 30 ... 130 mm 50 ... 250 mm	100 ... 500 mm 200 ... 1000 mm
resolution	0,002 ... 0,005 mm 0,002 ... 0,12 mm	0,01 ... 0,4 mm 0,01 ... 1,1 mm	0,01 ... 0,4 mm 0,01 ... 1,1 mm	< 0,01 mm < 0,06 mm < 0,3 mm	< 0,5 mm < 3 mm
linearity error	± 0,006 ... ± 0,015 mm ± 0,015 ... ± 0,35 mm	± 0,05 ... ± 1,2 mm ± 0,08 ... ± 3,5 mm	± 0,05 ... ± 1,2 mm ± 0,08 ... ± 3,5 mm	± 0,03 mm ± 0,2 mm ± 0,9 mm	± 1,5 mm ± 12 mm
response time / release time	< 0,9 ms	< 0,9 ms < 1,5 ms	< 0,9 ms < 1,5 ms	< 10 ms	< 10 ms
adjustment	Teach-in: button / external	Teach-in: button / external	Teach-in: button / external	no	no
output circuit	analog	analog	analog	analog	analog
connection types	connector	connector	connector	connector	connector
housing material	metal	metal	metal	metal	metal
Page	**212**	**214**	**216**	**218**	**220**

product family	OADM 20	OADM 20	OADM 20	OADM 20	OADM 21
					
width / diameter	20,6 mm	20,6 mm	20,6 mm	20,6 mm	20,4 mm
measuring distance Sd	30 ... 50 mm 30 ... 130 mm 50 ... 250 mm	100 ... 500 mm 200 ... 1000 mm	30 ... 70 mm 30 ... 130 mm 50 ... 300 mm	100 ... 600 mm 200 ... 1000 mm	200 ... 1000 mm
resolution	< 0,01 mm < 0,06 mm < 0,3 mm	< 0,5 mm < 3 mm	0,004 ... 0,02 mm 0,005 ... 0,06 mm 0,01 ... 0,33 mm	0,015 ... 0,67 mm 0,12 ... 3 mm	0,02 ... 0,5 mm
linearity error	± 0,03 mm ± 0,2 mm ± 0,9 mm	± 1,5 mm ± 12 mm	± 0,012 ... ± 0,06 mm ± 0,015 ... ± 0,2 mm ± 0,03 ... ± 1 mm	± 0,05 ... ± 2 mm ± 0,48 ... ± 12 mm	± 0,08 ... ± 2 mm
response time / release time	< 10 ms	< 10 ms	< 0,9 ms	< 0,9 ms < 2,8 ms	< 10 ms
adjustment	no	no	Teach-in: button / external	Teach-in: button / external	Teach-in: button / external
output circuit	RS 485	RS 485	analog	analog	analog
connection types	connector	connector	connector	connector	connector
housing material	metal	metal	metal	metal	metal
Page	**222**	**224**	**226**	**228**	**230**

General information

OADM is a range of laser distance sensors with products covering the measuring range from 16 to 1000 mm. The compact sensors with integrated microcontrollers produce an accurate output signal proportional to the measured distance. Intelligent internal signal analysis permits the sensor to operate accurately regardless of the color and most surfaces. The sensor can always be easily and precisely aligned with the small, visible spot of light. Distances to rough surfaces can be reliably measured by using a fine laser line in place of the laser spot, so that a wider area is monitored.

Typical applications

This family of sensors, with its wide selection of measuring ranges, can be used in many applications.

Typical applications are:

- Applications in which the production process is continuously monitored by the sensor to detect slow changes at an early stage and thereby achieve a reduction of rejects and costs.
- Automation of test points and test equipment permits increased productivity.
- Automation of format settings permits multifunctional machines and rapid, precise reconfiguration.

In some other applications, objects with rough and uneven surfaces must be measured. Sometimes, the surface of the object even has small holes or gaps. Such objects can be easily measured using a laser line optical system, which supplies a fine laser line in place of a focused laser beam.

Characteristics and advantages

Response time
Measuring cycles as short as 0,9 ms permit accurate measurements even on moving parts.

Integrated microcontroller
The integrated microcontroller makes an external processing device unnecessary and makes it simple to place the sensor wherever it is needed.

High resolution and linearity
By the use of a photodiode line, a very high linearity of ±0.006 mm is achieved at a resolution of up to 0.002 mm.

Laser spot or laser line
Distances, even to rough surfaces, are reliably measured by using a laser line instead of the laser spot.

Any surface
Intelligent signal processing improves the measurements made on critical surfaces by the photodiode line.

Teach-in function
The measuring range can be adjusted within the maximum measuring range by the user with the Teach-in button or via the Teach-in cable. The analog output has its full span within this taught-in range. The factory setting is the maximum measuring range. The taught-in range has a minimum extent. The resolution and linearity change when the measuring range is changed. The closer the furthest point of the measuring range is to the sensor, the better the resolution.

Characteristics and advantages

Synchronization/hold function

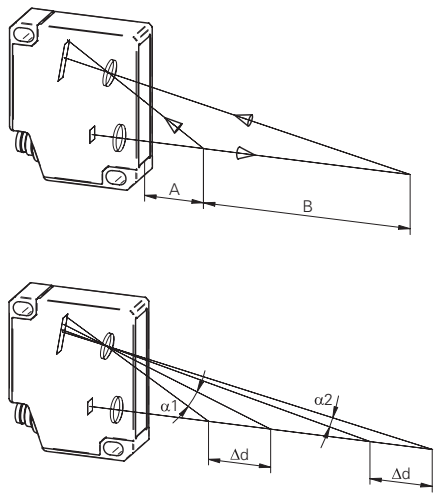
The measurements of several sensors can be synchronized using the synch input, or the last value can be held and the laser diode switched off.

Insensitivity to external light

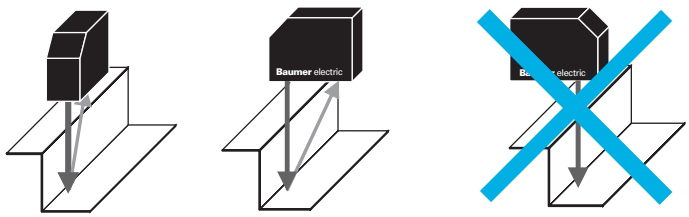
An algorithm makes the sensor insensitive to external light sources.

Technology and operation

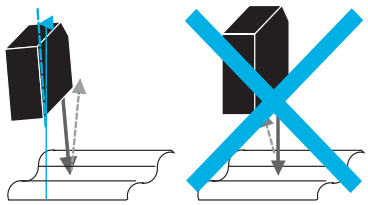
The distance measurement is based on the triangulation principle. The laser beam strikes the object as a small point. The receiver of the sensor (photodiode line) detects the position of this point. The angle of incidence changes according to the distance, and thereby the position of the laser point on the receiver. The photodiode line is read by an integrated microcontroller. The controller accurately calculates the angle from the light distribution on the photodiode line and then calculates the distance to the object from this. This distance is either issued at the serial port or converted into an output current proportional to the distance. The microcontroller guarantees a high degree of linearity and measuring precision. The combination of a photodiode line and a microcontroller permits interfering reflections to be suppressed and thereby provides reliable data from critical surfaces. The sensor adapts to different colors by adjusting its internal sensitivity, making it virtually independent of the color of the object. A digital output is activated if there is no object within the measuring range or if insufficient light is received to correctly detect the object, e.g. if the sensor is dirty. The possible resolution and accuracy change with the distance. The same distance Δd which causes a large change in the angle α1 close to the sensor produces a much smaller change in the angle α2 at a greater distance (see drawing). This non-linear behavior is corrected by the microcontroller, so that the output signal remains linear to the distance.



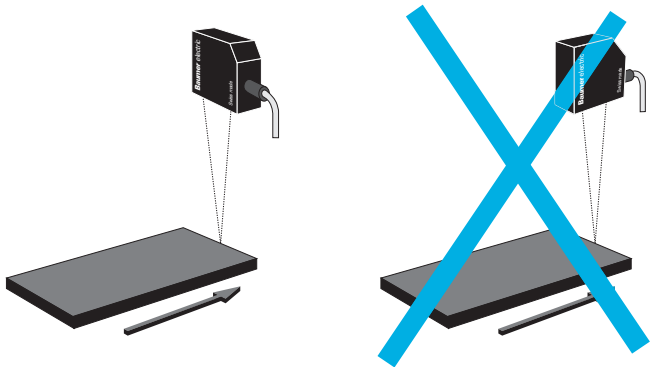
Mounting and adjustment



With all triangulation sensors, it must be ensured that the laser spot can be seen directly by the optical system of the receiver and that no obstructions are in front of the receiver.



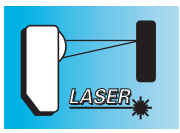
With glossy or reflective objects, the direct reflection must not impinge on the receiver. This can be avoided by slightly tilting the sensor.



For optimum measurement results, the sensor must be installed perpendicular to the movement of the object.

A simple rule applies that the distance between the sensor and the object should be kept as small as possible for each application. The shorter the range, the better (more than proportional) the resolution and accuracy.

Note on electromagnetic compatibility: ground the sensor and use a shielded connecting cable.

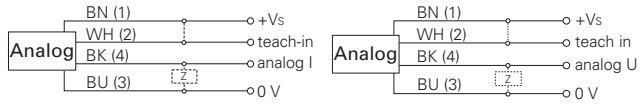


Sd = 16 ... 120 mm

- Pocket-size design
- teachable measuring range
- resolution up to 2 µm

general data	
sensing element	photoelectric array
adjustment	Teach-in: button / external
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
beam type	point
interference suppression	< 30 ms
measuring distance Sd = 16 ... 26 mm	
Teach-in range min.	> 1 mm
resolution	0,002 ... 0,005 mm
linearity error	± 0,006 ... ± 0,015 mm
beam diameter	0,5 ... 0,2 mm
measuring distance Sd = 16 ... 120 mm	
Teach-in range min.	> 2 mm
resolution	0,002 ... 0,12 mm
linearity error	± 0,015 ... ± 0,35 mm
beam diameter	0,9 ... 0,5 mm
electrical data	
response time / release time	< 0,9 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	100 mA
output circuit	analog
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagrams



connectors		
ESG 32AP0500G	4 pin	5 m straight (shielded)
ESW 31AP0500G	4 pin	5 m angular (shielded)
additional cable connectors and field wireable connectors, see accessories		

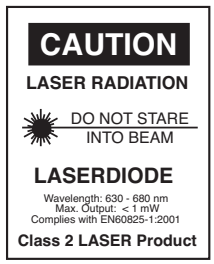
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

remarks

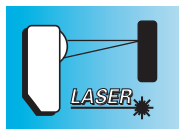
For objects with a reflectivity < 4%, the response time / release time is increased automatically up to max. 1,5 ms.

Missed measurement up to 30 cycles (30 ms) will be suppressed. During this time the analog output stays on hold.

laser warning

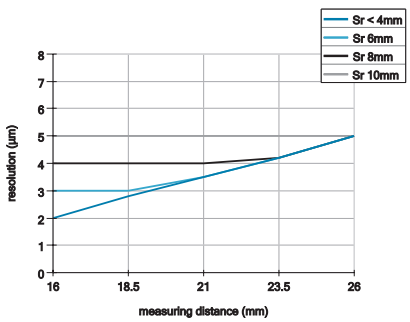


order reference	measuring distance Sd	output signal	load resistance
OADM 12I6430/S35A	16 ... 26 mm	4 ... 20 mA	< (+Vs - 6 V) / 0,02 A
OADM 12I6460/S35A	16 ... 120 mm	4 ... 20 mA	< (+Vs - 6 V) / 0,02 A
OADM 12U6430/S35A	16 ... 26 mm	0 ... 10 VDC	> 100 kOhm
OADM 12U6460/S35A	16 ... 120 mm	0 ... 10 VDC	> 100 kOhm

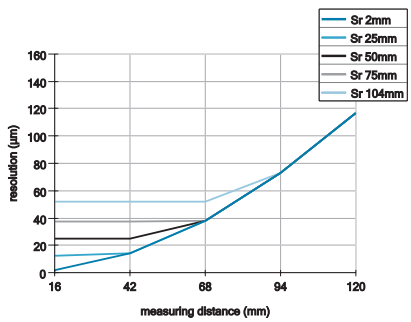


resolution

Sr = 16 ... 26 mm

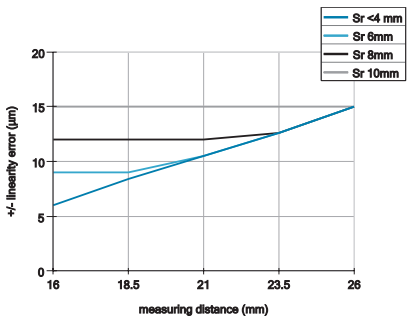


Sr = 16 ... 120 mm

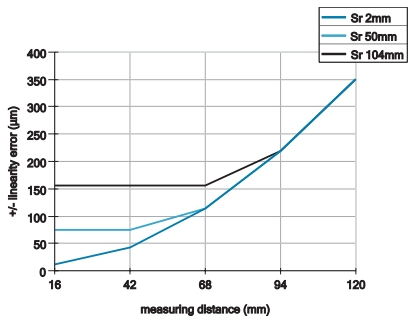


linearity error

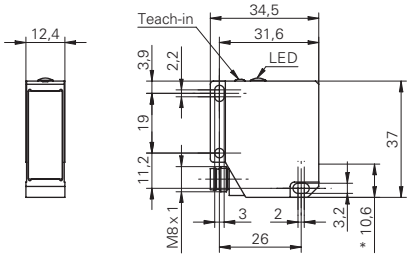
Sr = 16 ... 26 mm



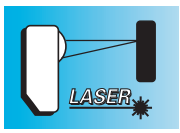
Sr = 16 ... 120 mm



dimension drawing



* emitter axis

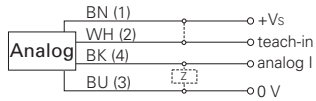


Sd = 50 ... 550 mm

- compact housing, current output
- teachable measuring range
- resolution up to 10 µm

general data	
sensing element	photoelectric array
adjustment	Teach-in: button / external
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
interference suppression	< 30 ms
measuring distance Sd = 50 ... 350 mm	
Teach-in range min.	> 5 mm
resolution	0,01 ... 0,4 mm
linearity error	± 0,05 ... ± 1,2 mm
measuring distance Sd = 50 ... 550 mm	
Teach-in range min.	> 10 mm
resolution	0,01 ... 1,1 mm
linearity error	± 0,08 ... ± 3,5 mm
electrical data	
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	100 mA
output circuit	analog
output signal	4 ... 20 mA
load resistance	< (+Vs - 6 V) / 0,02 A
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
measuring distance Sd = 50 ... 350 mm	
response time / release time	< 0,9 ms
measuring distance Sd = 50 ... 550 mm	
response time / release time	< 1,5 ms
mechanical data	
width / diameter	13,4 mm
height / length	48,2 mm
depth	40 mm
type	rectangular
housing material	aluminum
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors		
ESG 32AP0500G	4 pin	5 m straight (shielded)
ESW 31AP0500G	4 pin	5 m angular (shielded)
additional cable connectors and field wireable connectors, see accessories		

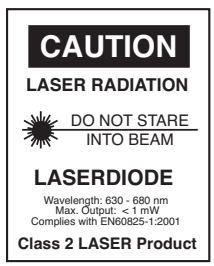
accessories	
SENSOFIX mounting kit	161829
mounting bracket	161695
for details, see accessories section	

remarks

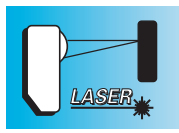
For objects with a reflectivity < 10%, the response time / release time is increased automatically up to max. 3 ms (OADM 13x6x75/S35A) resp. 5 ms (OADM 13x6x80/S35A).

Missed measurement up to 30 cycles (30 ms) will be suppressed. During this time the analog output stays on hold.

laser warning

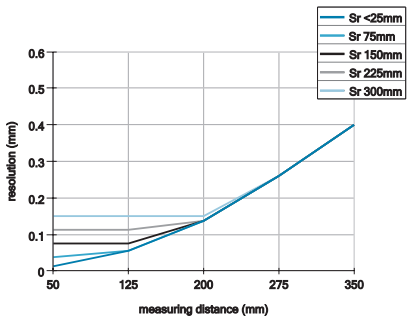


order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 13I6475/S35A	50 ... 350 mm	point	-	-	1 mm
OADM 13I6480/S35A	50 ... 550 mm	point	-	-	1 mm
OADM 13I6575/S35A	50 ... 350 mm	line	2 mm	4 ... 9 mm	-
OADM 13I6580/S35A	50 ... 550 mm	line	2 mm	4 ... 13 mm	-

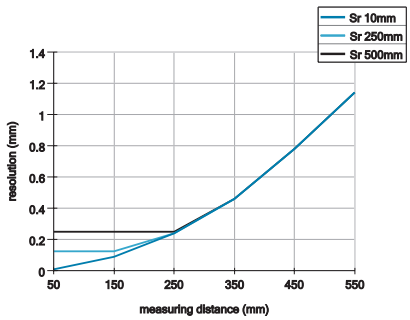


resolution

Sr = 50 ... 350 mm

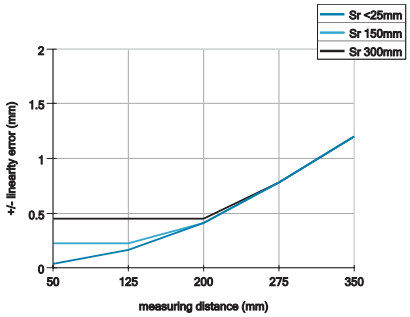


Sr = 50 ... 550 mm

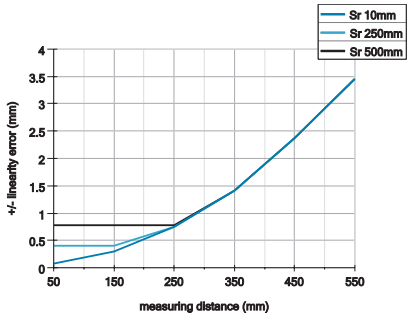


linearity error

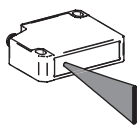
Sr = 50 ... 350 mm



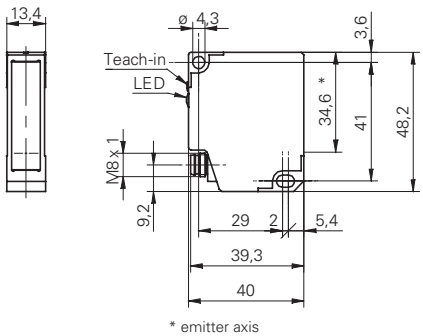
Sr = 50 ... 550 mm



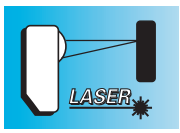
beam alignment (line)



dimension drawing



* emitter axis

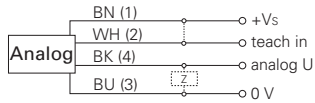


Sd = 50 ... 550 mm

- compact housing, voltage output
- teachable measuring range
- resolution up to 10 µm

general data	
sensing element	photoelectric array
adjustment	Teach-in: button / external
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
interference suppression	< 30 ms
measuring distance Sd = 50 ... 350 mm	
Teach-in range min.	> 5 mm
resolution	0,01 ... 0,4 mm
linearity error	± 0,05 ... ± 1,2 mm
measuring distance Sd = 50 ... 550 mm	
Teach-in range min.	> 10 mm
resolution	0,01 ... 1,1 mm
linearity error	± 0,08 ... ± 3,5 mm
electrical data	
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
output circuit	analog
output signal	0 ... 10 VDC
load resistance	> 100 kOhm
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
measuring distance Sd = 50 ... 350 mm	
response time / release time	< 0,9 ms
measuring distance Sd = 50 ... 550 mm	
response time / release time	< 1,5 ms
mechanical data	
width / diameter	13,4 mm
height / length	48,2 mm
depth	40 mm
type	rectangular
housing material	aluminum
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors

ESG 32AP0500G	4 pin	5 m straight (shielded)
ESW 31AP0500G	4 pin	5 m angular (shielded)

additional cable connectors and field wireable connectors, see accessories

accessories

SENSOFIX mounting kit	161829
mounting bracket	161695

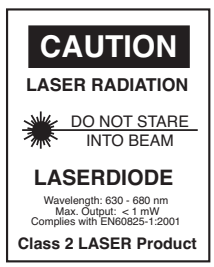
for details, see accessories section

remarks

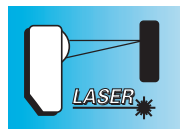
For objects with a reflectivity < 10%, the response time / release time is increased automatically up to max. 3 ms (OADM 13x6x75/S35A) resp. 5 ms (OADM 13x6x80/S35A).

Missed measurement up to 30 cycles (30 ms) will be suppressed. During this time the analog output stays on hold.

laser warning

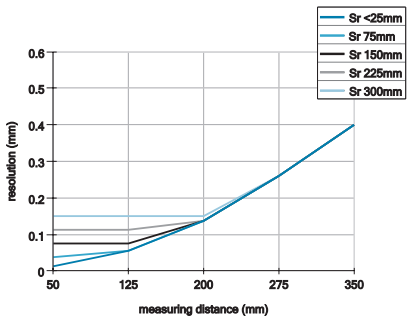


order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 13U6475/S35A	50 ... 350 mm	point	-	-	1 mm
OADM 13U6480/S35A	50 ... 550 mm	point	-	-	1 mm
OADM 13U6575/S35A	50 ... 350 mm	line	2 mm	4 ... 9 mm	-
OADM 13U6580/S35A	50 ... 550 mm	line	2 mm	4 ... 13 mm	-

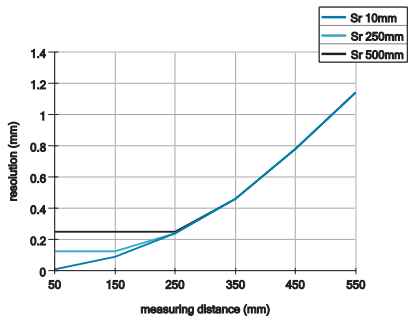


resolution

Sr = 50 ... 350 mm

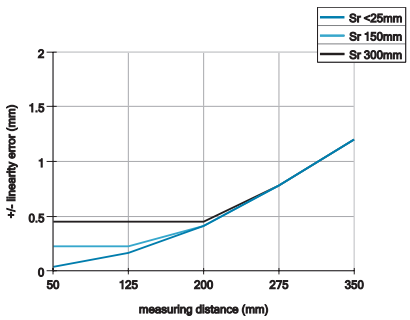


Sr = 50 ... 550 mm

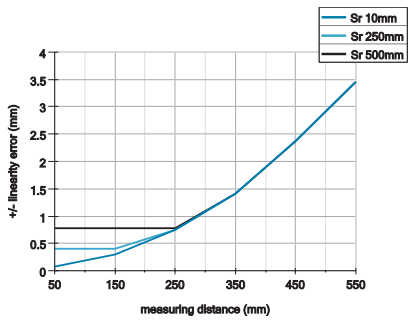


linearity error

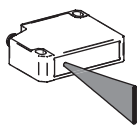
Sr = 50 ... 350 mm



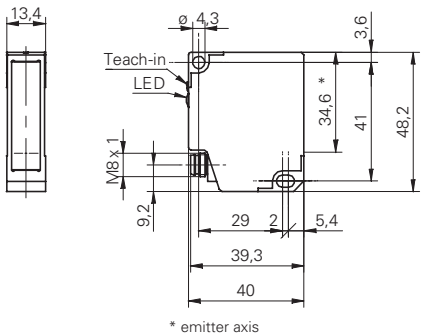
Sr = 50 ... 550 mm



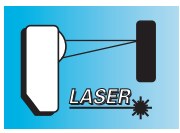
beam alignment (line)



dimension drawing



* emitter axis

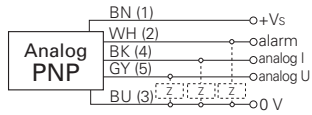


Sd = 30 ... 250 mm

- current or voltage output
- resolution up to 10 µm
- with laser line for rough surfaces

general data	
sensing element	photoelectric array
adjustment	no
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 30 ... 50 mm	
resolution	< 0,01 mm
linearity error	± 0,03 mm
measuring distance Sd = 30 ... 130 mm	
resolution	< 0,06 mm
linearity error	± 0,2 mm
measuring distance Sd = 50 ... 250 mm	
resolution	< 0,3 mm
linearity error	± 0,9 mm
electrical data	
response time / release time	< 10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA / 0 ... 10 VDC
load resistance (analog I)	< (+Vs - 6 V) / 0,02 A
load resistance (analog U)	> 100 kOhm
output current	< 100 mA
alarm output	PNP
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 5 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors

ES 34CP2B	5 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

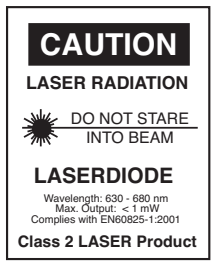
accessories

mounting bracket	131521
for details, see accessories section	

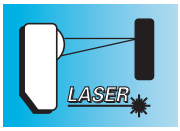
remarks

While switching-on the sensor, it checks if there is a current at current output BK (4). If so, the current output is activated. If not, the voltage output GY (5) is activated after 100 ms.

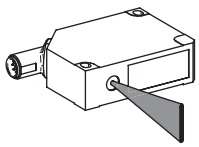
laser warning



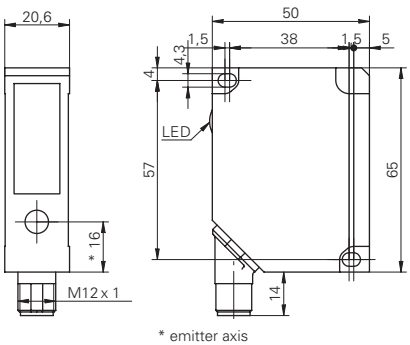
order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20I4440/S14C	30 ... 50 mm	point	-	-	1 ... 0,4 mm
OADM 20I4460/S14C	30 ... 130 mm	point	-	-	2 ... 1 mm
OADM 20I4470/S14C	50 ... 250 mm	point	-	-	2 mm
OADM 20I4540/S14C	30 ... 50 mm	line	1 ... 0,4 mm	2 mm	-
OADM 20I4560/S14C	30 ... 130 mm	line	2 ... 1 mm	3 ... 5 mm	-
OADM 20I4570/S14C	50 ... 250 mm	line	2,5 mm	4 ... 10 mm	-

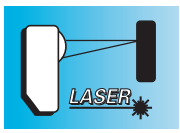


beam alignment (line)



dimension drawing



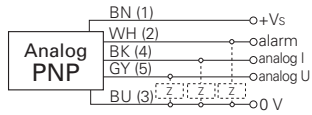


Sd = 100 ... 1000 mm

- current or voltage output
- resolution up to 0,5 mm
- with laser line for rough surfaces

general data	
sensing element	photoelectric array
adjustment	no
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 100 ... 500 mm	
resolution	< 0,5 mm
linearity error	± 1,5 mm
measuring distance Sd = 200 ... 1000 mm	
resolution	< 3 mm
linearity error	± 12 mm
electrical data	
response time / release time	< 10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA / 0 ... 10 VDC
load resistance (analog I)	< (+Vs - 6 V) / 0,02 A
load resistance (analog U)	> 100 kOhm
output current	< 100 mA
alarm output	PNP
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 5 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors

ES 34CP2B	5 pin	2 m straight (shielded)

additional cable connectors and field wireable connectors, see accessories

accessories

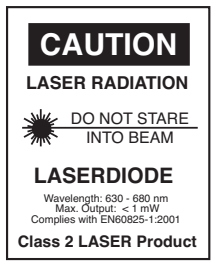
mounting bracket	131521

for details, see accessories section

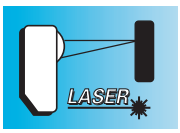
remarks

While switching-on the sensor, it checks if there is a current at current output BK (4). If so, the current output is activated. If not, the voltage output GY (5) is activated after 100 ms.

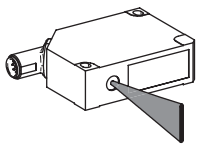
laser warning



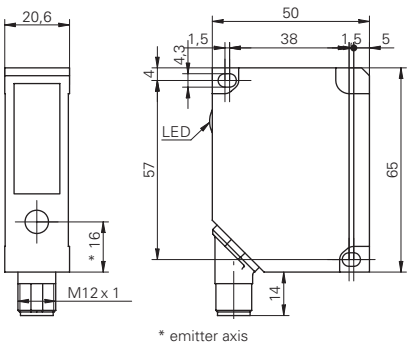
order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20I4471/S14C	100 ... 500 mm	point	-	-	2 mm
OADM 20I4481/S14C	200 ... 1000 mm	point	-	-	2 mm
OADM 20I4571/S14C	100 ... 500 mm	line	2,5 mm	5,5 ... 18 mm	-
OADM 20I4581/S14C	200 ... 1000 mm	line	2,5 mm	8,5 ... 35 mm	-

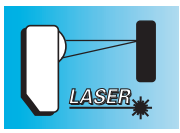


beam alignment (line)



dimension drawing



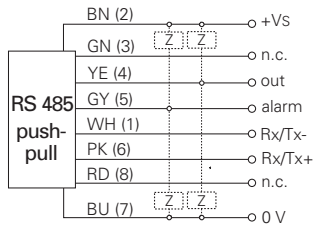


Sd = 30 ... 250 mm

- serial interface RS 485
- resolution up to 10 µm
- with laser line for rough surfaces

general data	
sensing element	photoelectric array
adjustment	no
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 30 ... 50 mm	
resolution	< 0,01 mm
linearity error	± 0,03 mm
measuring distance Sd = 30 ... 130 mm	
resolution	< 0,06 mm
linearity error	± 0,2 mm
measuring distance Sd = 50 ... 250 mm	
resolution	< 0,3 mm
linearity error	± 0,9 mm
electrical data	
response time / release time	< 10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	RS 485
output current	< 100 mA
alarm output	push-pull
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

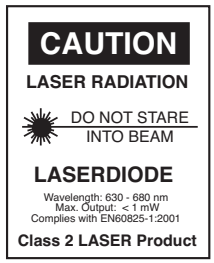
accessories

mounting bracket	131521
for details, see accessories section	

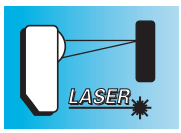
remarks

The sensor has a switching output (out) that is activated when the measurement is determined within the range between threshold 1 and threshold 2. Both thresholds can be set via interface.

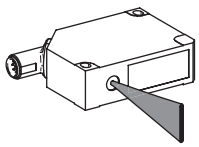
laser warning



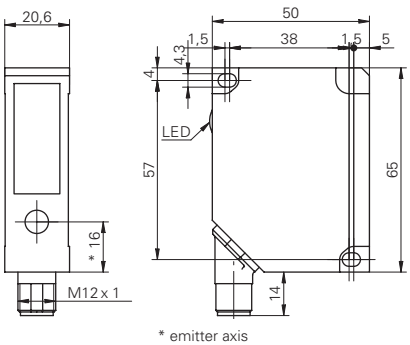
order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20S4440/S14F	30 ... 50 mm	point	-	-	1 ... 0,4 mm
OADM 20S4460/S14F	30 ... 130 mm	point	-	-	2 ... 1 mm
OADM 20S4470/S14F	50 ... 250 mm	point	-	-	2 mm
OADM 20S4540/S14F	30 ... 50 mm	line	1 ... 0,4 mm	2 mm	-
OADM 20S4560/S14F	30 ... 130 mm	line	2 ... 1 mm	3 ... 5 mm	-
OADM 20S4570/S14F	50 ... 250 mm	line	2,5 mm	4 ... 10 mm	-

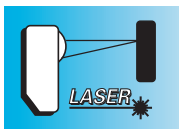


beam alignment (line)



dimension drawing



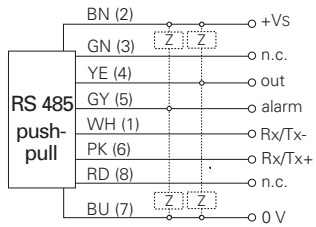


Sd = 100 ... 1000 mm

- measuring ranges from 30 to 1000 mm
- resolution up to 0,5 mm
- with laser line for rough surfaces

general data	
sensing element	photoelectric array
adjustment	no
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 100 ... 500 mm	
resolution	< 0,5 mm
linearity error	± 1,5 mm
measuring distance Sd = 200 ... 1000 mm	
resolution	< 3 mm
linearity error	± 12 mm
electrical data	
response time / release time	< 10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	RS 485
output current	< 100 mA
alarm output	push-pull
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)

additional cable connectors and field wireable connectors, see accessories

accessories

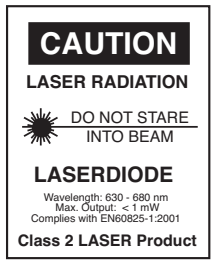
mounting bracket	131521

for details, see accessories section

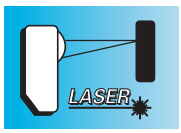
remarks

The sensor has a switching output (out) that is activated when the measurement is determined within the range between threshold 1 and threshold 2. Both thresholds can be set via interface.

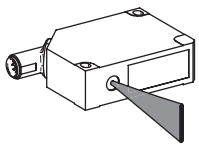
laser warning



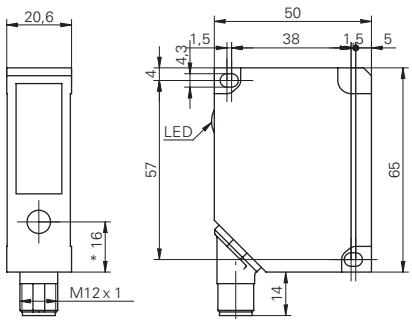
order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20S4471/S14F	100 ... 500 mm	point	-	-	2 mm
OADM 20S4481/S14F	200 ... 1000 mm	point	-	-	2 mm
OADM 20S4571/S14F	100 ... 500 mm	line	2,5 mm	5,5 ... 18 mm	-
OADM 20S4581/S14F	200 ... 1000 mm	line	2,5 mm	8,5 ... 35 mm	-



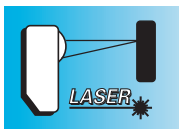
beam alignment (line)



dimension drawing



* emitter axis

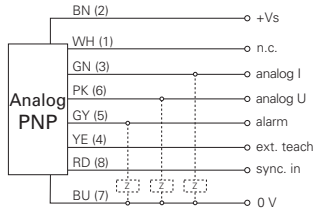


Sd = 30 ... 300 mm

- synchronization input
- teachable measuring range
- resolution up to 4 µm

general data	
sensing element	photoelectric array
adjustment	Teach-in: button / external
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 30 ... 70 mm	
Teach-in range min.	> 2 mm
resolution	0,004 ... 0,02 mm
linearity error	± 0,012 ... ± 0,06 mm
measuring distance Sd = 30 ... 130 mm	
Teach-in range min.	> 3 mm
resolution	0,005 ... 0,06 mm
linearity error	± 0,015 ... ± 0,2 mm
measuring distance Sd = 50 ... 300 mm	
Teach-in range min.	> 5 mm
resolution	0,01 ... 0,33 mm
linearity error	± 0,03 ... ± 1 mm
electrical data	
response time / release time	< 0,9 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA / 0 ... 10 VDC
load resistance (analog I)	< (+Vs - 6 V) / 0,02 A
load resistance (analog U)	> 100 kOhm
output current	< 100 mA
alarm output	PNP
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



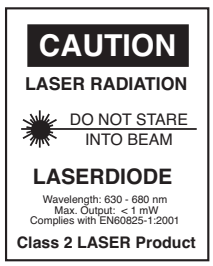
connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

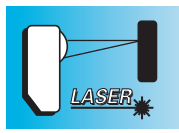
accessories

mounting bracket	131521
for details, see accessories section	

laser warning

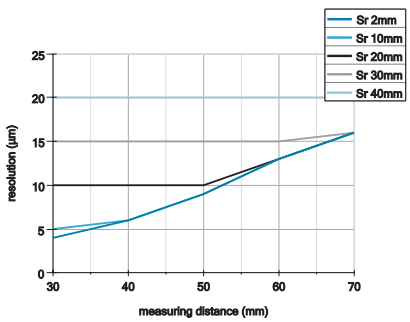


order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20I6441/S14F	30 ... 70 mm	point	-	-	1 ... 0,2 mm
OADM 20I6460/S14F	30 ... 130 mm	point	-	-	2 ... 1 mm
OADM 20I6472/S14F	50 ... 300 mm	point	-	-	2 mm
OADM 20I6541/S14F	30 ... 70 mm	line	1 ... 0,2 mm	2 mm	-
OADM 20I6560/S14F	30 ... 130 mm	line	2 ... 1 mm	3 ... 5 mm	-
OADM 20I6572/S14F	50 ... 300 mm	line	2,5 mm	4 ... 12 mm	-

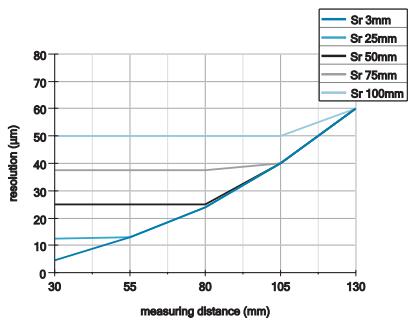


resolution

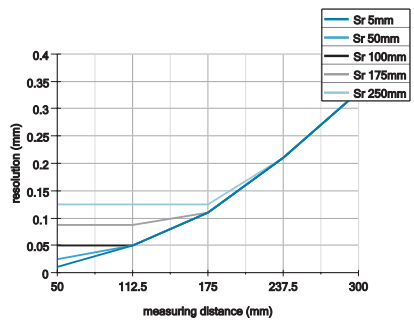
Sr = 30 ... 70 mm



Sr = 30 ... 130 mm

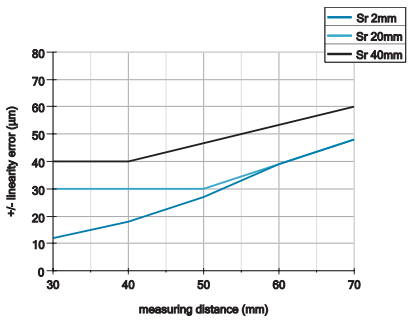


Sr = 50 ... 300 mm

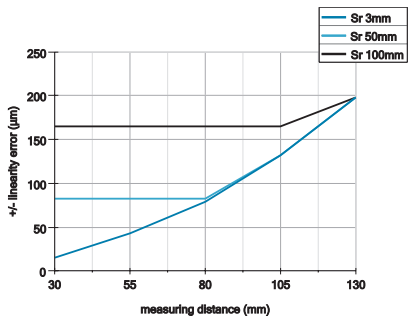


linearity error

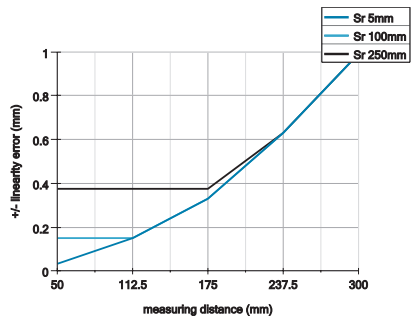
Sr = 30 ... 70 mm



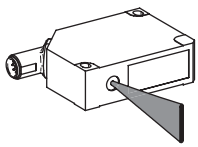
Sr = 30 ... 130 mm



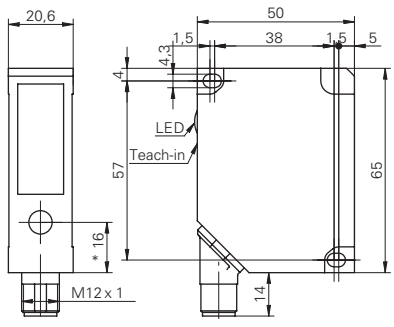
Sr = 50 ... 300 mm

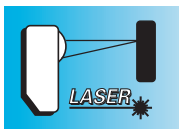


beam alignment (line)



dimension drawing



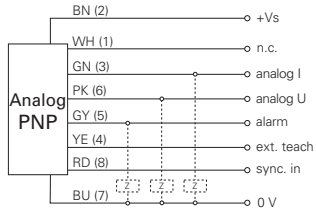


Sd = 100 ... 1000 mm

- synchronization input
- teachable measuring range
- resolution up to 15 µm

general data	
sensing element	photoelectric array
adjustment	Teach-in: button / external
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
light source	pulsed red laser diode
wave length	675 nm
laser class	2
measuring distance Sd = 100 ... 600 mm	
Teach-in range min.	> 10 mm
resolution	0,015 ... 0,67 mm
linearity error	± 0,05 ... ± 2 mm
measuring distance Sd = 200 ... 1000 mm	
Teach-in range min.	> 20 mm
resolution	0,12 ... 3 mm
linearity error	± 0,48 ... ± 12 mm
electrical data	
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA / 0 ... 10 VDC
load resistance (analog I)	< (+Vs - 6 V) / 0,02 A
load resistance (analog U)	> 100 kOhm
output current	< 100 mA
alarm output	PNP
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
measuring distance Sd = 100 ... 600 mm	
response time / release time	< 0,9 ms
measuring distance Sd = 200 ... 1000 mm	
response time / release time	< 2,8 ms
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram



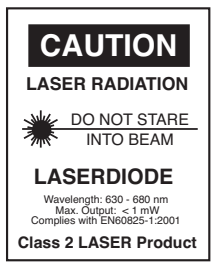
connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

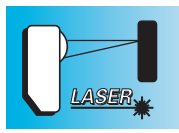
accessories

mounting bracket	131521
for details, see accessories section	

laser warning

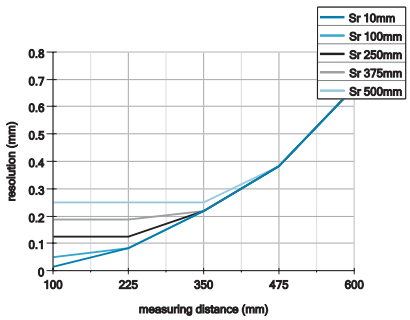


order reference	measuring distance Sd	beam type	beam width	beam height	beam diameter
OADM 20I6480/S14F	100 ... 600 mm	point	-	-	2 mm
OADM 20I6481/S14F	200 ... 1000 mm	point	-	-	2 mm
OADM 20I6580/S14F	100 ... 600 mm	line	2,5 mm	5,5 ... 21 mm	-
OADM 20I6581/S14F	200 ... 1000 mm	line	2,5 mm	8,5 ... 35 mm	-

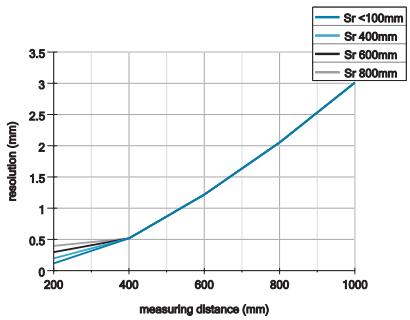


resolution

Sr = 100 ... 600 mm

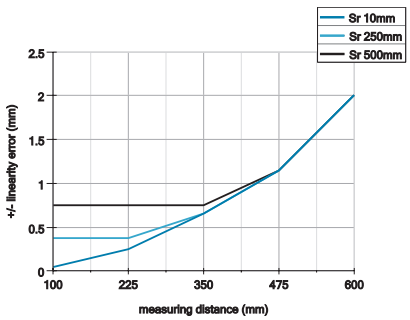


Sr = 200 ... 1000 mm

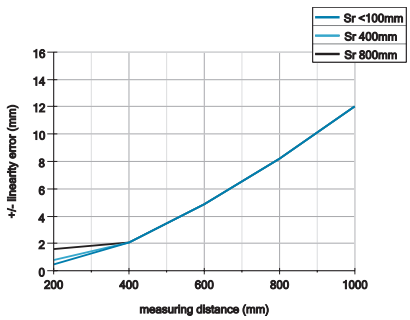


linearity error

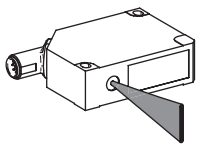
Sr = 100 ... 600 mm



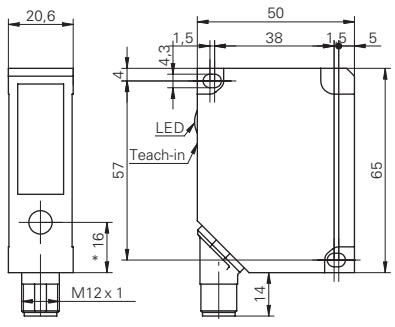
Sr = 200 ... 1000 mm

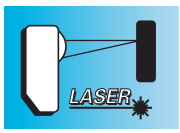


beam alignment (line)



dimension drawing





Sd = 200 ... 1000 mm

- teachable measuring range
- resolution up to 20 µm
- synchronization input

general data	
sensing element	photoelectric array
measuring distance Sd	200 ... 1000 mm
adjustment	Teach-in: button / external
Teach-in range min.	> 10 mm
power on indication	LED green
soiled lens indicator	LED red / LED red blinking
resolution	0,02 ... 0,5 mm
linearity error	± 0,08 ... ± 2 mm
light source	pulsed red laser diode
wave length	675 nm
laser class	2
electrical data	
response time / release time	< 10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA / 0 ... 10 VDC
load resistance (analog I)	< (+Vs - 6 V) / 0,02 A
load resistance (analog U)	> 100 kOhm
output current	< 100 mA
alarm output	PNP
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,4 mm
height / length	135 mm
depth	45 mm
housing material	aluminum
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

connection diagram

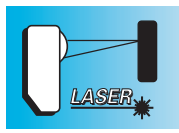
connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)

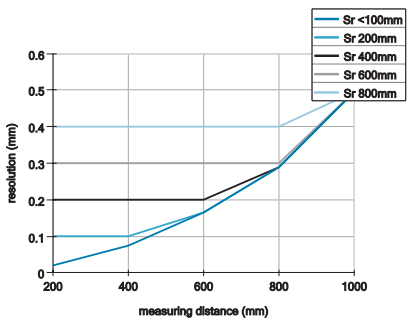
additional cable connectors and field wireable connectors, see accessories

laser warning

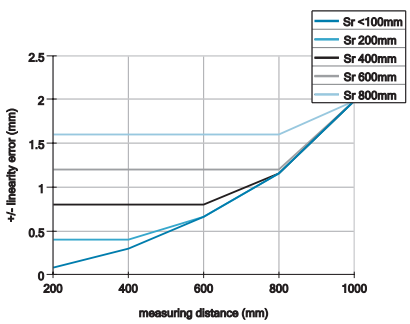
order reference	beam type	beam width	beam height	beam diameter
OADM 21I6481/S14F	point	-	-	2 mm
OADM 21I6581/S14F	line	2,5 mm	6 ... 20 mm	-



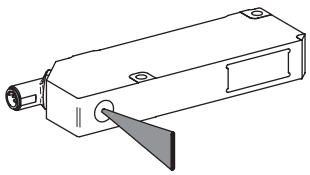
resolution



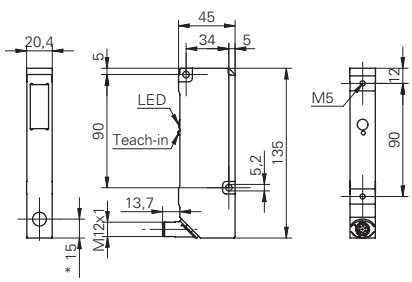
linearity error



beam alignment (line)



dimension drawing



* emitter axis

product family	OBDM 12	OBDM 12	OBDM 12	OBDM 12	OBDM 12
					
type	step analysis	min./max. analysis	tolerance analysis	window analysis	2-point comparison
width / diameter	12,4 mm	12,4 mm	12,4 mm	12,4 mm	12,4 mm
sensing distance Tw	16 ... 120 mm	16 ... 120 mm	16 ... 120 mm	16 ... 120 mm	16 ... 120 mm
response time	< 5 ms	< 1 ms	< 1 ms	< 1 ms	< 1 ms
NPN	■	■	■	■	■
PNP	■	■	■	■	■
connection types	connector	connector	connector	connector	connector
housing material	metal	metal	metal	metal	metal
Page	**237**	**238**	**239**	**240**	**241**

Difference sensors

General information

The range of difference sensors opens new perspectives in the field of sensing. The patented functions provide the user with new, innovative solutions in the detection of objects, monitoring of tolerances or the comparison of object sizes and object positions. With the fine laser beam and the high insensitivity of the sensor to colors, objects are accurately detected. Five different sensors with different functions are available according to the application.

Difference sensors with:
- Step analysis
- Window analysis
- Tolerance analysis
- Min./max. analysis
- 2-point comparisons

Characteristics and advantages

Difference evaluation
Distance-measuring sensors with integrated logic for distance difference evaluation. Complex evaluation by the connected controller is no longer necessary, saving time and costs.

Nominal difference teachable
With the standardized Teach-in process of Baumer electric, the nominal difference can be quickly and easily programmed.

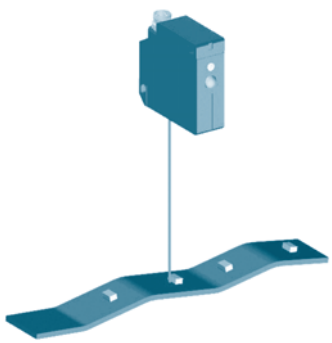
Switching output
The comparison of the actual and nominal difference is made internally by the sensors and is issued at the switching output as a simply assessed pass/fail signal.

In some other applications, objects with rough and uneven surfaces must be measured. Sometimes, the surface of the object even has small holes or gaps. Such objects can be easily measured using a laser line optical system, which supplies a fine laser line in place of a focused laser beam.

Applications and functions

Difference sensors with step analysis
In step analysis, objects are detected by their height difference (stage) and reported in the form of a digital output signal.

The sensor evaluates the positive or negative height difference within a specified time window of max. 5 ms. If the height difference is greater than 50% of the taught-in value, an impulse of at least 10 ms is issued at the output. When the value is less than 50%, the sensor switches back to the OFF state. If height differences are smaller than 50% of the taught value within the time window (e.g. fluctuation of the conveyor belt), the sensor remains in the OFF state.



- The stage / edge from which the objects are detected can be adjusted (minimum object height 0,2 mm)
- Defined output impulse of 10 ms (can also be read by a normal PLC)

- Detection of objects on a fluctuation conveyor belt
- Detection of stages or edges
- Positioning of objects by an edge, regardless of the distance

Applications and functions

Difference sensors with min./max. analysis

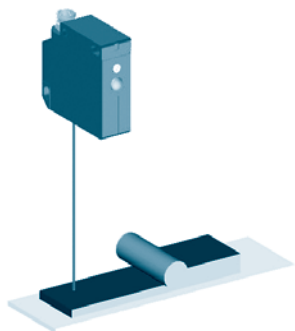
With min./max. analysis, objects can be inspected and monitored according to their scanned contour or shape. The scanning of the objects is activated by an external control signal. At the end of a detection sequence, the measured values are evaluated and the difference between the minimum and maximum values is determined. If the difference exceeds a nominal difference previously taught into the sensor, this is reported in the form of an ON signal. This signal remains active until a new detection sequence is started. When this starts, the output returns to the OFF state. If the difference is smaller than the nominal difference, the output remains in the OFF state.

- Difference is detected regardless of the distance
- Start and stop of the measuring cycle can be determined independently
- Easily evaluated pass/fail signal

- Round true running or knock of wheels / discs can be checked regardless of the distance
- Deformation of plastic parts after cooling can be checked

Difference sensors with tolerance analysis

The dimensional tolerance of objects can be determined by tolerance analysis. In the continuous detection of object distances, all measured values are checked to determine if it is between the specified maximum and minimum tolerances. In the case of if being between, an ON signal is issued at the output. If the distance remains within the tolerance range, the sensor remains in the OFF state.



- Sensor form of a caliper gauge
- Simple monitoring of a distance with a tolerance range (pass/fail information)
- Tolerance range and nominal distance can be taught in separately

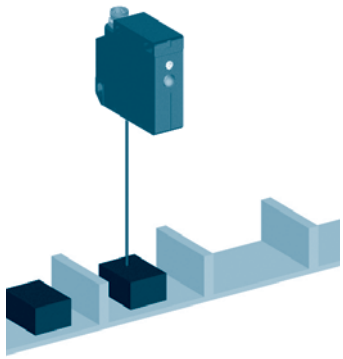
- Material thickness checking after a roller mill
- Material thickness checking for extruders

Applications and functions

Difference sensors with window analysis
With window analysis, objects can be classified by a specified switching window.

For this purpose, the switching window is specified in a simple Teach-in procedure with upper and lower limits. If an object is outside the defined limits, this is reported at the switching output.

- Foreground and background suppression in a single sensor

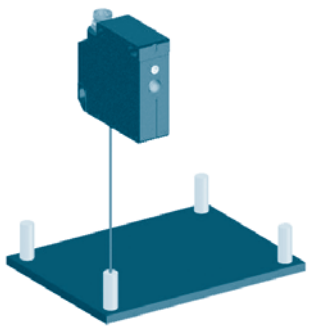


- Positions can be taught in separately
- Smallest window 0,45 mm

- Interfering objects in the foreground and background can be suppressed
- Objects can be detected on a segmented conveyor belt

Difference sensors with 2-point comparison
In a 2-point comparison, two distances detected at two specifically chosen times are measured and compared.

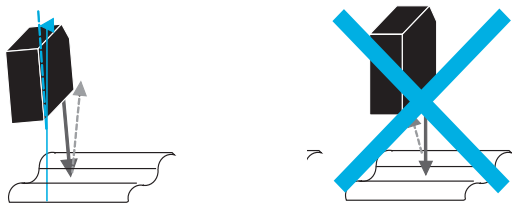
The choice of the time is made using a sync signal. The first distance is measured at the rising flank of the signal and the second distance at the falling flank of the signal. After the second distance has been measured, the sensor evaluates the difference between the two distances and compares this with a previously taught-in maximum permissible deviation. If this is exceeded, the output assumes the ON state.



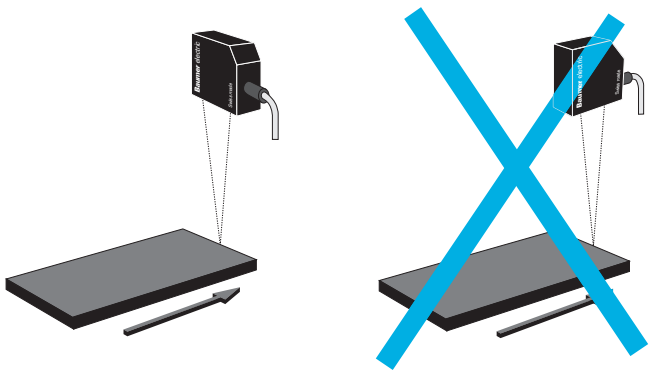
- Object heights can be compared regardless of the distance
- Deviation can be taught in (min. 0,3 mm)
- Measuring time can be determined separately by an external signal

- Checking the pressing depth of pins
- Comparison of the distances/heights of objects with a reference value

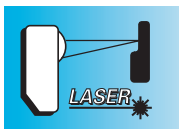
Mounting and adjustment



The direct reflection from glossy or reflective objects must not impinge on the receiver. This can be avoided by slightly tilting the sensor.



For optimum measurement results, the sensor must be installed perpendicular to the movement of the object.



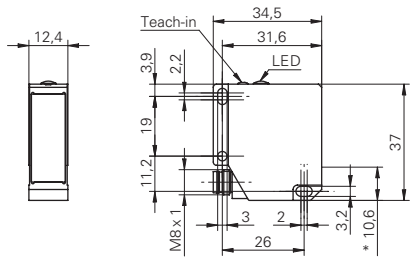
Tw = 16 ... 120 mm

- detection of edges/steps independent of the distance
- reference steps adjustable
- min. output pulse 10 ms

general data	
type	step analysis
sensing distance Tw	16 ... 120 mm
Teach-in range min.	> 0,2 mm
adjustment	Teach-in
power on indication	LED green
output indicator	LED red
light source	pulsed red laser diode
laser class	2
wave length	675 nm
beam diameter	0,5 ... 0,2
electrical data	
response time	< 5 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
output current	< 100 mA
output pulse length	10 ms
voltage drop Vd	< 2,8 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
front (optics)	glass
housing material	die-cast zinc
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

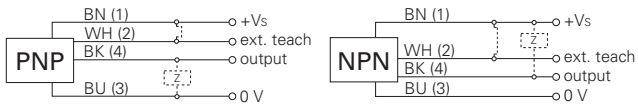
order reference	output circuit
OBDM 12N6910/S35A	NPN
OBDM 12P6910/S35A	PNP

dimension drawing

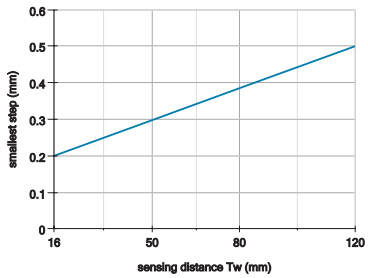


* emitter axis

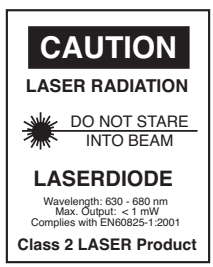
connection diagrams

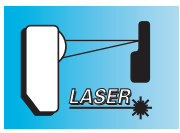


min. detectable difference



laser warning





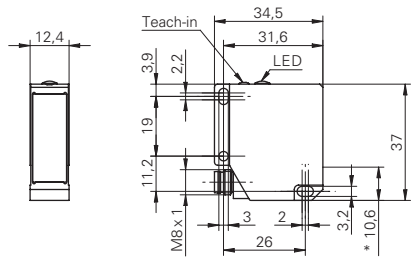
Tw = 16 ... 120 mm

- analysis of distance differences (min./max.)
- max. difference tolerance adjustable
- measuring time selectable

general data	
type	min./max. analysis
sensing distance Tw	16 ... 120 mm
Teach-in range min.	> 0,3 mm
adjustment	Teach-in
power on indication	LED green
output indicator	LED red
light source	pulsed red laser diode
laser class	2
wave length	675 nm
beam diameter	0,5 ... 0,2
electrical data	
response time	< 1 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
output current	< 100 mA
voltage drop Vd	< 2,8 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
front (optics)	glass
housing material	die-cast zinc
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

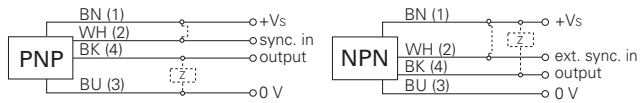
order reference	output circuit
OBDM 12N6920/S35A	NPN
OBDM 12P6920/S35A	PNP

dimension drawing

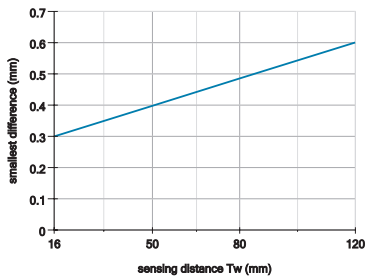


* emitter axis

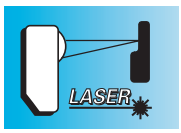
connection diagrams



min. detectable difference



laser warning



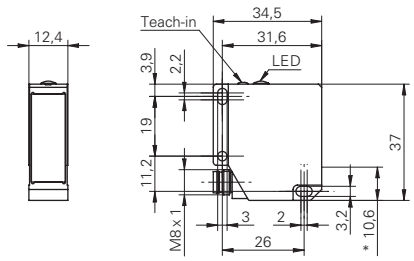
Tw = 16 ... 120 mm

- distance monitoring within a tolerance band
- nominal distance
- adjustable tolerance band

general data	
type	tolerance analysis
sensing distance Tw	16 ... 120 mm
Teach-in range min.	> 0,4 mm
adjustment	Teach-in
power on indication	LED green
output indicator	LED red
light source	pulsed red laser diode
laser class	2
wave length	675 nm
beam diameter	0,5 ... 0,2
electrical data	
response time	< 1 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
output current	< 100 mA
voltage drop Vd	< 2,8 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
front (optics)	glass
housing material	die-cast zinc
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

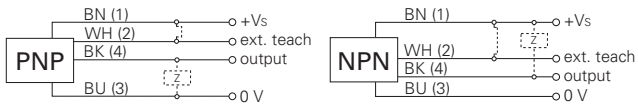
order reference	output circuit
OBDM 12N6930/S35A	NPN
OBDM 12P6930/S35A	PNP

dimension drawing

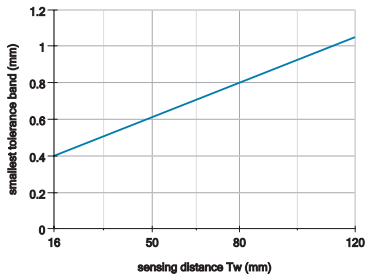


* emitter axis

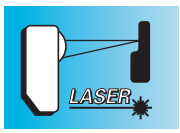
connection diagrams



min. detectable difference



laser warning



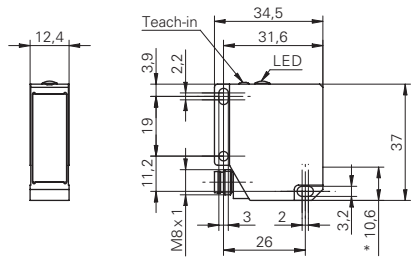
Tw = 16 ... 120 mm

- range switch (foreground / background suppression)
- adjustable window

general data	
type	window analysis
sensing distance Tw	16 ... 120 mm
Teach-in range min.	> 0,4 mm
adjustment	Teach-in
power on indication	LED green
output indicator	LED red
light source	pulsed red laser diode
laser class	2
wave length	675 nm
beam diameter	0,5 ... 0,2
electrical data	
response time	< 1 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
output current	< 100 mA
voltage drop Vd	< 2,8 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
front (optics)	glass
housing material	die-cast zinc
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

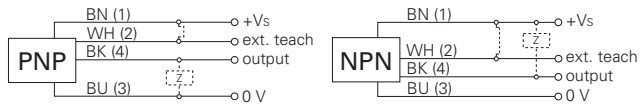
order reference	output circuit
OBDM 12N6940/S35A	NPN
OBDM 12P6940/S35A	PNP

dimension drawing

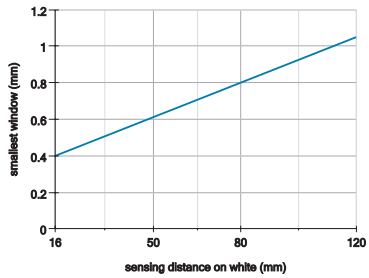


* emitter axis

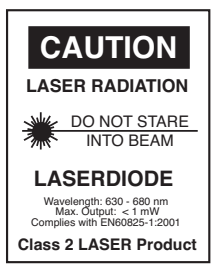
connection diagrams

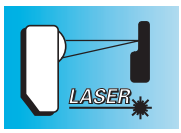


min. detectable difference



laser warning





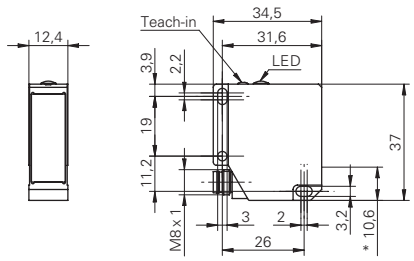
Tw = 16 ... 120 mm

- comparison of two distances
- max. tolerance adjustable
- specific measuring moment selectable

general data	
type	2-point comparison
sensing distance Tw	16 ... 120 mm
Teach-in range min.	> 0,3 mm
adjustment	Teach-in
power on indication	LED green
output indicator	LED red
light source	pulsed red laser diode
laser class	2
wave length	675 nm
beam diameter	0,5 ... 0,2
electrical data	
response time	< 1 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
output current	< 100 mA
voltage drop Vd	< 2,8 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
front (optics)	glass
housing material	die-cast zinc
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

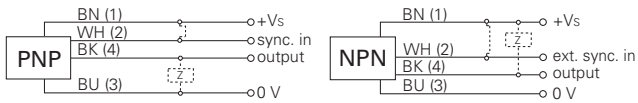
order reference	output circuit
OBDM 12N6950/S35A	NPN
OBDM 12P6950/S35A	PNP

dimension drawing

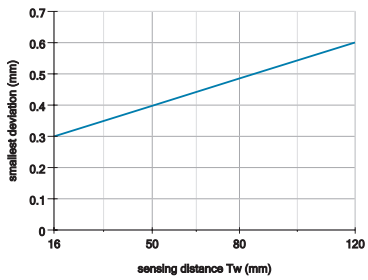


* emitter axis

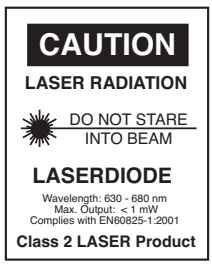
connection diagrams



min. detectable difference



laser warning



red light LED version

product family	FHDK 04	FHCK 07	FHDK 07	FHDK 10	FHDK 10	FHDK 10	FHDK 10
							
		MINOS	*MINOS*				
	IO-Link						
for glass detection							■
version						line beam	
width / diameter	4 mm	8 mm	8 mm	10,4 mm	10,4 mm	10,4 mm	10,4 mm
sensing distance Tw	30 mm ±2 mm 50 mm ±3 mm	10 ... 60 mm	10 ... 60 mm	30 mm ±3 mm 50 mm ±2 mm 80 mm ±8 mm	20 ... 120 mm	20 ... 80 mm	10 ... 30 mm
response time / release time	< 0,5 ms	< 0,5 ms	< 0,5 ms	< 1 ms	< 1 ms	< 1 ms	< 1 ms
sensing distance adjustment		Teach-in	Teach-in		mechanical, 5 turn	mechanical, 5 turn	mechanical, 5 turn
push-pull	■			■			
NPN		■	■		■	■	■
PNP		■	■		■	■	■
cable	■	■	■	■	■	■	
connector	■	■	■	■	■	■	■
housing material	plastic	plastic	plastic	plastic	plastic	plastic	plastic
Page	**246**	**248**	**250**	**252**	**254**	**256**	**258**

laser version

product family	OHDK 10	OHDM 12	OHDK 14	OHDM 16	OHDM 16	OHDM 20
						
		IO-Link				IO-Link
Wafer mapping sensor					■	
width / diameter	10,4 mm	12,4 mm	14,8 mm	15,4 mm	15,4 mm	20,6 mm
sensing distance Tw	22 ... 130 mm	17 ... 120 mm	20 ... 350 mm	25 ... 300 mm	123 ... 143 mm	210 ... 1500 mm
response time / release time	< 0,25 ms		< 0,5 ms	< 0,1 ms < 0,6 ms	< 5 ms	
response time		< 1 ms				< 6 ms
release time		< 2,7 ms				< 18 ms
sensing distance adjustment	mechanical, 5 turn	Teach-in	mechanical, 9 turn	mechanical, 8 turn	no	Teach-in
NPN	■	■	■	■	■	
PNP	■	■	■	■	■	■
cable	■			■	■	
connector	■	■	■	■		■
housing material	plastic	metal	plastic	metal	metal	metal
Page	**260**	**264**	**270**	**274**	**276**	**280**

FHDM 12	FHDK 14	FHDK 14	FHDM 16	FHDK 20	FHDK 26
					
		IO-Link			
12,4 mm	14,8 mm	14,8 mm	15,4 mm	20 mm	25 mm
15 ... 300 mm	20 ... 350 mm 30 ... 500 mm	40 ... 200 mm	20 ... 450 mm 20 ... 600 mm	30 ... 200 mm	120 ... 400 mm
< 1 ms	< 1 ms < 5 ms	< 0,5 ms	< 1 ms < 5 ms	< 0,5 ms	< 1 ms
mechanical, 5 turn	mechanical, 10 turn	Teach-in	mechanical, 5 turn	Teach-in	mechanical, 9 turn
■	■	■	■	■	■
■	■	■	■	■	■
■			■		■
■	■	■	■	■	■
metal	plastic	plastic	metal	plastic	plastic
262	**266**	**268**	**272**	**278**	**282**

Diffuse sensors with background suppression

General information

Diffuse sensors with background suppression using the triangulation principle not only measure the light intensity reflected by the target, but also determine the distance of the object from the sensor. In this way, objects with the minimum size of the light beam located within the adjustable sensing distance can be detected regardless of their color and surface.

The diffuse sensors with background suppression and laser light source were developed specifically for applications in which exact positioning is important. With the finely focused beam, even very small objects such as the wires of a resistor or threads can be clearly detected or counted.

Applications

- Detection of boxes, metal and plastic parts lying on a base such as a conveyor belt, table or transport trolley from above
- Detection of bulk materials or other non-transparent materials in a container
- Counting of different-colored objects such as plastic bottles or printed packages
- Reliable presence monitoring of assembly parts, even with objects moving in the background

Characteristics and advantages

Adjustable sensing distance
The switching point can be adjusted accurately between the object and the interfering background using a set screw or teach-in method

Largely independent of color
The sensing distance remains constant even if the color of the objects changes. Readjustment is therefore unnecessary. Objects changing in the background also have no effect.

Small spot size
Laser sensors can detect objects with a size of just 0,1 mm. Sensors with pinpoint diodes have a spot of only 2 mm diameter at the focus.

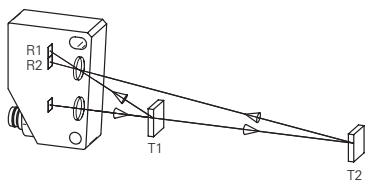
Red light emitters
Visible red light permits simple adjustment of the sensor to small objects by eye.

Short response time
Small, quickly moving objects are reliably detected due to the short response time.

Technology and operation

The sensors are based on the triangulation principle. Only the angle of the light reflected back from the object determines the distance at which the sensor responds. The amount of reflected light is far less important.

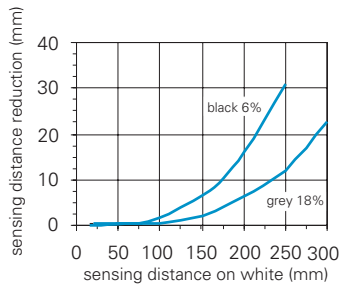
The schematic sketch below shows that receiver R1 receives the light reflected back from the object T1 (acute angle of incidence) and receiver R2 the light reflected back from the background (shallow angle of incidence). The transition from R1 to R2 determines the sensing distance.

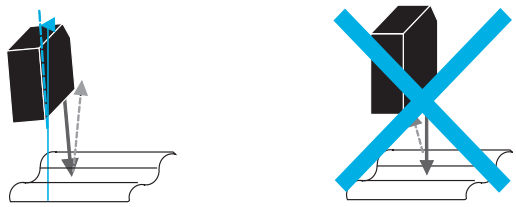


Mounting and adjustment

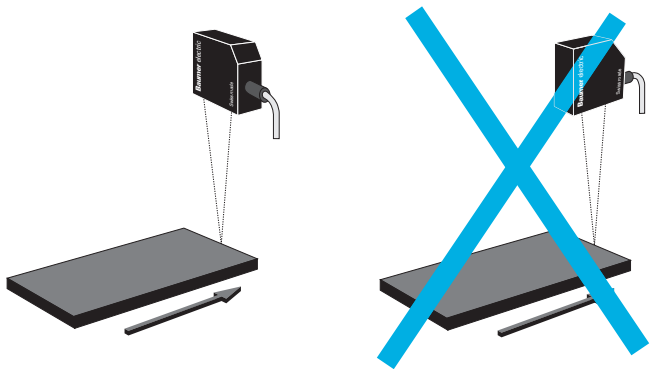
The diffuse sensor must be aimed at the object. The sensing distance must be set to a distance between the target and the background. The background must be located behind the adjusted sensing distance by at least the distance of the sensing distance reduction of the sensor to black.

For diffuse sensors with background suppression, the sensing range diagram is specified for the optimum adjustment. This indicates the sensing range reduction as a function of the sensing range to white for different degrees of remission. This means the distance by which the sensing distance to black or gray is reduced in comparison with white. When the adjusted sensing range to white is entered on the X axis of the diagram, the reduction of the sensing distance to black or gray can be read off on the Y axis. The sensing distance reduction also indicates the minimum distance a black or gray object must be separated from a white background.

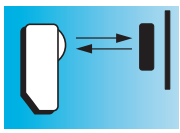




The direct reflection from glossy or reflective objects must not impinge on the receiver. This can be avoided by slightly tilting the sensor.



It should be ensured that the object to be detected approaches the active area of the sensor from the side, which avoids malfunctions caused by deflection of the light beam at edges.



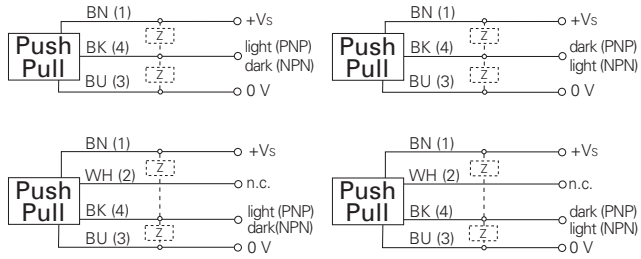
Tw = 50 mm

IO-Link

- subminiature housing
- fixed sensing distance
- push-pull output

general data	
type	background suppression
light source	pulsed point source LED
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	11 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 2 VDC
output circuit	push-pull
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes, supply only
mechanical data	
width / diameter	4 mm
height / length	44,8 mm
depth	6,2 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 65

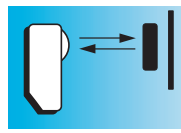
connection diagrams



connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

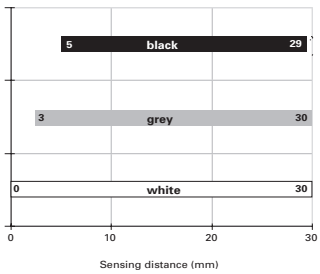
accessories	
mounting brad	162920
for details, see accessories section	

order reference	sensing distance Tw	connection types	output function
FHDK 04G6101	30 mm ±2 mm	cable 3 pin	light operate
FHDK 04G6101/KS35A	30 mm ±2 mm	flylead connector M8, 4 pin	light operate
FHDK 04G6102	50 mm ±3 mm	cable 3 pin	light operate
FHDK 04G6102/KS35A	50 mm ±3 mm	flylead connector M8, 4 pin	light operate
FHDK 04G6111	30 mm ±2 mm	cable 3 pin	dark operate
FHDK 04G6111/KS35A	30 mm ±2 mm	flylead connector M8, 4 pin	dark operate
FHDK 04G6112	50 mm ±3 mm	cable 3 pin	dark operate
FHDK 04G6112/KS35A	50 mm ±3 mm	flylead connector M8, 4 pin	dark operate

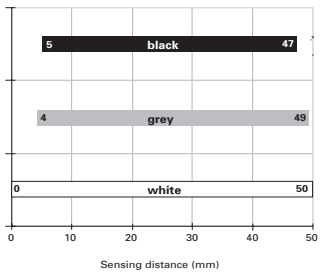


sensing distance diagram

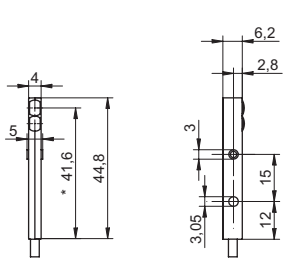
Tw = 30 mm ±2 mm



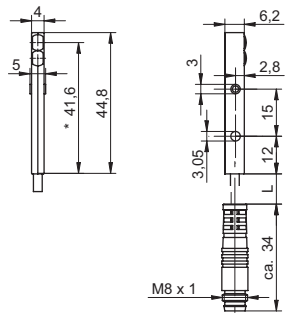
Tw = 50 mm ±3 mm



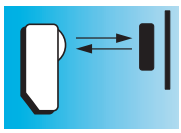
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

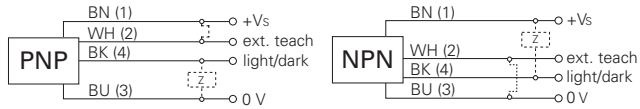


Tw = 10 ... 60 mm

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	background suppression
light source	pulsed red LED
sensing distance Tw	10 ... 60 mm
sensing range Tb (at Tw max.)	2 ... 60 mm
sensing range Tb (at Tw min.)	5 ... 10 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

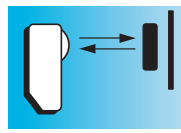
connection diagrams



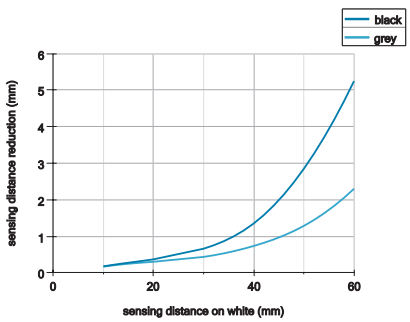
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

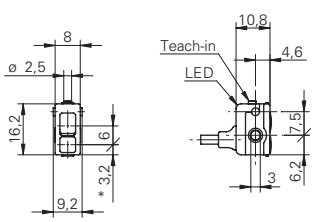
order reference	connection types	output circuit
FHCK 07N6901	cable rear side	NPN
FHCK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FHCK 07P6901	cable rear side	PNP
FHCK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



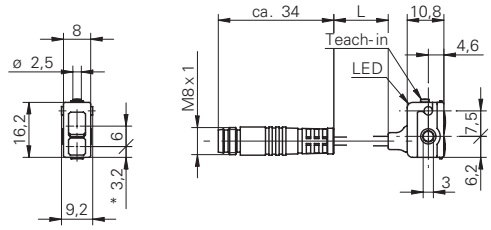
sensing distance diagram



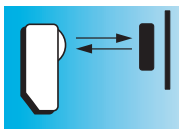
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

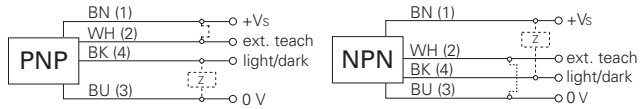


Tw = 10 ... 60 mm

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	background suppression
light source	pulsed red LED
sensing distance Tw	10 ... 60 mm
sensing range Tb (at Tw max.)	2 ... 60 mm
sensing range Tb (at Tw min.)	5 ... 10 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

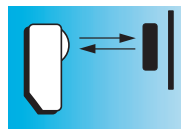
connection diagrams



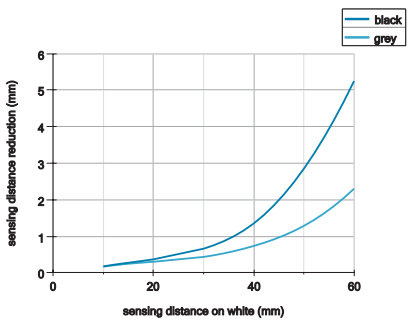
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

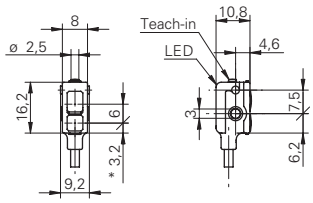
order reference	connection types	output circuit
FHDK 07N6901	cable bottom side	NPN
FHDK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FHDK 07P6901	cable bottom side	PNP
FHDK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



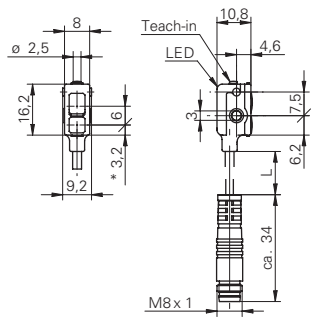
sensing distance diagram



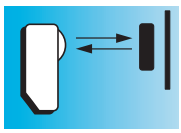
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

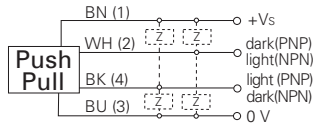


Tw = 80 mm

- subminiature housing
- fixed sensing distance
- push-pull output

general data	
type	background suppression
light source	pulsed red LED
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	18 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output circuit	push-pull
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14,7 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

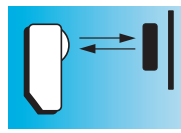
connection diagram



connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

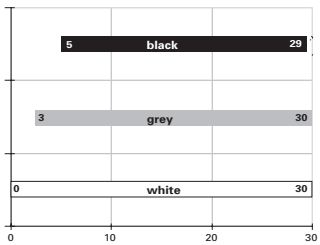
accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

order reference	sensing distance Tw	connection types	protection class
FHDK 10G5120	30 mm ±2 mm	cable 4 pin	IP 65
FHDK 10G5120/S35A	30 mm ±2 mm	connector M8, 4 pin	IP 67
FHDK 10G5121	50 mm ±3 mm	cable 4 pin	IP 65
FHDK 10G5121/S35A	50 mm ±3 mm	connector M8, 4 pin	IP 67
FHDK 10G5122	80 mm ±8 mm	cable 4 pin	IP 65
FHDK 10G5122/S35A	80 mm ±8 mm	connector M8, 4 pin	IP 67



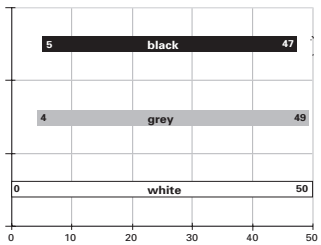
sensing distance diagram

Tw = 30 mm ±2 mm



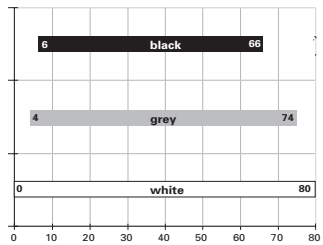
sensing distance (mm)

Tw = 50 mm ±3 mm



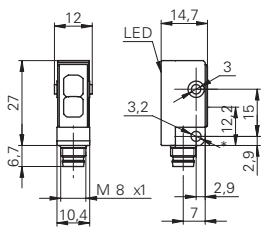
sensing distance (mm)

Tw = 80 mm ±8 mm

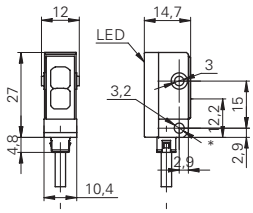


sensing distance (mm)

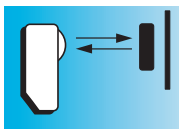
dimension drawings



* emitter axis



* emitter axis

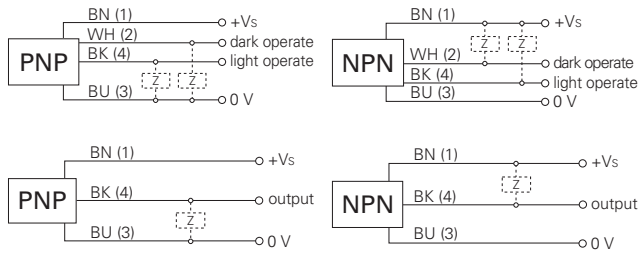


Tw = 20 ... 120 mm

- subminiature housing
- large sensing range
- sensing distance adjustable via potentiometer

general data	
type	background suppression
sensing distance Tw	20 ... 120 mm
sensing range Tb (at Tw max.)	5 ... 120 mm
sensing range Tb (at Tw min.)	5 ... 20 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

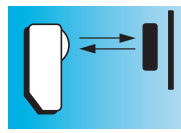
connection diagrams



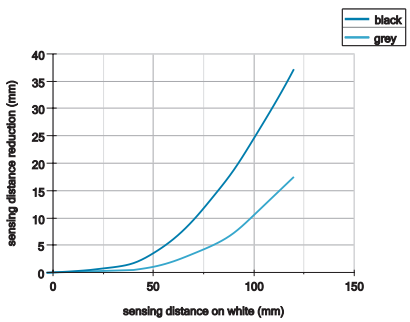
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

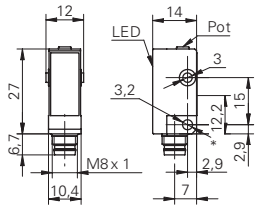
order reference	connection types	output circuit	output function	light source	beam diameter	protection class
FHDK 10N1101/KS35	flylead connector M8, 3 pin	NPN	light operate	pulsed red LED	4 mm	IP 65
FHDK 10N5101	cable 4 pin	NPN	light / dark operate	pulsed red LED	4 mm	IP 65
FHDK 10N5101/S35A	connector M8, 4 pin	NPN	light / dark operate	pulsed red LED	4 mm	IP 67
FHDK 10N5110	cable 4 pin	NPN	light / dark operate	pulsed point source LED	2 mm	IP 65
FHDK 10N5110/S35A	connector M8, 4 pin	NPN	light / dark operate	pulsed point source LED	2 mm	IP 67
FHDK 10P1101/KS35	flylead connector M8, 3 pin	PNP	light operate	pulsed red LED	4 mm	IP 65
FHDK 10P5101	cable 4 pin	PNP	light / dark operate	pulsed red LED	4 mm	IP 65
FHDK 10P5101/S35A	connector M8, 4 pin	PNP	light / dark operate	pulsed red LED	4 mm	IP 67
FHDK 10P5110	cable 4 pin	PNP	light / dark operate	pulsed point source LED	2 mm	IP 65



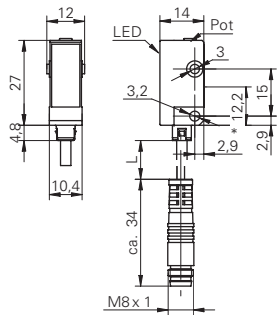
sensing distance diagram



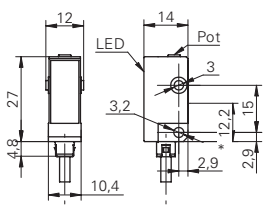
dimension drawings



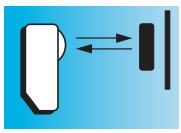
* emitter axis



* emitter axis cable length L = 200 mm



* emitter axis



Tw = 20 ... 80 mm

- subminiature housing
- with line beam
- sensing distance adjustable via potentiometer

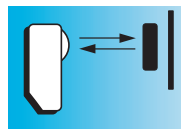
general data	
type	background suppression
version	line beam
light source	pulsed red LED
sensing distance Tw	20 ... 80 mm
sensing range Tb (at Tw max.)	5 ... 80 mm
sensing range Tb (at Tw min.)	5 ... 20 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

connection diagrams

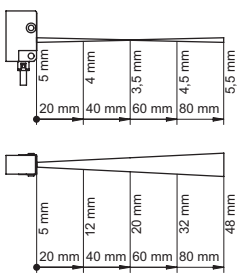
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

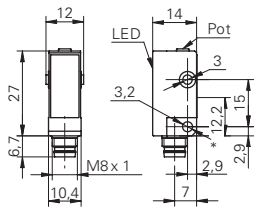
order reference	connection types	output circuit	protection class
FHDK 10N5150	cable 4 pin	NPN	IP 65
FHDK 10N5150/S35A	connector M8, 4 pin	NPN	IP 67
FHDK 10P5150	cable 4 pin	PNP	IP 65
FHDK 10P5150/S35A	connector M8, 4 pin	PNP	IP 67



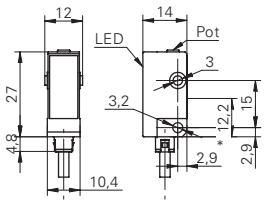
beam characteristic



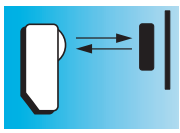
dimension drawings



* emitter axis



* emitter axis



Tw = 10 ... 30 mm

- subminiature housing
- optimized for glass detection
- sensing distance adjustable via potentiometer

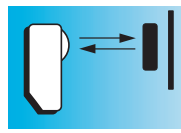
general data	
type	background suppression
special type	for glass detection
light source	pulsed red LED
sensing distance Tw	10 ... 30 mm
sensing range Tb (at Tw max.)	3 ... 30 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

order reference	output circuit
FHDK 10N5160/S35A	NPN
FHDK 10P5160/S35A	PNP

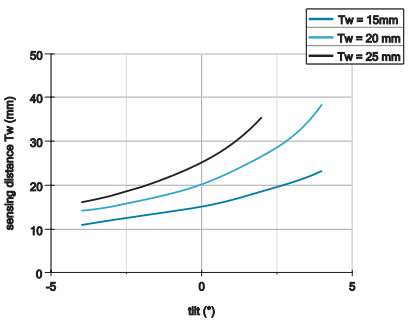
connection diagrams

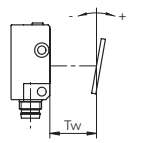
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket	133792
for details, see accessories section	



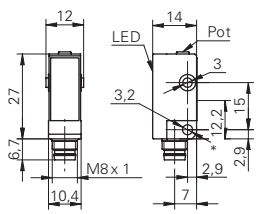
sensing distance diagram



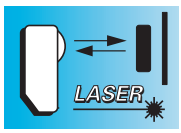


sensor object (mirror)

dimension drawing



* emitter axis



Tw = 22 ... 130 mm

- subminiature housing
- high repeatability
- sensing distance adjustable via potentiometer

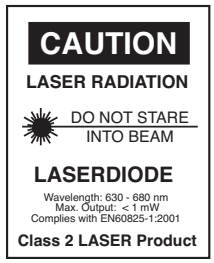
general data	
type	background suppression
light source	pulsed red laser diode
sensing distance Tw	22 ... 130 mm
sensing range Tb (at Tw max.)	3 ... 130 mm
sensing range Tb (at Tw min.)	3 ... 22 mm
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensing distance adjustment	mechanical, 5 turn
laser class	2
distance to laser focus	40 mm
wave length	675 nm
electrical data	
response time / release time	< 0,25 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	16,3 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C

connection diagrams

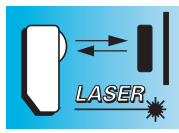
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

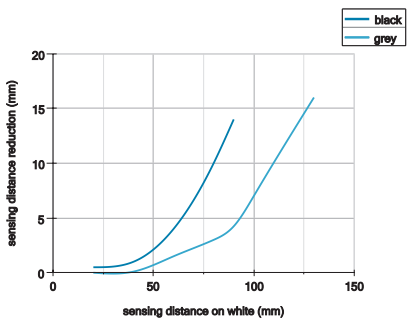
laser warning



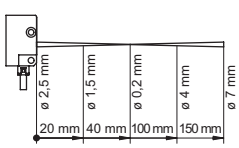
order reference	connection types	output circuit	protection class
OHDK 10N5101	cable 4 pin	NPN	IP 65
OHDK 10N5101/S35A	connector M8, 4 pin	NPN	IP 67
OHDK 10P5101	cable 4 pin	PNP	IP 65
OHDK 10P5101/S35A	connector M8, 4 pin	PNP	IP 67



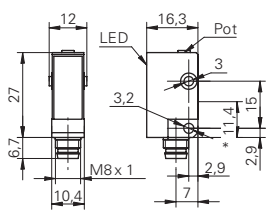
sensing distance diagram



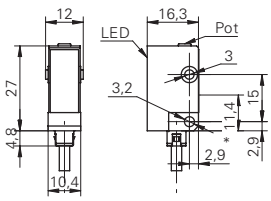
beam characteristic



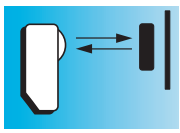
dimension drawings



* emitter axis



* emitter axis



Tw = 15 ... 300 mm

- rugged miniature metal housing
- sensing distance adjustable via potentiometer
- suppression of mutual optical interference

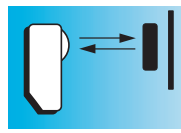
general data	
type	background suppression
light source	pulsed red LED
sensing distance Tw	15 ... 300 mm
sensing range Tb (at Tw max.)	15 ... 300 mm
sensing range Tb (at Tw min.)	5 ... 15 mm
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

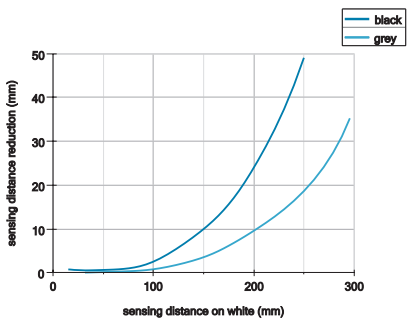
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

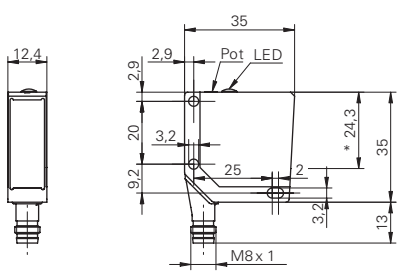
order reference	connection types	output circuit
FHDM 12N5001	cable 4 pin	NPN
FHDM 12N5001/S35A	connector M8, 4 pin	NPN
FHDM 12P5001	cable 4 pin	PNP
FHDM 12P5001/S35A	connector M8, 4 pin	PNP



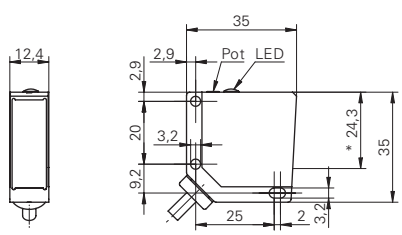
sensing distance diagram



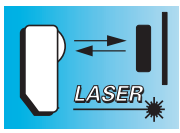
dimension drawings



* emitter axis



* emitter axis



Tw = 17 ... 120 mm

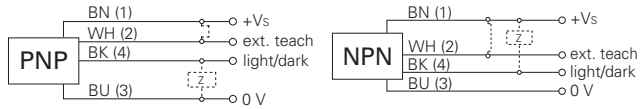
IO-Link

- rugged miniature metal housing
- negligible black/white difference
- teachable sensing distance

general data	
type	background suppression
light source	pulsed red laser diode
sensing distance Tw	17 ... 120 mm
sensing range Tb (at Tw max.)	16 ... 120 mm
sensing range Tb (at Tw min.)	16 ... 17 mm
light indicator	LED red
power on indication	LED green
sensing distance adjustment	Teach-in
laser class	2
beam diameter	0,9 ... 0,5 mm
wave length	675 nm
electrical data	
response time	< 1 ms
release time	< 2,7 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	80 mA
current consumption typ.	40 mA
voltage drop Vd	< 2,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	12,4 mm
height / length	37 mm
depth	34,5 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

order reference	output circuit
OHDM 12N6901/S35A	NPN
OHDM 12P6901/S35A	PNP

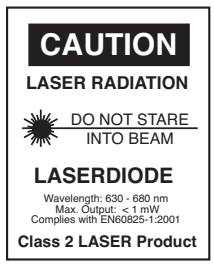
connection diagrams

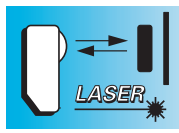


connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

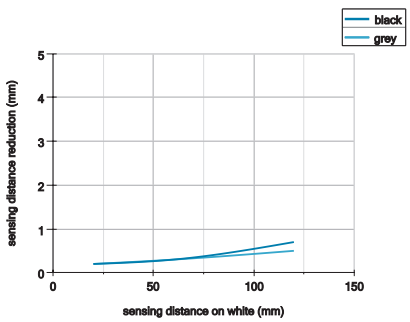
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

laser warning

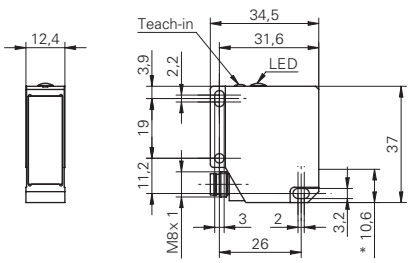




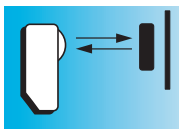
sensing distance diagram



dimension drawing



* emitter axis



Tw = 20 ... 500 mm

- long sensing range
- sensing distance adjustable via potentiometer
- suppression of mutual opt. interferene

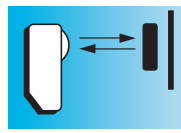
general data	
type	background suppression
light source	pulsed red LED
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensing distance adjustment	mechanical, 10 turn
wave length	660 nm
suppression of reciprocal influence	yes
sensing distance Tw = 20 ... 350 mm	
sensing range Tb (at Tw max.)	20 ... 350 mm
sensing range Tb (at Tw min.)	5 ... 20 mm
sensing distance Tw = 30 ... 500 mm	
sensing range Tb (at Tw max.)	30 ... 500 mm
sensing range Tb (at Tw min.)	5 ... 30 mm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

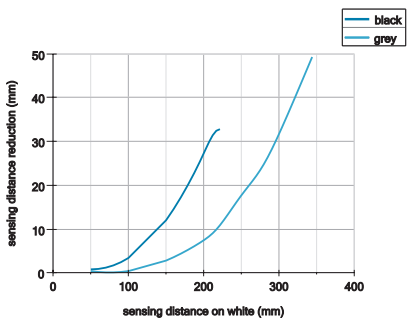
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

order reference	sensing distance Tw	output circuit	response time / release time
FHDK 14N5101/S35A	20 ... 350 mm	NPN	< 1 ms
FHDK 14N5104/S35A	30 ... 500 mm	NPN	< 5 ms
FHDK 14P5101/S35A	20 ... 350 mm	PNP	< 1 ms
FHDK 14P5104/S35A	30 ... 500 mm	PNP	< 5 ms

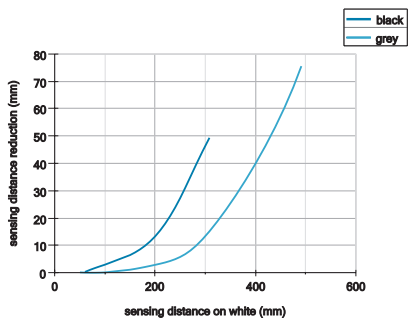


sensing distance diagram

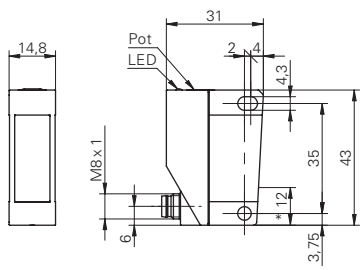
Tw = 20 ... 350 mm



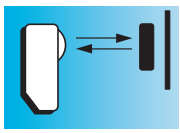
Tw = 30 ... 500 mm



dimension drawing



* emitter axis



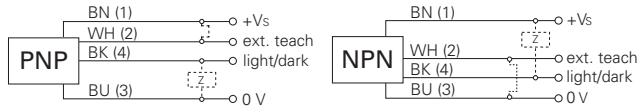
Tw = 40 ... 200 mm

IO-Link

- short response time
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	background suppression
light source	pulsed red LED
sensing distance Tw	40 ... 200 mm
sensing range Tb (at Tw max.)	2 ... 200 mm
sensing range Tb (at Tw min.)	12 ... 40 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	40 mA
current consumption typ.	35 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

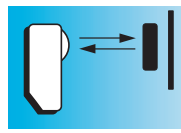
connection diagrams



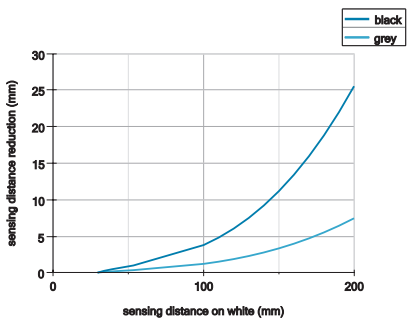
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

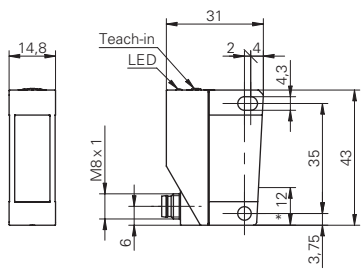
order reference	output circuit
FHDK 14N6901/S35A	NPN
FHDK 14P6901/S35A	PNP



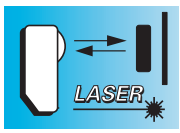
sensing distance diagram



dimension drawing



* emitter axis



Tw = 20 ... 350 mm

- short response time
- high repeatability
- sensing distance adjustable via potentiometer

general data	
type	background suppression
light source	pulsed red laser diode
sensing distance Tw	20 ... 350 mm
sensing range Tb (at Tw max.)	20 ... 350 mm
sensing range Tb (at Tw min.)	5 ... 20 mm
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensing distance adjustment	mechanical, 9 turn
laser class	2
distance to laser focus	115 mm
wave length	650 nm
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 2,2 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

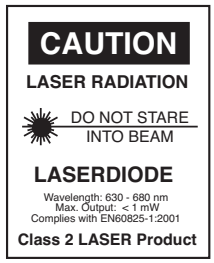
order reference	output circuit
OHDK 14N5101/S35A	NPN
OHDK 14P5101/S35A	PNP

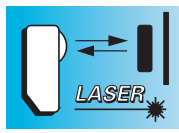
connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

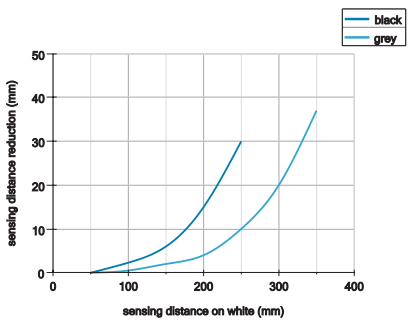
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

laser warning

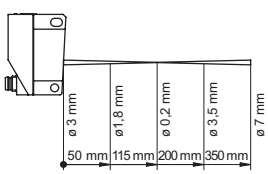




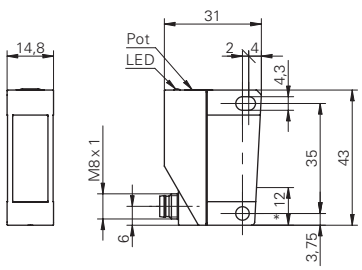
sensing distance diagram



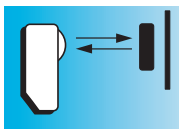
beam characteristic



dimension drawing



* emitter axis



Tw = 20 ... 600 mm

- rugged metal housing
- sensing distance adjustable via potentiometer
- suppression of mutual optical interference

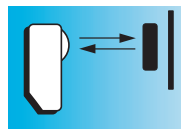
general data	
type	background suppression
light source	pulsed red LED
sensing range Tb (at Tw min.)	5 ... 20 mm
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
suppression of reciprocal influence	yes
sensing distance Tw = 20 ... 450 mm	
sensing range Tb (at Tw max.)	20 ... 450 mm
sensing distance Tw = 20 ... 600 mm	
sensing range Tb (at Tw max.)	20 ... 600 mm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	41 mA
current consumption typ.	29 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

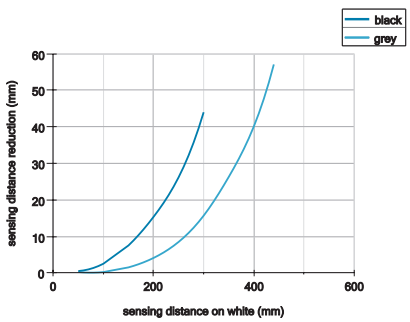
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
for details, see accessories section	

order reference	sensing distance Tw	connection types	output circuit	response time / release time
FHDM 16N5001	20 ... 450 mm	cable 4 pin	NPN	< 1 ms
FHDM 16N5001/S14	20 ... 450 mm	connector M12, 4 pin	NPN	< 1 ms
FHDM 16N5004	20 ... 600 mm	cable 4 pin	NPN	< 5 ms
FHDM 16N5004/S14	20 ... 600 mm	connector M12, 4 pin	NPN	< 5 ms
FHDM 16P5001	20 ... 450 mm	cable 4 pin	PNP	< 1 ms
FHDM 16P5001/S14	20 ... 450 mm	connector M12, 4 pin	PNP	< 1 ms
FHDM 16P5004/S14	20 ... 600 mm	connector M12, 4 pin	PNP	< 5 ms
FHDM 16P5004	20 ... 600 mm	cable 4 pin	PNP	< 5 ms

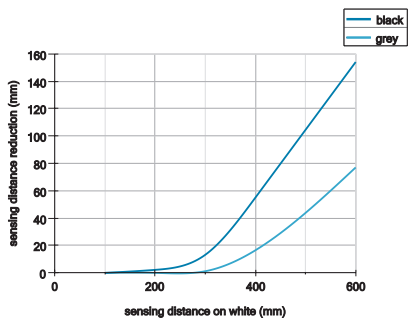


sensing distance diagram

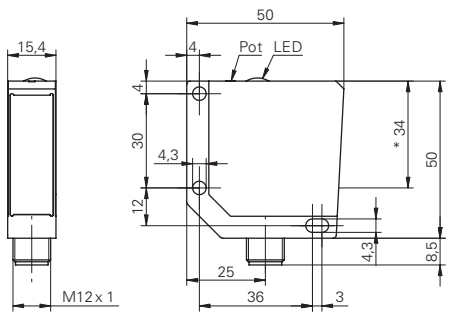
Tw = 20 ... 450 mm



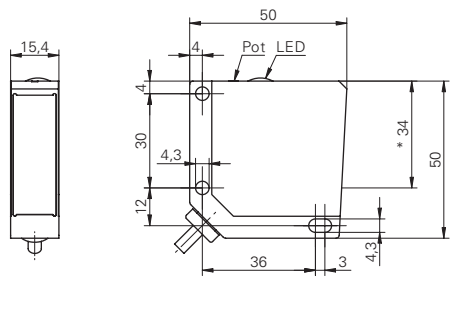
Tw = 20 ... 600 mm



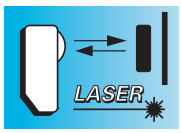
dimension drawings



* emitter axis



* emitter axis



Tw = 25 ... 300 mm

- rugged metal housing
- long sensing range
- high repeatability

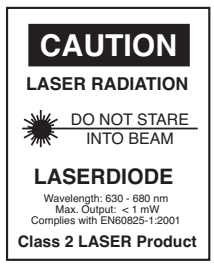
general data	
type	background suppression
light source	pulsed red laser diode
sensing distance Tw	25 ... 300 mm
sensing range Tb (at Tw max.)	40 ... 300 mm
sensing range Tb (at Tw min.)	5 ... 25 mm
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
sensing distance adjustment	mechanical, 8 turn
laser class	2
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

connection diagrams

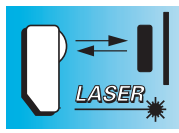
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

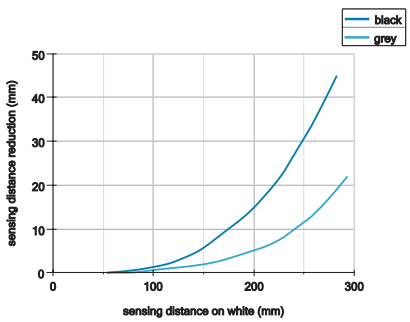
laser warning



order reference	connection types	output circuit	response time / release time	wave length	distance to laser focus	suppression of reciprocal influence
OHDM 16N5001	cable 4 pin	NPN	< 0,6 ms	650 nm	80 mm	yes
OHDM 16N5001/S14	connector M12, 4 pin	NPN	< 0,6 ms	650 nm	80 mm	yes
OHDM 16P5001	cable 4 pin	PNP	< 0,6 ms	650 nm	80 mm	yes
OHDM 16P5001/S14	connector M12, 4 pin	PNP	< 0,6 ms	650 nm	80 mm	yes
OHDM 16P5002/S14	connector M12, 4 pin	PNP	< 0,6 ms	675 nm	40 mm	yes
OHDM 16P5012	cable 4 pin	PNP	< 0,1 ms	650 nm	60 mm	-
OHDM 16P5012/S14	connector M12, 4 pin	PNP	< 0,1 ms	650 nm	60 mm	-

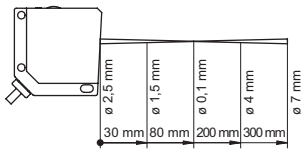


sensing distance diagram

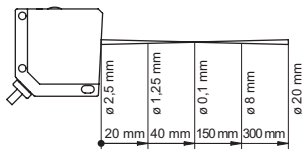


beam characteristic

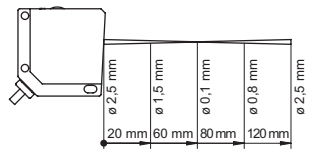
distance to laser focus = 80 mm



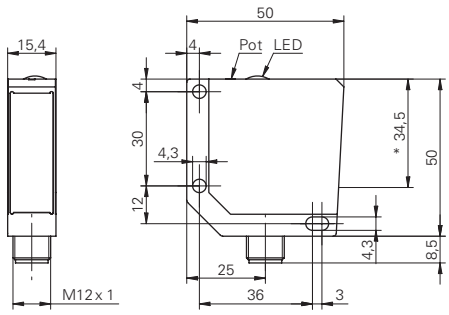
distance to laser focus = 40 mm



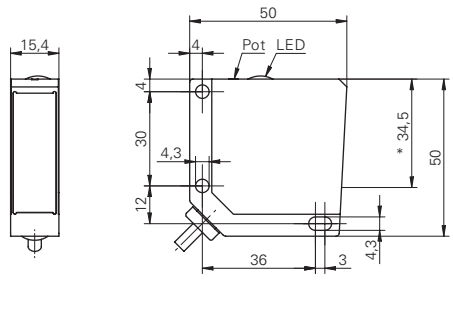
distance to laser focus = 60 mm



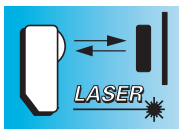
dimension drawings



* emitter axis



* emitter axis



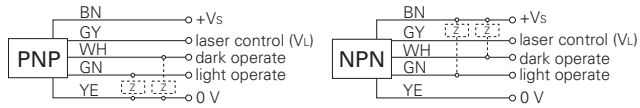
Tw = 133 mm

- for lateral detection of wafer edges
- very long range
- laser sensor in rugged metal housing

general data	
type	background suppression
special type	Wafer mapping sensor
light source	pulsed red laser diode
sensing distance Tw	123 ... 143 mm
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
power on indication	LED green
sensing distance adjustment	no
laser class	2
wave length	650 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
connection types	cable 5 pin
ambient conditions	
operating temperature	-5 ... +50 °C
protection class	IP 67

order reference	output circuit
OHDM 16N5651	NPN
OHDM 16P5651	PNP

connection diagrams

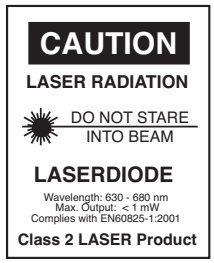


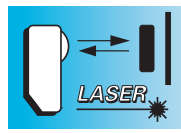
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

remarks

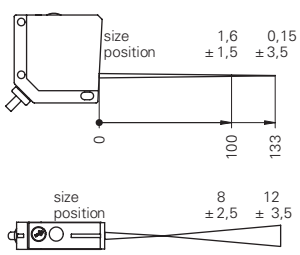
Function laser control - input:
- Laser diode on VL < 1 V
- Laser diode off VL > Vs - 4 V or open

laser warning

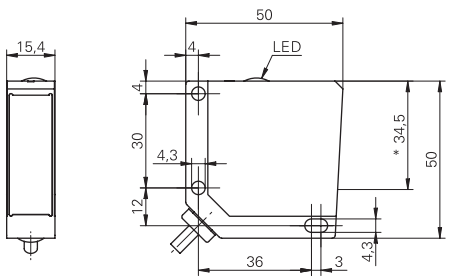




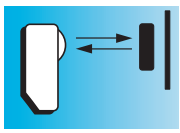
beam characteristic



dimension drawing



* emitter axis



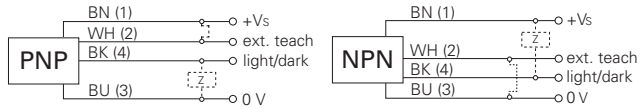
Tw = 30 ... 200 mm

- cross-technology housing concept
- sensing distance adjustable via Teach-in
- small mounting depth

general data	
type	background suppression
light source	pulsed red LED
sensing distance Tw	30 ... 200 mm
sensing range Tb (at Tw max.)	2 ... 200 mm
sensing range Tb (at Tw min.)	12 ... 30 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	48 mA
current consumption typ.	28 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	20 mm
height / length	42 mm
depth	15 mm
type	rectangular
housing material	plastic (PBT-ASA)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

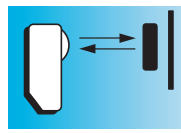
order reference	output circuit
FHDK 20N6901/S35A	NPN
FHDK 20P6901/S35A	PNP

connection diagrams

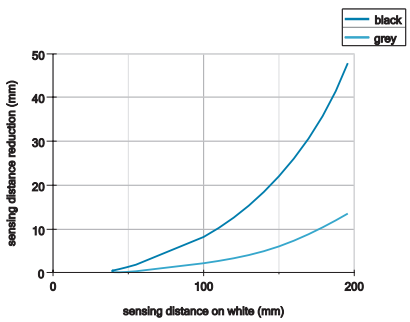


connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

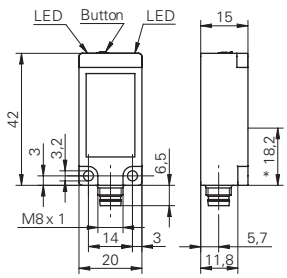
accessories	
SENSOFIX mounting kit	150326
for details, see accessories section	



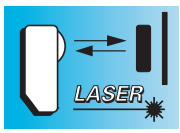
sensing distance diagram



dimension drawing



* emitter axis



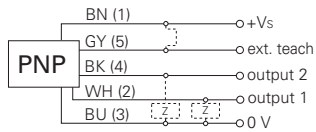
Tw = 210 ... 1500 mm

IO-Link

- large range
- negligible black/white difference
- two teachable sensing distances

general data	
type	background suppression
light source	pulsed red laser diode
sensing distance Tw	210 ... 1500 mm
sensing range Tb (at Tw max.)	200 ... 1500 mm
sensing range Tb (at Tw min.)	200 ... 210 mm
light indicator	LED red
power on indication	LED green
sensing distance adjustment	Teach-in
laser class	2
beam diameter	2 mm
wave length	675 nm
electrical data	
response time	< 6 ms
release time	< 18 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	100 mA
voltage drop Vd	< 5 VDC
output function	light / dark operate
output circuit	PNP
output current	< 20 mA
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	20,6 mm
height / length	65 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 5 pin
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 67

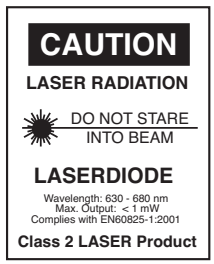
connection diagram



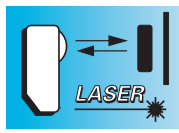
connectors		
ES 34CP2	5 pin	2 m straight
ES 33CP2	5 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
mounting bracket	131521
for details, see accessories section	

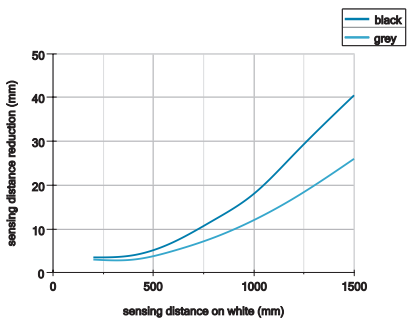
laser warning



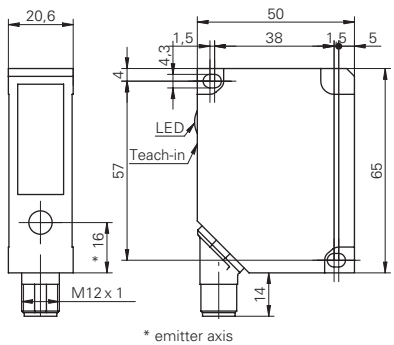
order reference
OHDM 20P6990/S14C

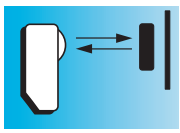


sensing distance diagram



dimension drawing





Tw = 120 ... 400 mm

- sensing distance adjustable via potentiometer
- small blind range

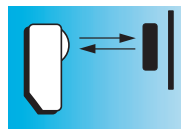
general data	
type	background suppression
light source	pulsed infrared diode
sensing distance Tw	120 ... 400 mm
sensing range Tb (at Tw max.)	10 ... 400 mm
sensing range Tb (at Tw min.)	8 ... 120 mm
light indicator	LED yellow
sensing distance adjustment	mechanical, 9 turn
wave length	880 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	35 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	25 mm
height / length	80 mm
depth	58 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

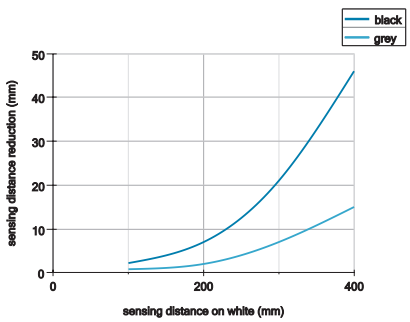
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
mounting bracket	112477
for details, see accessories section	

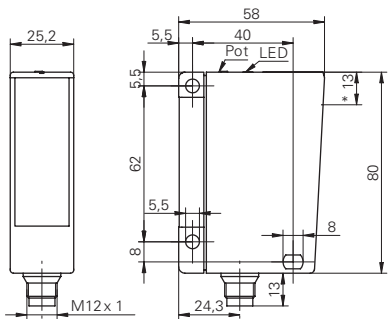
order reference	connection types	output circuit
FHDK 26N5001/S14	connector M12, 4 pin	NPN
FHDK 26P5001	cable 4 pin	PNP
FHDK 26P5001/S14	connector M12, 4 pin	PNP

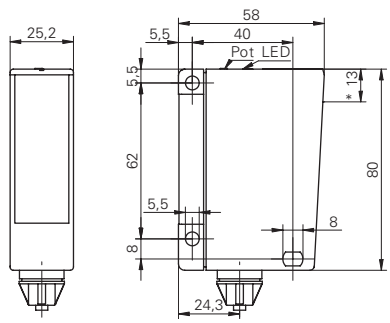


sensing distance diagram



dimension drawings





red light LED version

product family	FNCK 07	FNDK 07	FNDM 12	FNDK 14
				
	MINOS	*MINOS*		
width / diameter	8 mm	8 mm	12,4 mm	14,8 mm
sensing distance Tw	10 ... 45 mm	10 ... 45 mm	20 ... 80 mm	55 ... 200 mm
response time / release time	< 0,5 ms	< 0,5 ms	< 1 ms	< 0,5 ms
sensing distance adjustment	Teach-in	Teach-in	mechanical, 5 turn	Teach-in
NPN	■	■	■	■
PNP	■	■	■	■
cable	■	■	■	
connector	■	■	■	■
housing material	plastic	plastic	metal	plastic
Page	**288**	**290**	**292**	**294**

laser version

product family	ONDM 16
	
width / diameter	15,4 mm
sensing distance Tw	25 ... 200 mm
response time / release time	< 0,6 ms
sensing distance adjustment	mechanical, 8 turn
PNP	■
cable	■
connector	■
housing material	metal
Page	**296**

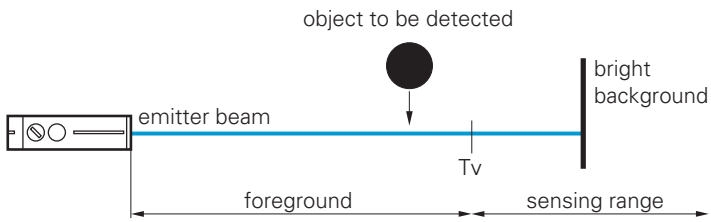
Diffuse sensors with foreground suppression

General information

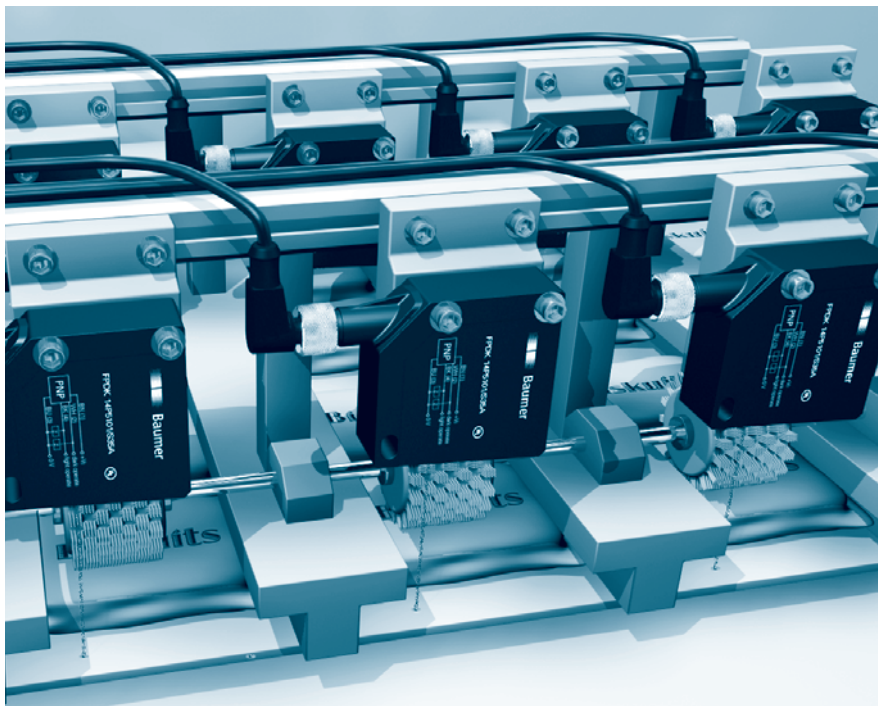
Diffuse sensors with foreground suppression using the triangulation principle not only measure the light intensity reflected by the target, but also determine the distance of the object from the sensor. In this way, objects with the minimum size of the light beam located within the adjustable sensing distance can be detected regardless of their color and surface. Objects moving through the light beam in the adjustable foreground are suppressed.

Applications

- Detection of thin, poorly-reflecting objects on a reflective conveyor belt (if black/white offset of the diffuse sensor with background suppression becomes a problem)
- Detection of objects without a blind region. The sensor must be adjusted to a defined background, which then operates as a «reflector» (see sketch).



sensor must see background, object breaks beam in the foreground



Diffuse sensors with foreground suppression

Characteristics and advantages

Adjustable foreground distance
The foreground distance or, expressed otherwise, the beginning of the sensing distance, can be precisely adjusted by a set screw or Teach-in.

Insensitive to color
The beginning of the sensing distance remains largely constant even if the color of the objects changes. Readjustment is therefore unnecessary.

Small spot size
Laser sensors can detect objects with a size of just 0,1 mm.

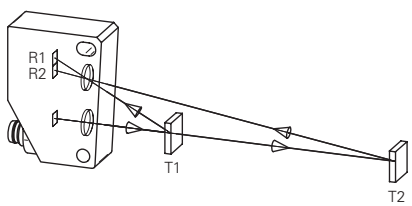
Short response time
Small, quickly moving objects are reliably detected due to the short response time.

Technology and operation

The sensors are based on the triangulation principle. The beginning of the sensing distance is only determined by the angle of the light reflected back from the object. The amount of reflected light is far less important.

The schematic sketch below shows that receiver R1 receives the light reflected back from the object T1 (foreground) and receiver R2 the light reflected back from object T2. The transition from R1 to R2 determines the sensing distance.

Inside the sensing distance, the sensor operates as a normal diffuse sensor, i.e. the max. range depends on the reflectivity of the object.

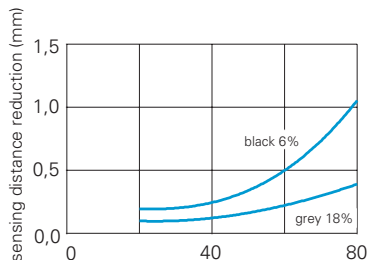


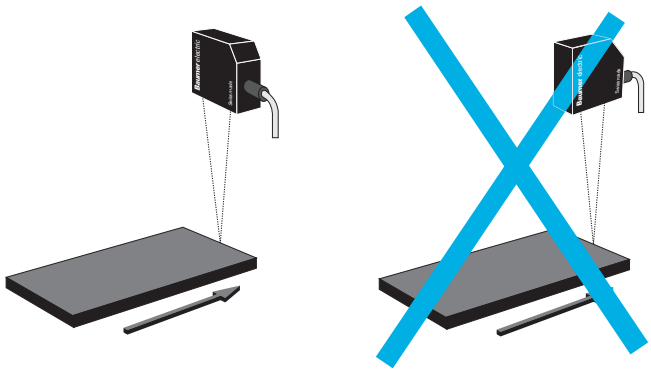
Mounting and adjustment

The diffuse sensor must be aimed at the object. The beginning of the sensing distance must be set to a distance between the target and the object in the foreground.

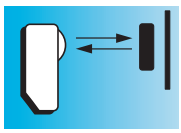
For diffuse sensors with foreground suppression, the sensing distance diagram is specified. This indicates the sensing distance expansion as a function of the beginning of the sensing distance to white for different degrees of remission. This means the distance by which the beginning of the sensing distance to black or gray is increased in comparison with white. When the adjusted beginning of the sensing distance to white is entered on the X axis of the diagram, the increase of the sensing distance to black or gray can be read off on the Y axis.

The sensing distance increase also indicates how far a black or gray object may be located behind the adjusted sensing distance for the object to be correctly detected.





It should be ensured that the object to be detected approaches the active area of the sensor from the side, which avoids malfunctions.

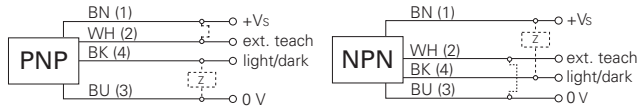


Tw = 10 ... 45 mm

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual opt. Interferene

general data	
type	foreground suppression
light source	pulsed red LED
sensing distance Tw	10 ... 45 mm
sensing range Tb (at Tw max.)	45 ... 150 mm
sensing range Tb (at Tw min.)	10 ... 150 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

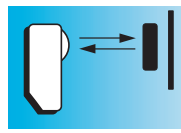
connection diagrams



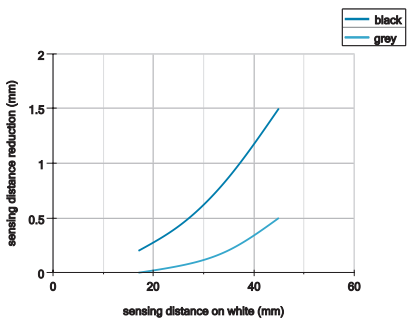
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

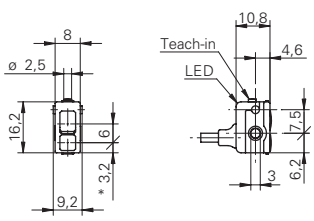
order reference	connection types	output circuit
FNCK 07N6901	cable rear side	NPN
FNCK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FNCK 07P6901	cable rear side	PNP
FNCK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



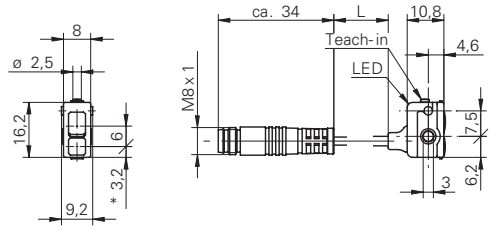
sensing distance diagram



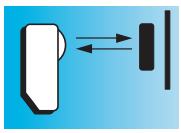
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

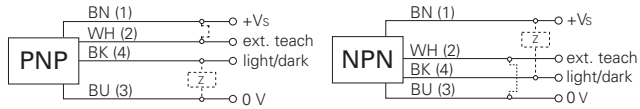


Tw = 10 ... 45 mm

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	foreground suppression
light source	pulsed red LED
sensing distance Tw	10 ... 45 mm
sensing range Tb (at Tw max.)	45 ... 150 mm
sensing range Tb (at Tw min.)	10 ... 150 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

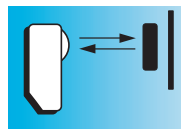
connection diagrams



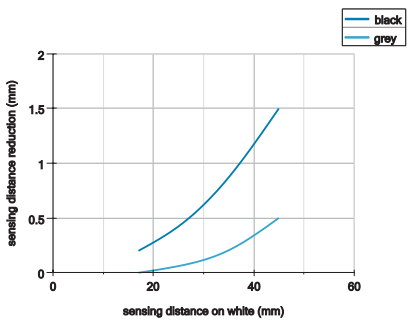
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

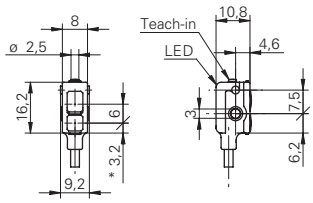
order reference	connection types	output circuit
FNDK 07N6901	cable bottom side	NPN
FNDK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FNDK 07P6901	cable bottom side	PNP
FNDK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



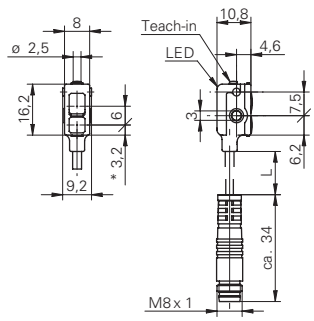
sensing distance diagram



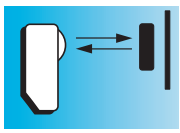
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm



Tw = 20 ... 80 mm

- rugged miniature metal housing
- sensing distance adjustable via potentiometer

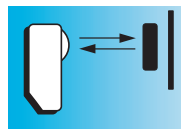
general data	
type	foreground suppression
light source	pulsed red LED
sensing distance Tw	20 ... 80 mm
sensing range Tb (at Tw max.)	80 ... 160 mm
sensing range Tb (at Tw min.)	20 ... 30 mm
light indicator	LED yellow
sensing distance adjustment	mechanical, 5 turn
wave length	660 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

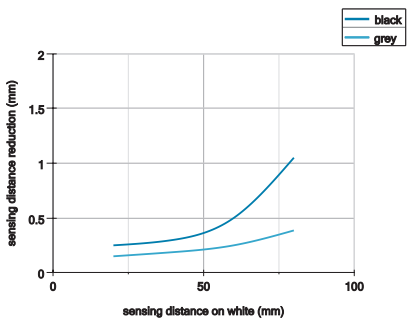
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

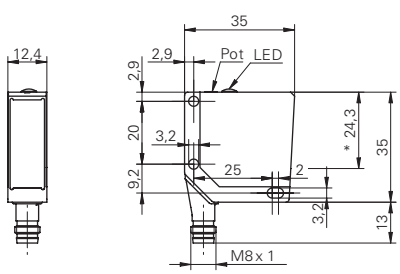
order reference	connection types	output circuit
FNDM 12N5001	cable 4 pin	NPN
FNDM 12N5001/S35A	connector M8, 4 pin	NPN
FNDM 12P5001	cable 4 pin	PNP
FNDM 12P5001/S35A	connector M8, 4 pin	PNP



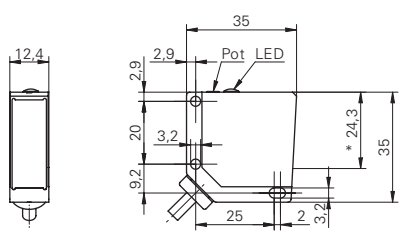
sensing distance diagram



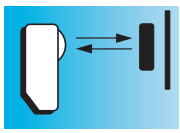
dimension drawings



* emitter axis



* emitter axis

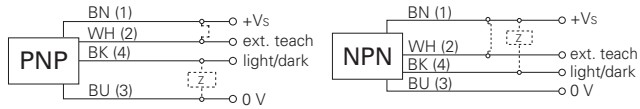


Tw = 55 ... 200 mm

- short response time
- sensing distance adjustable via Teach-in

general data	
type	foreground suppression
light source	pulsed red LED
sensing distance Tw	55 ... 200 mm
sensing range Tb (at Tw max.)	200 ... 350 mm
sensing range Tb (at Tw min.)	55 ... 350 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
output indicator	LED yellow
sensing distance adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	40 mA
current consumption typ.	35 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

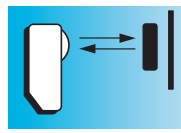
connection diagrams



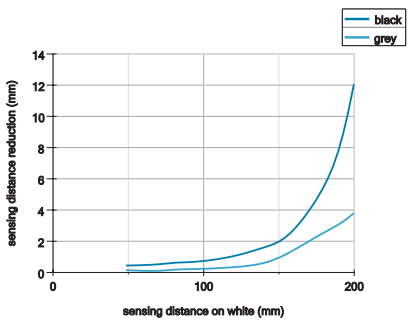
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

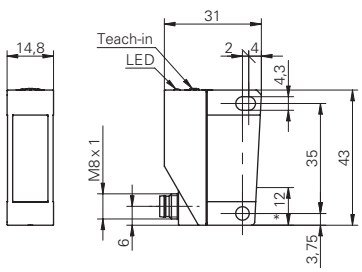
order reference	output circuit
FNDK 14N6901/S35A	NPN
FNDK 14P6901/S35A	PNP



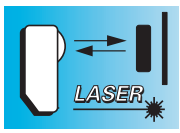
sensing distance diagram



dimension drawing



* emitter axis



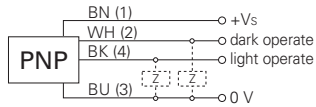
Tw = 25 ... 200 mm

- rugged metal housing
- high repeatability

general data	
type	foreground suppression
light source	pulsed red laser diode
sensing distance Tw	25 ... 200 mm
sensing range Tb (at Tw max.)	200 ... 500 mm
sensing range Tb (at Tw min.)	25 ... 45 mm
repeatability	< 0,1 mm at laser focus
light indicator	LED yellow
sensing distance adjustment	mechanical, 8 turn
laser class	2
distance to laser focus	80 mm
wave length	650 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,6 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

order reference	connection types
ONDM 16P5101	cable 4 pin
ONDM 16P5101/S14	connector M12, 4 pin

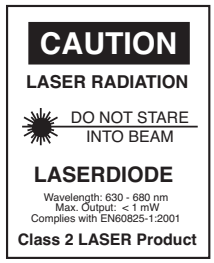
connection diagram

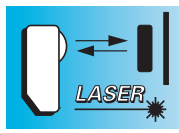


connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

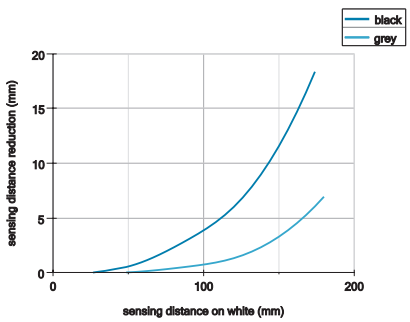
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

laser warning

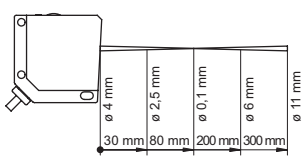




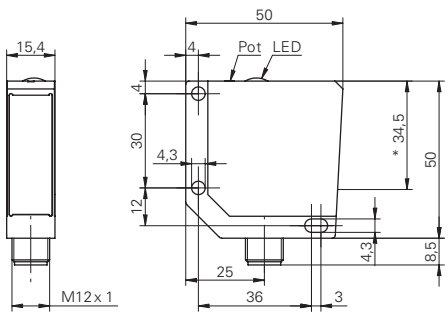
sensing distance diagram



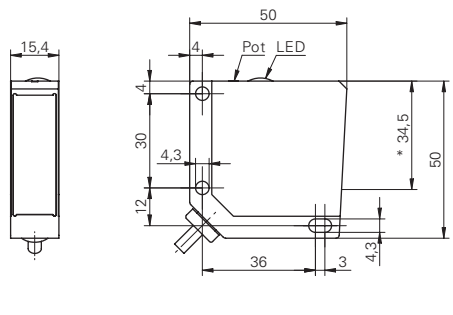
beam characteristic



dimension drawings



* emitter axis



* emitter axis

red light LED version

product family	FZCK 07	FZDK 07	FZDM 08	FZAM 08	FZDK 10	FZDM 12	FZAM 12
							
	MINOS	*MINOS*					
width / diameter	8 mm	8 mm	8 mm	8 mm	10,4 mm	12,4 mm	12 mm
sensing distance Tw	20 ... 150 mm	20 ... 150 mm	< 40 mm < 80 mm	< 40 mm < 80 mm	5 ... 200 mm	30 ... 250 mm	30 ... 200 mm
response time / release time	< 0,5 ms	< 0,5 ms	< 1 ms	< 1 ms	< 1 ms	< 1 ms	< 1 ms
sensitivity adjustment	Teach-in	Teach-in	no	no	Pot, 270°	Pot, 5 turn	Pot, 270°
NPN	■	■			■	■	■
PNP	■	■	■	■	■	■	■
cable	■	■	■	■	■	■	■
connector	■	■	■	■	■	■	■
housing material	plastic	plastic	metal	metal	plastic	metal	metal
Page	**302**	**304**	**306**	**308**	**310**	**316**	**318**

laser version

product family	OZDK 10	OZDK 10	OZDK 14	OZDM 16	OZDM 16
					
version		line beam			
width / diameter	10,4 mm	10,4 mm	14,8 mm	15,4 mm	15,4 mm
sensing distance Tw	3 ... 150 mm	3 ... 150 mm	20 ... 300 mm	0 ... 250 mm	0 ... 250 mm
response time / release time	< 0,05 ms	< 0,05 ms	< 0,15 ms	< 0,05 ms	< 0,1 ms
sensitivity adjustment	Pot, 5 turn	Pot, 5 turn	Teach-in	Pot, 14 turn	Pot, 14 turn
NPN	■	■	■	■	
PNP	■	■	■	■	■
cable	■	■		■	■
connector	■	■	■	■	■
housing material	plastic	plastic	plastic	metal	metal
Page	**312**	**314**	**322**	**326**	**328**

FZDK 14	FZDM 16	FZAM 18	FZAM 18	FZAM 18	FZDK 20	FZAM 30
						
14,8 mm	15,4 mm	18 mm	18 mm	18 mm	20 mm	30 mm
5 ... 600 mm	0 ... 400 mm	60 ... 430 mm	20 ... 150 mm	60 ... 430 mm	5 ... 500 mm	100 ... 700 mm 300 ... 1500 mm
< 1 ms	< 1 ms	< 1 ms	< 0,5 ms	< 1 ms	< 0,5 ms	< 0,25 ms < 2,5 ms
Pot, 270°	Pot, 270°	Teach-in	Pot, 15 turn	Pot, 270°	Pot, 270°	Pot, 15 turn
■	■	■	■	■	■	■
■	■	■	■	■	■	■
	■	■	■	■		■
■	■	■		■	■	
plastic	metal	metal	metal	metal	plastic	metal
320	**324**	**330**	**332**	**334**	**336**	**338**

Diffuse sensor with intensity difference

General information

The emitter and receiver are in the same housing. The emitted infrared, red or laser light is reflected directly by the target back to the sensor. If the target reflects sufficiently well, the received light causes the sensor to switch.

Applications

- Differentiation and sorting of objects, e.g. by size, degree of reflection etc.
- Counting of objects
- Presence check, e.g. of a paper stack.

Characteristics and advantages

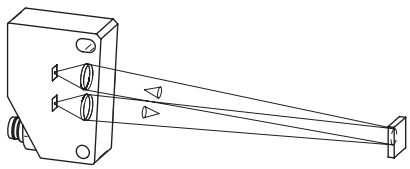
- Exploitation of the refection from the target
- Suitable to discern black from white
- Relatively large active range
- Simple installation (only one sensor)
- Short response time

- The sensing distance depends largely on the reflective properties of the object surface.
- Suitable to discern between black and white objects.
- Relatively large active range.
- Positioning and monitoring with just one sensor.

Technology and operation

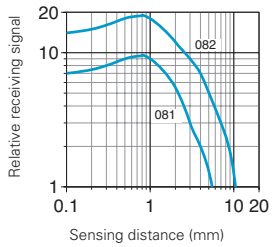
The light shining on the target is largely diffused and reflected back in all directions. A very small part of this remitted light is observed by the receiver. If the target reflects sufficiently well, the received light causes the sensor to switch.

As the sensor operates with the reflection from the materials, the surface properties, color and gloss have a great influence on the switching distance.



Mounting and adjustment

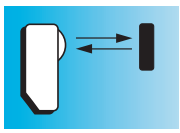
With diffuse sensors operating by the intensity difference principle, the relative receiving signal is specified. This represents the signal level received from a white object as a function of the distance. Using this diagram, the sensing range can be determined for an object which is not white. The correction factor of the respective material is required for this purpose.



Correction factor

The material and surface properties of the object (representing the reflectivity) influence the switching distance of a diffuse sensor with intensity difference. To determine the corrected switching distance, the following values must therefore be applied to the relative receiving signal (KFs) or in approximation to the distance (KFd).

Material	KFs	KFd
Kodak test card	100%	100%
Pale, planed wood	80%	90%
Rough wood	20%	45%
Drawn aluminum	25%	50%
Cardboard, matte black	7%	26%

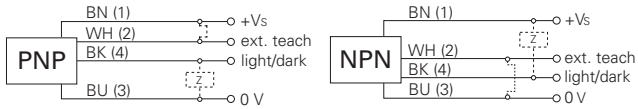


Tw = 20 ... 150 mm

- ultra compact housing
- sensitivity adjustable via Teach-in
- suppression of mutual opt. interferene

general data	
type	intensity difference
light source	pulsed red LED
sensing distance Tw	20 ... 150 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

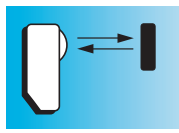
connection diagrams



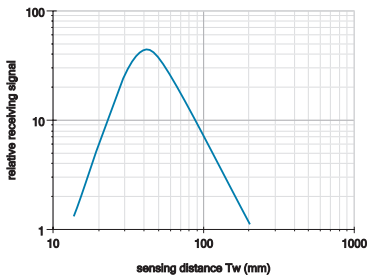
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

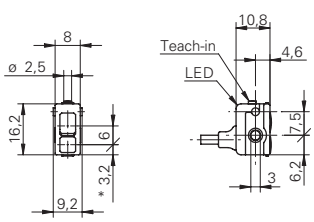
order reference	connection types	output circuit
FZCK 07N6901	cable rear side	NPN
FZCK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FZCK 07P6901	cable rear side	PNP
FZCK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



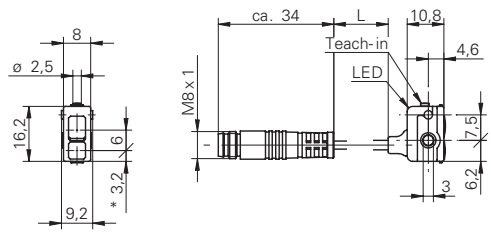
relative receiving signal



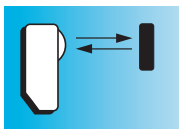
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

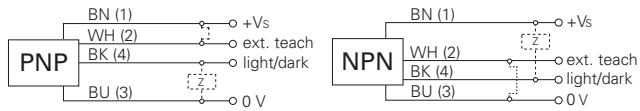


Tw = 20 ... 150 mm

- ultra compact housing
- sensitivity adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	intensity difference
light source	pulsed red LED
sensing distance Tw	20 ... 150 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

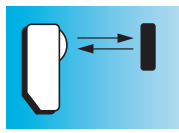
connection diagrams



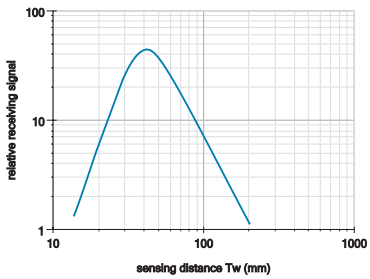
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

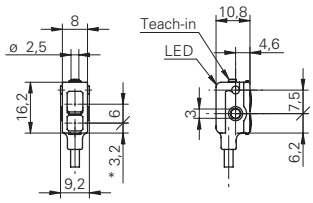
order reference	connection types	output circuit
FZDK 07N6901	cable bottom side	NPN
FZDK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FZDK 07P6901	cable bottom side	PNP
FZDK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



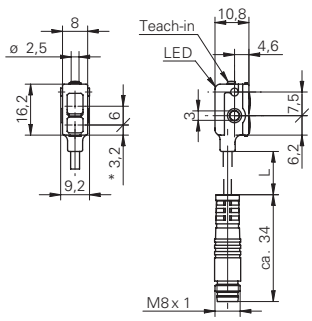
relative receiving signal



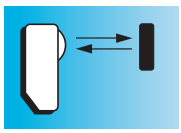
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

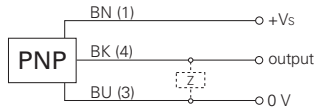


Tw = 40 mm
Tw = 80 mm

- subminiature metal housing
- fixed sensing distance

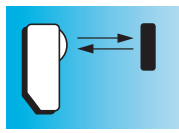
general data	
type	intensity difference
light source	pulsed infrared diode
alignment / soiled lens indicator	flashing light indicator
light indicator	LED red
sensitivity adjustment	no
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	42 mA
current consumption typ.	20 mA
voltage drop Vd	< 2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	58 mm
depth	12 mm
type	rectangular
housing material	aluminum anodized
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

connection diagram



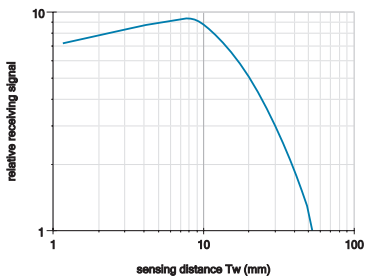
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

order reference	sensing distance Tw	connection types	output function
FZDM 08P1001	< 40 mm	cable 3 pin	light operate
FZDM 08P1001/S35L	< 40 mm	connector M8, 3 pin	light operate
FZDM 08P1002	< 80 mm	cable 3 pin	light operate
FZDM 08P1002/S35L	< 80 mm	connector M8, 3 pin	light operate
FZDM 08P3001	< 40 mm	cable 3 pin	dark operate
FZDM 08P3001/S35L	< 40 mm	connector M8, 3 pin	dark operate
FZDM 08P3002	< 80 mm	cable 3 pin	dark operate
FZDM 08P3002/S35L	< 80 mm	connector M8, 3 pin	dark operate

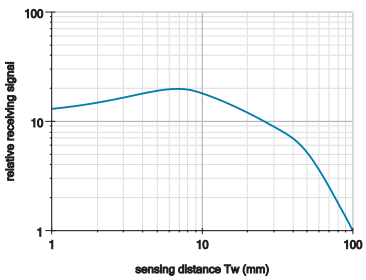


relative receiving signal

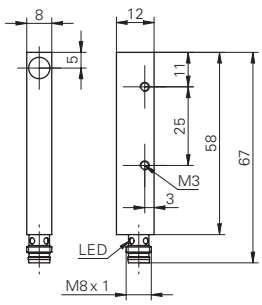
Tw < 40 mm

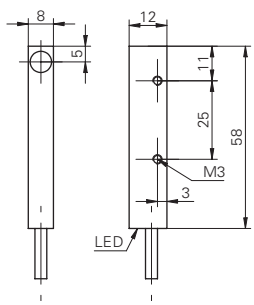


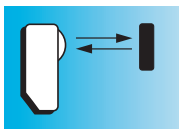
Tw < 80 mm



dimension drawings





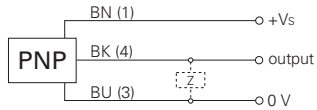


Tw = 40 mm
Tw = 80 mm

- subminiature metal housing
- fixed sensing distance

general data	
type	intensity difference
light source	pulsed infrared diode
alignment / soiled lens indicator	flashing light indicator
light indicator	LED red
sensitivity adjustment	no
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	42 mA
current consumption typ.	20 mA
voltage drop Vd	< 2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
type	cylindrical
housing material	brass nickel plated
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

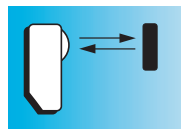
connection diagram



connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

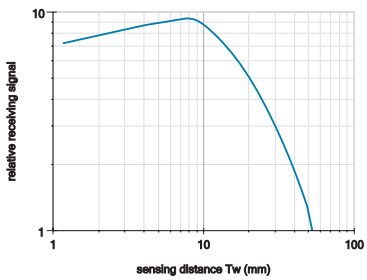
accessories	
SENSOFIX mounting kit	151719
for details, see accessories section	

order reference	sensing distance Tw	height / length	connection types	output function
FZAM 08P1001	< 40 mm	56 mm	cable 3 pin	light operate
FZAM 08P1001/S35L	< 40 mm	73 mm	connector M8, 3 pin	light operate
FZAM 08P1002	< 80 mm	56 mm	cable 3 pin	light operate
FZAM 08P1002/S35L	< 80 mm	73 mm	connector M8, 3 pin	light operate
FZAM 08P3001	< 40 mm	56 mm	cable 3 pin	dark operate
FZAM 08P3001/S35L	< 40 mm	73 mm	connector M8, 3 pin	dark operate
FZAM 08P3002	< 80 mm	56 mm	cable 3 pin	dark operate
FZAM 08P3002/S35L	< 80 mm	73 mm	connector M8, 3 pin	dark operate

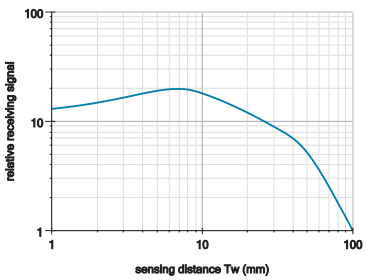


relative receiving signal

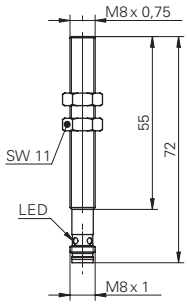
Tw < 40 mm

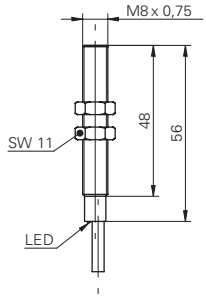


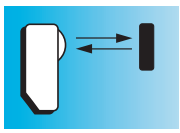
Tw < 80 mm



dimension drawings





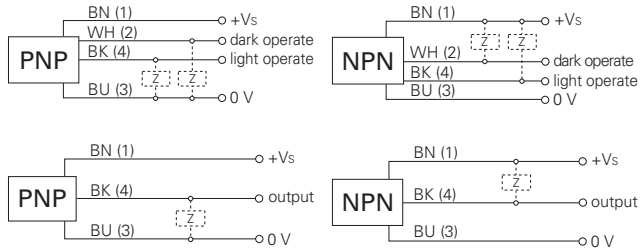


Tw = 5 ... 200 mm

- subminiature housing
- sensing distance adjustable via potentiometer

general data	
type	intensity difference
light source	pulsed red LED
sensing distance Tw	5 ... 200 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

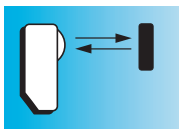
connection diagrams



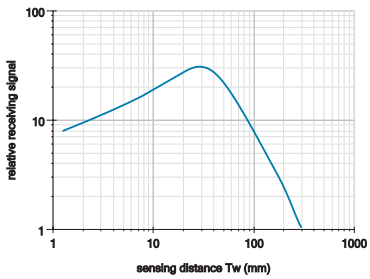
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

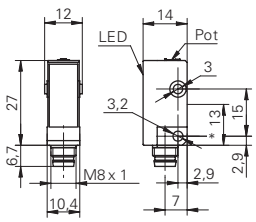
order reference	connection types	output circuit	output function	protection class
FZDK 10N1101/KS35	flylead connector M8, 3 pin	NPN	light operate	IP 65
FZDK 10N5101	cable 4 pin	NPN	light / dark operate	IP 65
FZDK 10N5101/S35A	connector M8, 4 pin	NPN	light / dark operate	IP 67
FZDK 10P1101/KS35	flylead connector M8, 3 pin	PNP	light operate	IP 65
FZDK 10P5101	cable 4 pin	PNP	light / dark operate	IP 65
FZDK 10P5101/S35A	connector M8, 4 pin	PNP	light / dark operate	IP 67



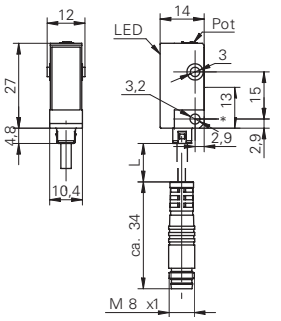
relative receiving signal



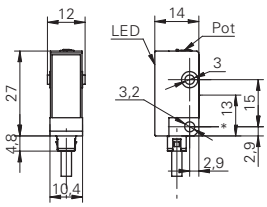
dimension drawings



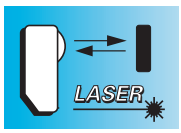
* emitter axis



* emitter axis cable length L = 200 mm



* emitter axis



Tw = 3 ... 150 mm

- subminiature housing
- line beam
- very short response time

general data	
type	intensity difference
light source	pulsed red laser diode
sensing distance Tw	3 ... 150 mm
optimum operating distance	20 ... 40 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Pot, 5 turn
laser class	2
distance to laser focus	40 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	16,3 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C

connection diagrams

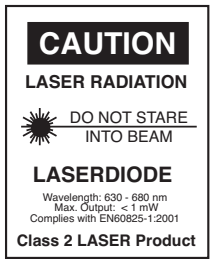
connectors

ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

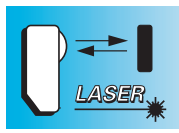
accessories

SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

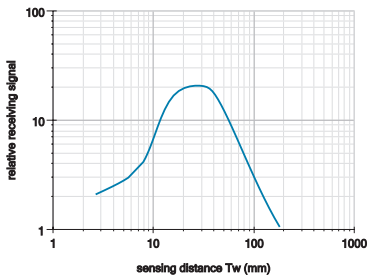
laser warning



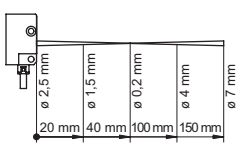
order reference	connection types	output circuit	protection class
OZDK 10N5101	cable 4 pin	NPN	IP 65
OZDK 10N5101/S35A	connector M8, 4 pin	NPN	IP 67
OZDK 10P5101	cable 4 pin	PNP	IP 65
OZDK 10P5101/S35A	connector M8, 4 pin	PNP	IP 67



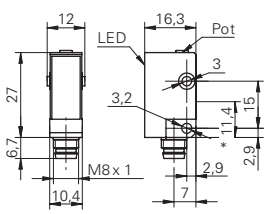
relative receiving signal



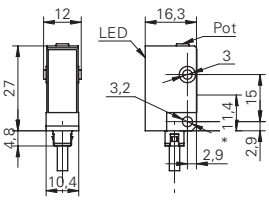
beam characteristic



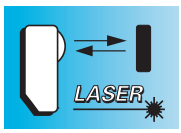
dimension drawings



* emitter axis



* emitter axis



Tw = 3 ... 150 mm

- subminiature housing
- high repeatability
- very short response time

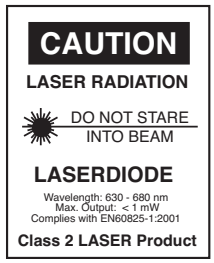
general data	
type	intensity difference
version	line beam
light source	pulsed red laser diode
sensing distance Tw	3 ... 150 mm
optimum operating distance	35 ... 45 mm
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Pot, 5 turn
laser class	2
distance to laser focus	40 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	16,3 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C

connection diagrams

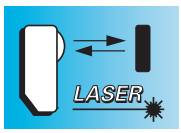
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

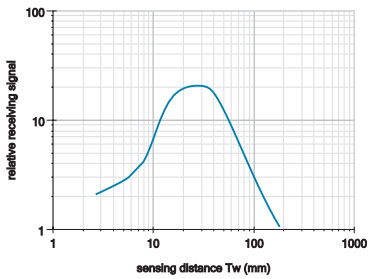
laser warning



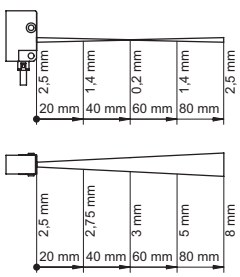
order reference	connection types	output circuit	protection class
OZDK 10N5150	cable 4 pin	NPN	IP 65
OZDK 10N5150/S35A	connector M8, 4 pin	NPN	IP 67
OZDK 10P5150	cable 4 pin	PNP	IP 65
OZDK 10P5150/S35A	connector M8, 4 pin	PNP	IP 67



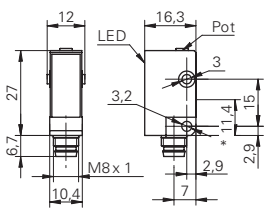
relative receiving signal



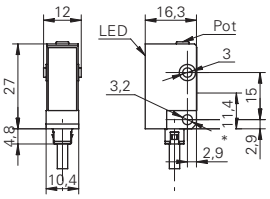
beam characteristic



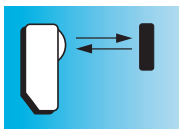
dimension drawings



* emitter axis



* emitter axis



Tw = 30 ... 250 mm

- rugged miniature metal housing
- sensing distance adjustable via potentiometer

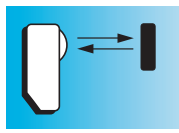
general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	30 ... 250 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 5 turn
wave length	880 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

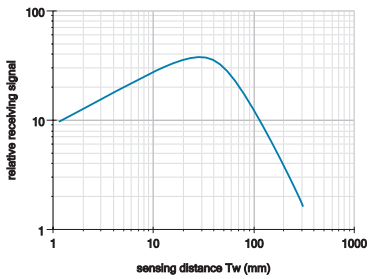
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

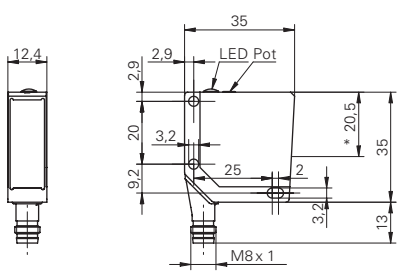
order reference	connection types	output circuit
FZDM 12N5101	cable 4 pin	NPN
FZDM 12N5101/S35A	connector M8, 4 pin	NPN
FZDM 12P5101	cable 4 pin	PNP
FZDM 12P5101/S35A	connector M8, 4 pin	PNP



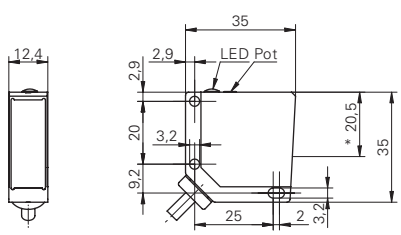
relative receiving signal



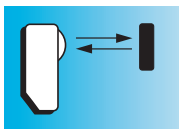
dimension drawings



* emitter axis



* emitter axis

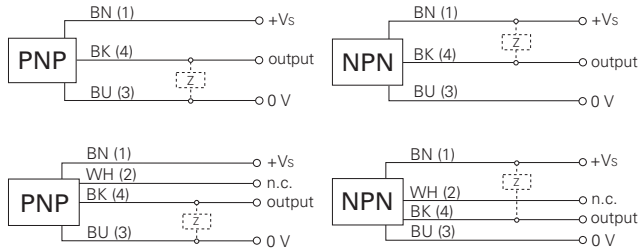


Tw = 30 ... 200 mm

- rugged metal housing
- sensing distance adjustable via potentiometer
- suppression of mutual optical interference

general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	30 ... 200 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	42 mA
current consumption typ.	24 mA
voltage drop Vd	< 1,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12 mm
type	cylindrical
housing material	brass nickel plated
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

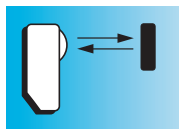
connection diagrams



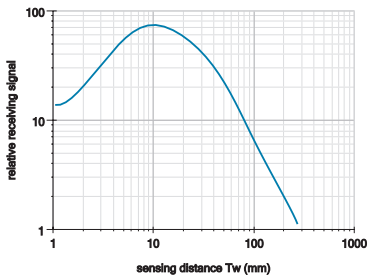
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151720
for details, see accessories section	

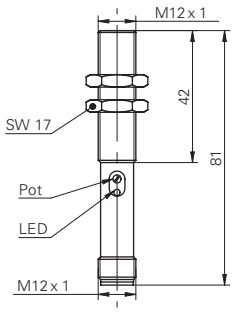
order reference	height / length	connection types	output circuit	output function
FZAM 12N1104	70 mm	cable 3 pin	NPN	light operate
FZAM 12N1104/S14	80 mm	connector M12, 4 pin	NPN	light operate
FZAM 12N3104	70 mm	cable 3 pin	NPN	dark operate
FZAM 12N3104/S14	80 mm	connector M12, 4 pin	NPN	dark operate
FZAM 12P1104	70 mm	cable 3 pin	PNP	light operate
FZAM 12P1104/S14	80 mm	connector M12, 4 pin	PNP	light operate
FZAM 12P3104	70 mm	cable 3 pin	PNP	dark operate
FZAM 12P3104/S14	80 mm	connector M12, 4 pin	PNP	dark operate

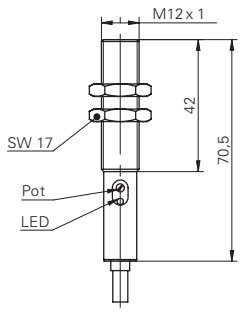


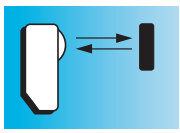
relative receiving signal



dimension drawings







Tw = 5 ... 600 mm

- long sensing range
- sensing distance adjustable via potentiometer
- suppression of mutual optical interference

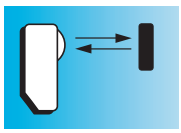
general data	
type	intensity difference
light source	pulsed red LED
sensing distance Tw	5 ... 600 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

order reference	output circuit
FZDK 14N5101/S35A	NPN
FZDK 14P5101/S35A	PNP

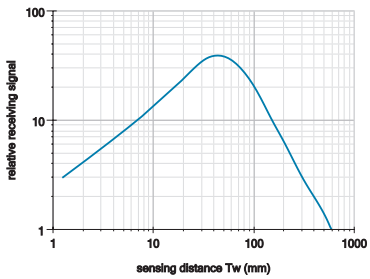
connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

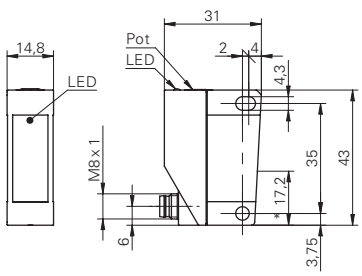
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	



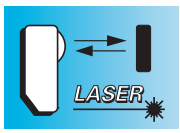
relative receiving signal



dimension drawing



* emitter axis



Tw = 20 ... 300 mm

- very short response time
- high repeatability
- sensing distance adjustable via Teach-in

general data	
type	intensity difference
light source	pulsed red laser diode
sensing distance Tw	20 ... 300 mm
repeatability	< 0,2 mm at laser focus
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Teach-in
laser class	2
distance to laser focus	115 mm
wave length	650 nm
electrical data	
response time / release time	< 0,15 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 2,2 VDC
output function	light operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

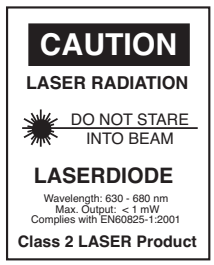
order reference	output circuit
OZDK 14N1901/S35A	NPN
OZDK 14P1901/S35A	PNP

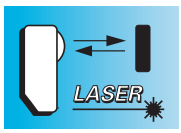
connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

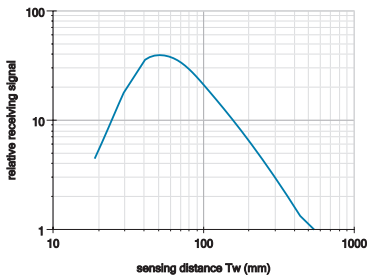
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

laser warning

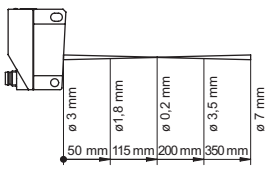




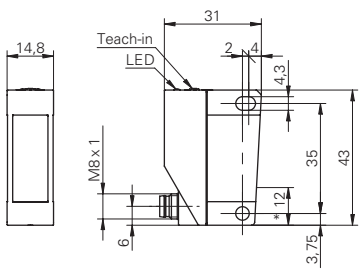
relative receiving signal



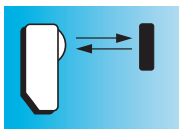
beam characteristic



dimension drawing



* emitter axis



Tw = 0 ... 400 mm

- rugged metal housing
- sensing distance adjustable via potentiometer

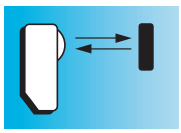
general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	0 ... 400 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	41 mA
current consumption typ.	29 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

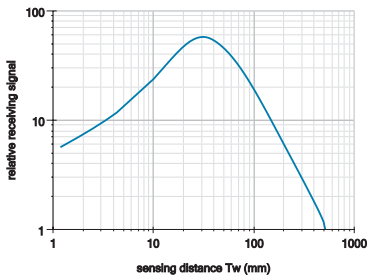
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
for details, see accessories section	

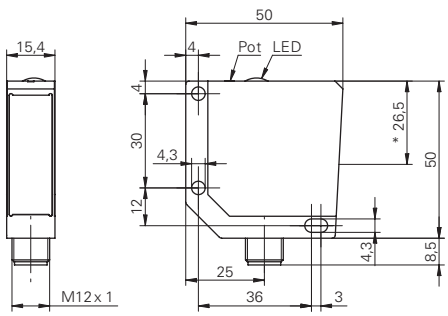
order reference	connection types	output circuit
FZDM 16N5101	cable 4 pin	NPN
FZDM 16N5101/S14	connector M12, 4 pin	NPN
FZDM 16P5101	cable 4 pin	PNP
FZDM 16P5101/S14	connector M12, 4 pin	PNP



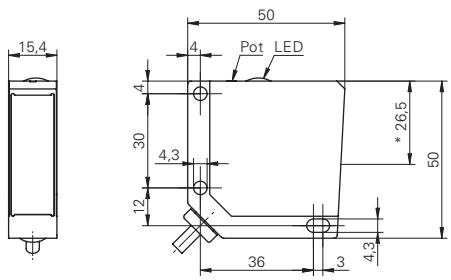
relative receiving signal



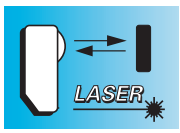
dimension drawings



* emitter axis



* emitter axis

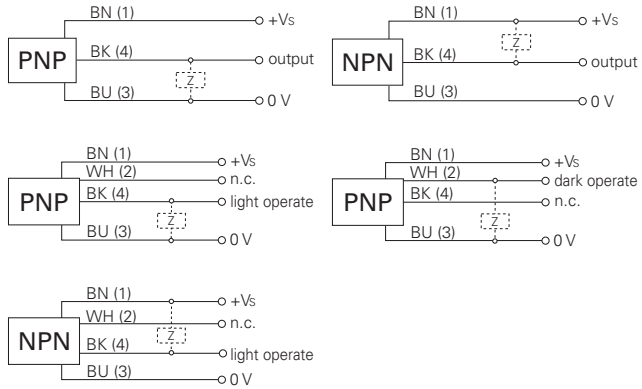


Tw = 0 ... 250 mm

- rugged metal housing
- high repeatability
- very short response time

general data	
type	intensity difference
light source	pulsed red laser diode
sensing distance Tw	0 ... 250 mm
optimum operating distance	40 ... 80 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
sensitivity adjustment	Pot, 14 turn
laser class	2
distance to laser focus	80 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	12 ... 30 VDC
current consumption max.	65 mA
current consumption typ.	60 mA
voltage drop Vd	< 1,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

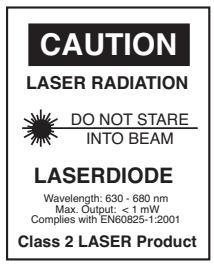
connection diagrams



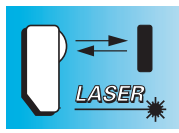
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

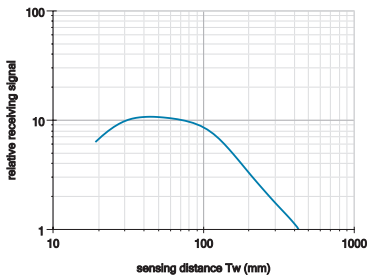
laser warning



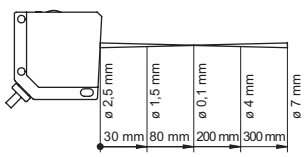
order reference	connection types	output circuit	output function
OZDM 16N1001	cable 3 pin	NPN	light operate
OZDM 16N1001/S14	connector M12, 4 pin	NPN	light operate
OZDM 16P1001	cable 3 pin	PNP	light operate
OZDM 16P1001/S14	connector M12, 4 pin	PNP	light operate
OZDM 16P3001	cable 3 pin	PNP	dark operate
OZDM 16P3001/S14	connector M12, 4 pin	PNP	dark operate



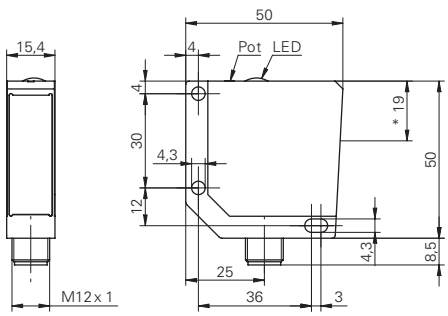
relative receiving signal



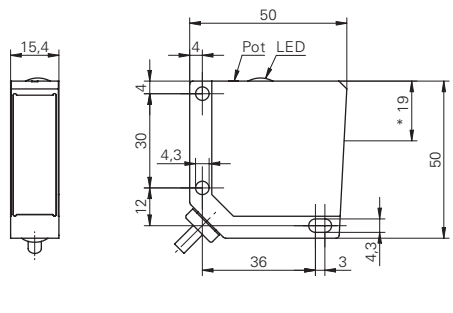
beam characteristic



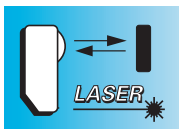
dimension drawings



* emitter axis



* emitter axis



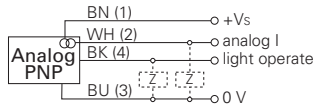
Tw = 0 ... 250 mm

- with analog output
- high repeatability
- very short response time

general data	
type	intensity difference
light source	pulsed red laser diode
sensing distance Tw	0 ... 250 mm
optimum operating distance	40 ... 80 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
sensitivity adjustment	Pot, 14 turn
laser class	2
distance to laser focus	80 mm
wave length	675 nm
electrical data	
response time / release time	< 0,1 ms
voltage supply range +Vs	12 ... 30 VDC
current consumption max.	65 mA
current consumption typ.	60 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output circuit	PNP / analog 4 ... 20 mA
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

order reference	connection types
OZDM 16P1901	cable 4 pin
OZDM 16P1901/S14	connector M12, 4 pin

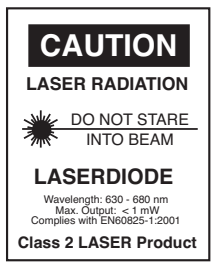
connection diagram

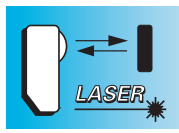


connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

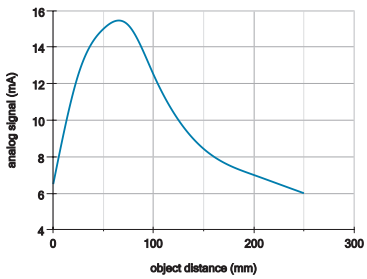
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

laser warning

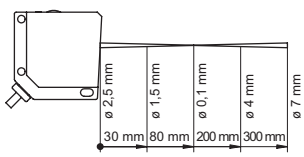




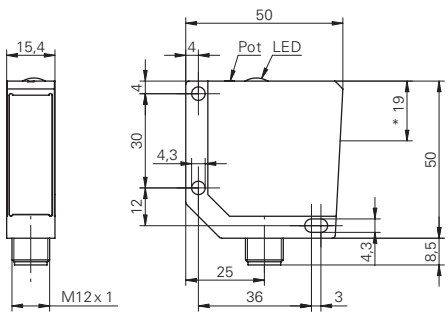
signal progression



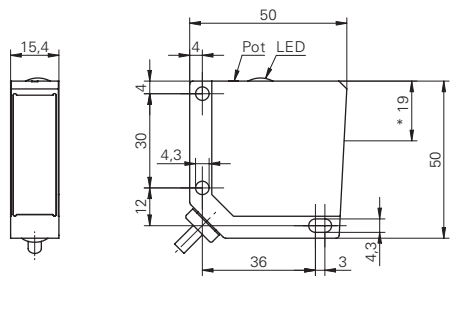
beam characteristic



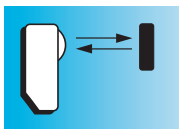
dimension drawings



* emitter axis



* emitter axis



Tw = 60 ... 430 mm

- with alarm output
- sensing distance adjustable via Teach-in
- extended sensing distance with lens

general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	60 ... 430 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	880 nm
suppression of reciprocal influence	yes
sensing distance Tw (with doubling lense)	80 ... 800 mm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	55 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate alarm
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67

connection diagrams

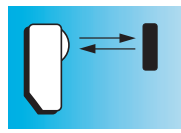
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151658
glass cover	103068
doubling lens	107250
cap nut	115913
for details, see accessories section	

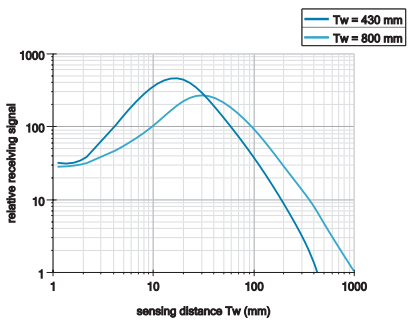
remarks

With doubling lens / cap nut, the sensing distance can be doubled.

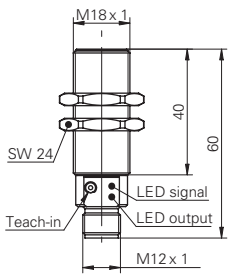
order reference	height / length	connection types	output circuit
FZAM 18N6460	50 mm	cable 4 pin	NPN
FZAM 18N6460/S14	60 mm	connector M12, 4 pin	NPN
FZAM 18P6460	50 mm	cable 4 pin	PNP
FZAM 18P6460/S14	60 mm	connector M12, 4 pin	PNP

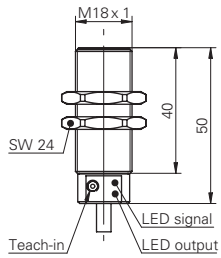


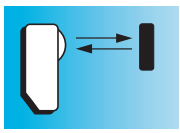
relative receiving signal



dimension drawings







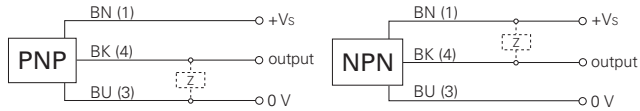
Tw = 20 ... 150 mm

- rugged metal housing
- sensing distance adjustable with potentiometer (axial)
- extended sensing distance with lens

general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	20 ... 150 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 15 turn
wave length	880 nm
suppression of reciprocal influence	yes
sensing distance Tw (with doubling lense)	30 ... 280 mm
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
height / length	50 mm
type	cylindrical
housing material	brass nickel plated / PC
front (optics)	PC
connection types	cable 3 pin
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65

order reference	output circuit
FZAM 18N1155	NPN
FZAM 18P1155	PNP

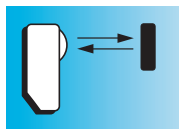
connection diagrams



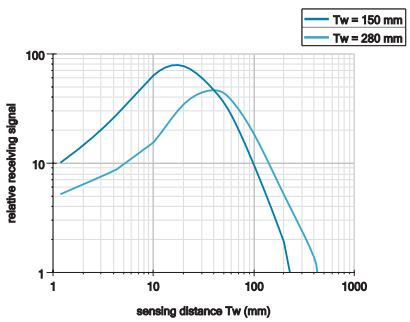
accessories	
SENSOFIX mounting kit	151658
glass cover	103068
doubling lens	107250
cap nut	115913
for details, see accessories section	

remarks

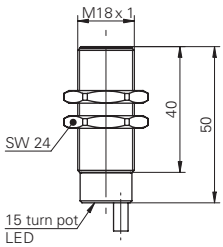
With doubling lens / cap nut, the sensing distance can be doubled.

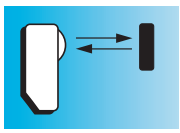


relative receiving signal



dimension drawing



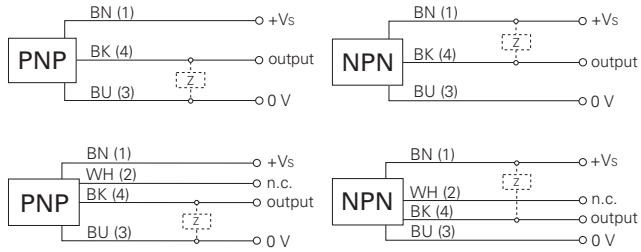


Tw = 60 ... 430 mm

- rugged metal housing
- sensing distance adjustable with radially mounted potentiometer

general data	
type	intensity difference
light source	pulsed infrared diode
sensing distance Tw	60 ... 430 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	880 nm
suppression of reciprocal influence	yes
sensing distance Tw (with doubling lense)	80 ... 800 mm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67

connection diagrams



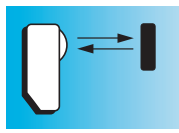
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151658
glass cover	103068
doubling lens	107250
cap nut	115913
for details, see accessories section	

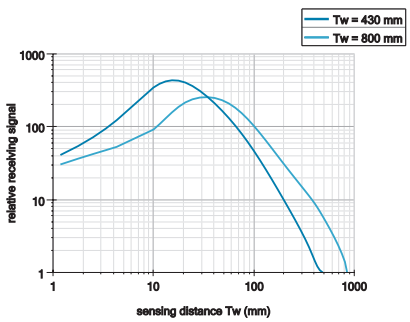
remarks

With doubling lens / cap nut, the sensing distance can be doubled.

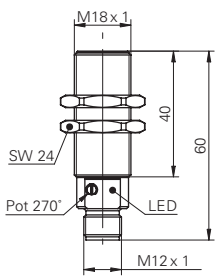
order reference	height / length	connection types	output circuit
FZAM 18N1150	50 mm	cable 3 pin	NPN
FZAM 18N1150/S14	60 mm	connector M12, 4 pin	NPN
FZAM 18P1150	50 mm	cable 3 pin	PNP
FZAM 18P1150/S14	60 mm	connector M12, 4 pin	PNP

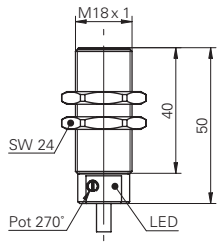


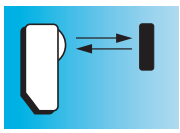
relative receiving signal



dimension drawings







Tw = 5 ... 500 mm

- cross-technology housing concept
- sensing distance adjustable via potentiometer
- small mounting depth

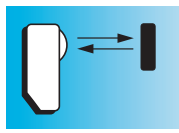
general data	
type	intensity difference
light source	pulsed red LED
sensing distance Tw	5 ... 500 mm
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	22 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	20 mm
height / length	42 mm
depth	15 mm
type	rectangular
housing material	plastic (PBT-ASA)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

order reference	output circuit
FZDK 20N5101/S35A	NPN
FZDK 20P5101/S35A	PNP

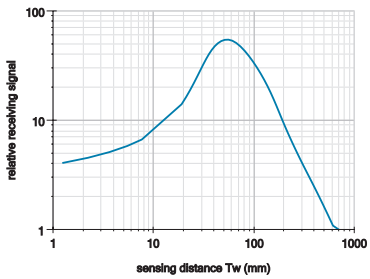
connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

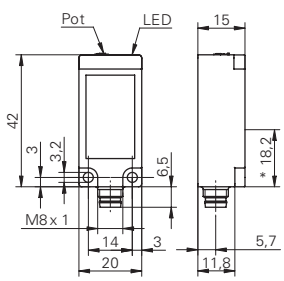
accessories	
SENSOFIX mounting kit	150326
for details, see accessories section	



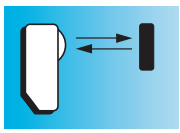
relative receiving signal



dimension drawing



* emitter axis



Tw = 100 ... 1500 mm

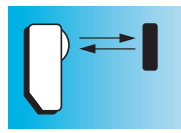
- rugged metal housing
- long sensing range

general data	
type	intensity difference
light source	pulsed infrared diode
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 15 turn
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	60 mA
current consumption typ.	50 mA
voltage drop Vd	< 2,5 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	30 mm
height / length	66 mm
type	cylindrical
housing material	brass nickel plated
front (optics)	PC
connection types	cable 4 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 65

connection diagrams

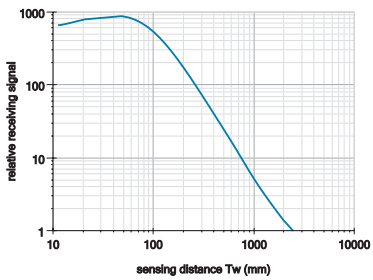
accessories	
glass cover	103226
doubling lens	107408
cap nut	102801
for details, see accessories section	

order reference	sensing distance Tw	output circuit	response time / release time
FZAM 30N5002	300 ... 1500 mm	NPN	< 2,5 ms
FZAM 30N5003	100 ... 700 mm	NPN	< 0,25 ms
FZAM 30P5002	300 ... 1500 mm	PNP	< 2,5 ms
FZAM 30P5003	100 ... 700 mm	PNP	< 0,25 ms

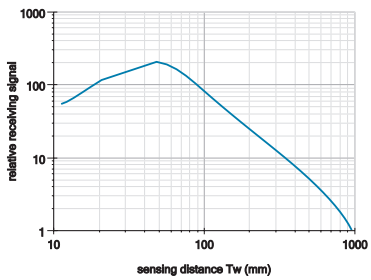


relative receiving signal

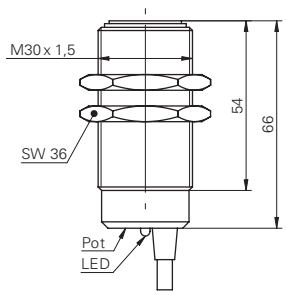
Tw = 300 ... 1500 mm



Tw = 100 ... 700 mm



dimension drawing

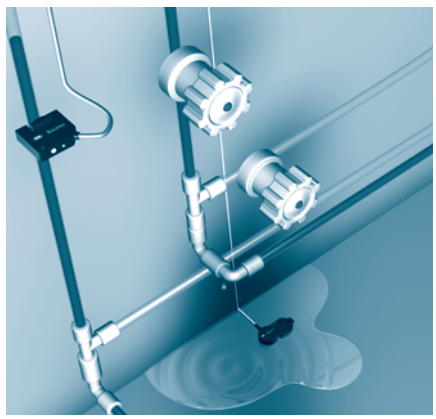


product family	FFAK 17	FFAK 17	FFAK 16	FFAM 17	FFAM 16	FFDK 16	FODK 23
							
width / diameter	30 mm	30 mm	30 mm	30 mm	30 mm	16 mm	23 mm
response time / release time						< 2 ms	< 1 ms
sensitivity adjustment	no	Pot	no	Pot	Pot	no	no
NPN	■	■	■				
PNP	■	■	■	■	■	■	■
cable	■	■	■	■	■	■	■
housing material	plastic	plastic	plastic	metal	metal	plastic	plastic
Page	**344**	**345**	**346**	**347**	**348**	**349**	**350**

Level monitoring/leak sensors

General information

With optical level monitoring and leak sensors, liquids can be easily and reliably detected without the need of an electrical connection or mechanical movement between the liquid and the sensor. There are two possible principles of detection: the sensor is in direct contact with the liquid or it is fastened to a hose or stand pipe to detect the level without contact. The available fiber optic versions permit level and leak control in constricted surroundings and even in hazardous zones.



Typical applications

The chemical resistance of the sensors permits versatile applications:

- Level monitoring of liquids such as
  - acetone
  - acids, e.g. hydrochloric, sulfuric or battery acid
  - alkalis
  - mineral oil
  - milk
  - all non-conductive liquids
- Contact free level detection in (semi) transparent hoses and stand pipes
- Detection of the minimum and maximum levels in trays and tanks
- Leak monitoring of oil trays or lubricant tanks
- Monitoring of leaked liquids in dispensers and other liquid handling systems

Characteristics and advantages of level monitoring sensors

Chemical resistance
The sensor housings are made of polysulfonide or stainless steel and are resistant to certain liquids.

Detectable media
As optical light is used to detect the liquid, various and non-conductive liquids can be detected.

Simple commissioning
It is unnecessary to adjust sensors with integrated electronics. With fiber optics, the adjustment is made via a fiber optic sensor.

Hazardous environments
The intrinsically safe fiber optic version with Teflon PFA coating can also be used in hazardous environments.

Characteristics and advantages of leak sensors

Detectable media
As optical light is used to detect the liquid, various and non-conductive liquids can be detected. Typically, 1ml of leaked liquid is sufficient to initiate an alarm.

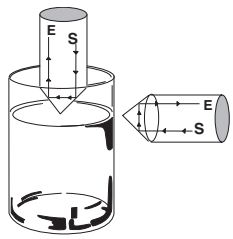
Failsafe facility
The integrated failsafe facility triggers an alarm on leaks, cable rupture, detachment from the fastening or if the sensor is defective.

Hazardous environments
The intrinsically safe fiber optic version with Teflon PFA coating can also be used in hazardous environments.

Technology and operation

Level monitoring and leak sensors in contact with the liquid

The operating principles of both types of sensor are shown in the sketch below. The critical angle for total reflection changes depending on whether the sensor tip is surrounded by water or air. If the sensor tip is surrounded by a liquid, the light beam is refracted by the liquid and the sensor output changes its state. The liquid medium may be electrically conductive, turbid or clear. The same operating principle is employed for the leak sensors. Only the volume of the liquid is different. Typically, as little as 1ml of a liquid can be detected.

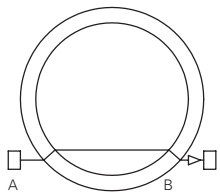


Level not reached

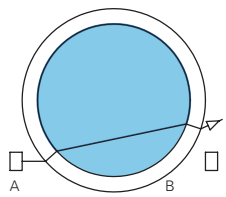
Level reached

Level monitoring sensors without contact with the liquid

The level monitoring sensors for hose or stand pipe mounting operate by a similar principle. For example, the FFDK 16 also exploits the refractive properties of liquids. In a state without the liquid, the emitted light (A) impinges directly on the receiver (B). If the liquid enters the detection range, a part of the emitted light is refracted, so that less light impinges on the receiver. This change in the light can be assessed by the sensor.

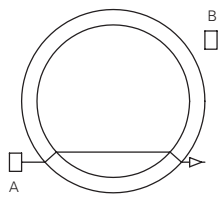


Level not reached

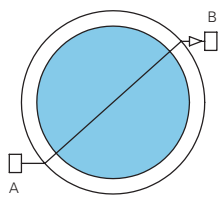


Level reached

With the fiber optic version FSL 500C6Y00, the principle is exactly the opposite. In a state without the liquid, no light impinges on the receiver (B). It is only when liquid enters the detection range of the array that a part of the emitted light (A) is diverted to the receiver (B). This change in the light can be assessed by the receiver. The advantage of the array configuration with a monitoring range of approx. 5 mm is that interference caused by foam and small air bubbles can be suppressed by a powerful fiber optic sensor.



Level not reached

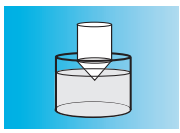


Level reached

Mounting and adjustment

Level monitoring sensors for hose/stand pipe mounting:
The sensors can very easily be attached to a hose or stand pipe with cable ties. A separate bracket or other holder is unnecessary. No adjustments must be made to the FFDK 16 with integrated electronics. It is only necessary to choose between light and dark switching. With the fiber optic version FSL, the adjustment is made via a fiber optic sensor.

Leak sensors:
The leak sensors can be screwed directly to the floor or on a base. No adjustments must be made to the sensor FODK 23. With the fiber optic version FOC, the adjustment is made via a fiber optic sensor. The sensors can be very easily released from their holders for cleaning purposes move to beginning of sentence.

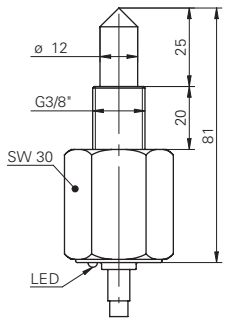


- chemical resistance
- up to 10 bar nominal pressure

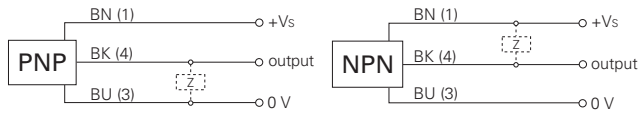
general data	
type	Liquid level sensor
light source	pulsed infrared diode
nominal pressure (probe tip)	10 bar
output indicator	LED red
sensitivity adjustment	no
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	15 mA
voltage drop Vd	< 2 VDC
output function	normally open (NO)
output current	< 200 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	30 mm
height / length	81 mm
type	cylindrical
material (sensing device)	polysulphone
housing material	polysulphone
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 67

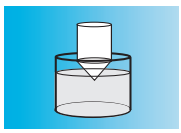
order reference	output circuit
FFAK 17NTD1001/L	NPN
FFAK 17PTD1001/L	PNP

dimension drawing



connection diagrams

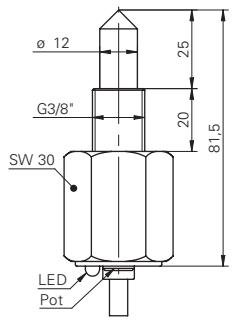




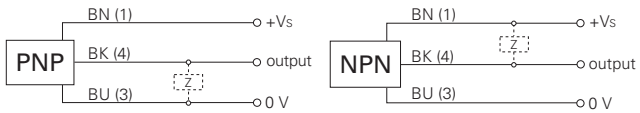
- sensitivity adjustable
- chemical resistance
- up to 10 bar nominal pressure

general data	
type	Liquid level sensor
light source	pulsed infrared diode
nominal pressure (probe tip)	10 bar
output indicator	LED red
sensitivity adjustment	Pot
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	15 mA
voltage drop Vd	< 2 VDC
output function	normally open (NO)
output current	< 200 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	30 mm
height / length	81,5 mm
type	cylindrical
material (sensing device)	polysulphone
housing material	polysulphone
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 67

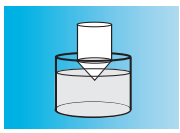
dimension drawing



connection diagrams



order reference	output circuit
FFAK 17NTD1002/L	NPN
FFAK 17PTD1002/L	PNP

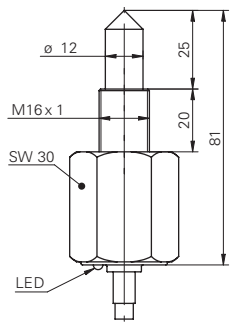


- with thread M16x1
- chemical resistance
- up to 10 bar nominal pressure

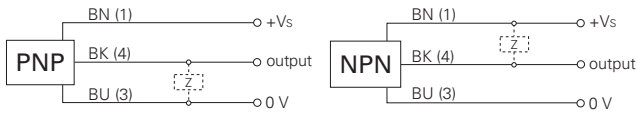
general data	
type	Liquid level sensor
light source	pulsed infrared diode
nominal pressure (probe tip)	10 bar
output indicator	LED red
sensitivity adjustment	no
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	15 mA
voltage drop Vd	< 2 VDC
output function	normally open (NO)
output current	< 200 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	30 mm
height / length	81 mm
type	cylindrical
material (sensing device)	polysulphone
housing material	polysulphone
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 67

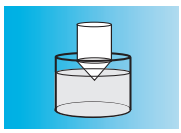
order reference	output circuit
FFAK 16NTD1001/L	NPN
FFAK 16PTD1001/L	PNP

dimension drawing



connection diagrams



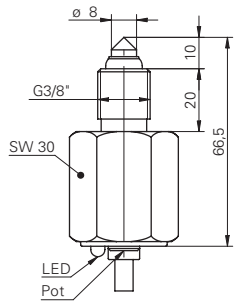


- rugged metal housing
- chemical resistance
- up to 40 bar nominal pressure

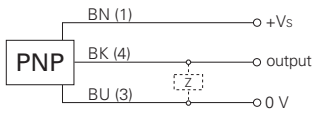
general data	
type	Liquid level sensor
light source	pulsed infrared diode
nominal pressure (probe tip)	40 bar
output indicator	LED yellow
sensitivity adjustment	Pot
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	15 mA
voltage drop Vd	< 2 VDC
output function	normally open (NO)
output circuit	PNP
output current	< 200 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	30 mm
height / length	66,5 mm
type	cylindrical
material (sensing device)	glass (borosilicate)
housing material	stainless steel DIN 1.4305/AISI 303
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 67

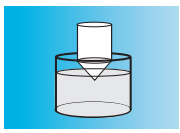
order reference
FFAM 17PTD1002/L

dimension drawing



connection diagram



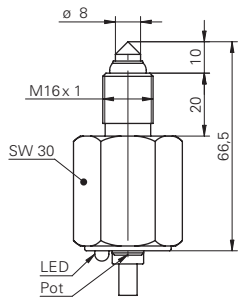


- with thread M16x1
- rugged metal housing
- up to 40 bar nominal pressure

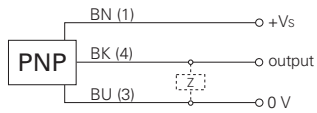
general data	
type	Liquid level sensor
light source	pulsed infrared diode
nominal pressure (probe tip)	40 bar
output indicator	LED yellow
sensitivity adjustment	Pot
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	15 mA
voltage drop Vd	< 2 VDC
output function	normally open (NO)
output circuit	PNP
output current	< 200 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	30 mm
height / length	66,5 mm
type	cylindrical
material (sensing device)	glass (borosilicate)
housing material	stainless steel DIN 1.4305/AISI 303
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 67

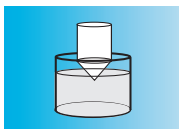
order reference
FFAM 16PTD1002/L

dimension drawing



connection diagram



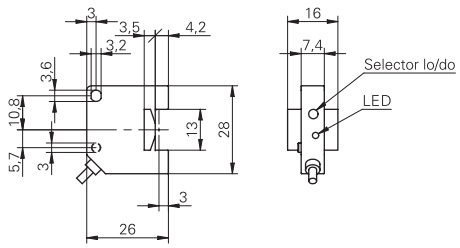


- Liquid level sensor for pipe mounting
- pipe diameter from 8 ... 13mm
- easy setup - no adjustment necessary

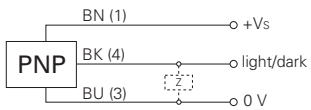
general data	
type	Liquid level sensor
light source	pulsed infrared diode
output indicator	LED red
sensitivity adjustment	no
wave length	950 nm
max. outer diameter of the pipe / tube	8 ... 13 mm
max. thickness of the pipe / tube	1 mm
electrical data	
response time / release time	< 2 ms
voltage supply range +Vs	9 ... 30,8 VDC
current consumption max.	25 mA
voltage drop Vd	< 1 VDC
output function	light / dark operate switchable
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	16 mm
height / length	28 mm
depth	26 mm
type	rectangular
housing material	PC
connection types	cable 3 pin
ambient conditions	
operating temperature	-10 ... +55 °C
protection class	IP 50

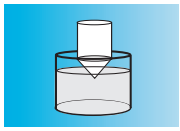
order reference
FFDK 16P50Y0

dimension drawing



connection diagram



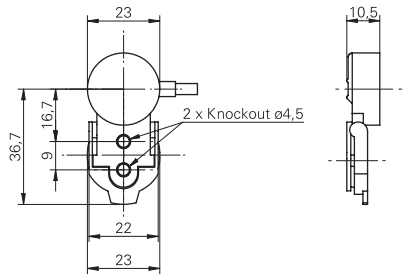


- leakage sensor with integrated electronics
- detects liquid amounts of approx. 1 ml
- chemical resistance thanks to Teflon PFA sheath

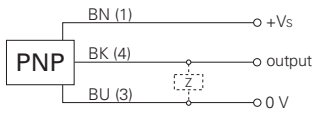
general data	
type	Leakage sensor
light source	pulsed red LED
output indicator	LED orange
light indicator	LED green
sensitivity adjustment	no
wave length	645 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	30 mA
voltage drop Vd	< 1 VDC
output function	normally closed (NC)
output circuit	PNP
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	23 mm
height / length	10,5 mm
depth	37,2 mm
type	rectangular
material (sensing device)	teflon PFA
housing material	Teflon PFA
connection types	cable 3 pin
ambient conditions	
operating temperature	-25 ... +50 °C
protection class	IP 67

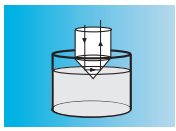
order reference
FODK 23P90Y0

dimension drawing



connection diagram



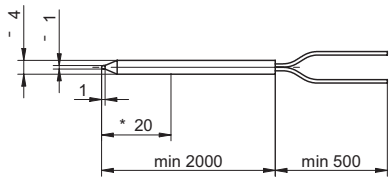


Fiber optic level sensor FUL

- the special sensor tip prevents drop formation
- high chemical resistance

general data	
type	liquid level sensor
optical fiber length	2 m
mechanical data	
type	cylindrical
min. bending radius	30 mm
tensile strength	5 N
optical fiber material	Teflon® PFA
ambient conditions	
operating temperature	-30 … +105 °C
order reference	
FUL 200D2Y00	(use with fiber optic sensor FVDK 67 / FVDK 69)

dimension drawing

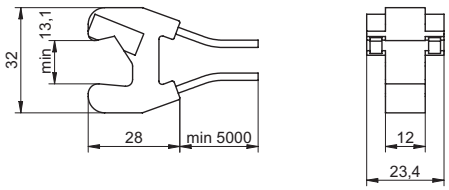


Fiber optic level sensor for stand pipe mounting FSL

- fine light curtain suppresses foam/air bubbles
- diameter of the pipe/tube 3 ... 13 mm

general data	
type	liquid level sensor
optical fiber length	5 m
max. outer diameter of the pipe/tube	3 ... 13 mm
max. thickness of the pipe/tube	1 mm
mechanical data	
type	rectangular
min. bending radius	4 mm
tensile strength	20 N
optical fiber material	PMMA, PFA coated
housing material	PEI / PC
ambient conditions	
operating temperature	-30 … +70 °C
order reference	
FSL 500C6Y00	(use with fiber optic sensor FVDK 67 / FVDK 69)

dimension drawing

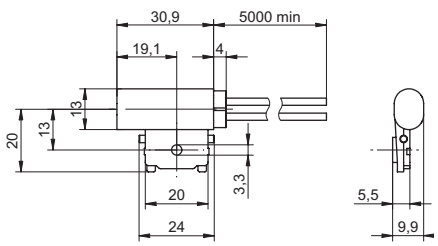


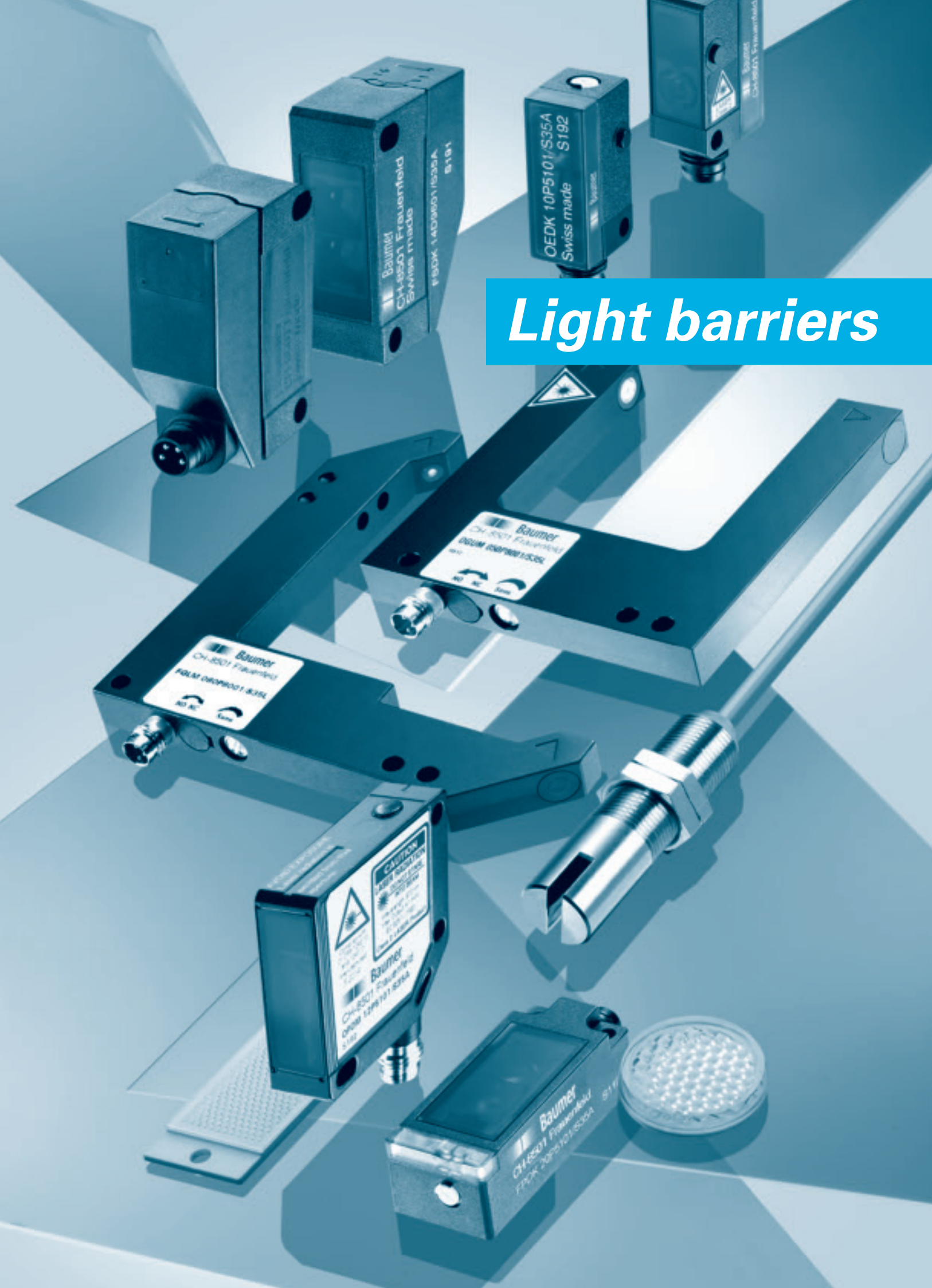
Fiber optic leak sensor FOC

- detects typical liquid volumes of 1 ml
- high chemical resistance

general data	
type	leakage sensor
optical fiber length	5 m
mechanical data	
type	rectangular
min. bending radius	20 mm
tensile strength	10 N
optical fiber material	PE, PFA coated
housing material	Teflon® PFA
ambient conditions	
operating temperature	-30 … +70 °C
order reference	
FOC 500C6Y00	(use with fiber optic sensor FVDK 67 / FVDK 69)

dimension drawing




Light barriers

red light LED version

product family	FPCK 07	FPDK 07	FPDK 10	FPDM 12	FPDK 14	FRDK 14	FPDM 16
							
						IO-Link	
for transparent objects						■	
version					single lens optics		
width / diameter	8 mm	8 mm	10,4 mm	12,4 mm	14,8 mm	14,8 mm	15,4 mm
actual range Sb	0,5 m	0,5 m	1,8 m	5,1 m	4 m 7,2 m	1 m	7,3 m
response time / release time	< 0,5 ms	< 0,5 ms	< 1 ms	< 1 ms	< 1 ms	< 0,1 ms	< 1 ms
sensitivity adjustment	Teach-in	Teach-in	no	no Pot, 5 turn	no	Teach-in	no Pot, 10 turn
NPN	■	■	■	■	■	■	■
PNP	■	■	■	■	■	■	■
cable	■	■	■	■			■
connector	■	■	■	■	■	■	■
housing material	plastic	plastic	plastic	metal	plastic	plastic	metal
Page	**358**	**360**	**362**	**364**	**368**	**370**	**376**

laser version

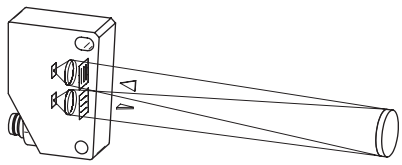
product family	OPDM 12	OPDK 14	OPDK 14	OPDM 16
				
for transparent objects			■	
version	single lens optics	single lens optics	single lens optics	
width / diameter	12,4 mm	14,8 mm	14,8 mm	15,4 mm
actual range Sb	1 m 5 m 11 m	10 m	1 m	1 m 11 m
response time / release time	< 0,05 ms < 0,1 ms	< 0,25 ms	< 0,25 ms	< 0,1 ms
sensitivity adjustment	no	Teach-in	Teach-in	no Pot, 270°
NPN	■	■		
PNP	■	■	■	■
cable	■			■
connector	■	■	■	■
housing material	metal	plastic	plastic	metal
Page	**366**	**372**	**374**	**380**

FPDM 16	FPAM 18	FPDK 20	FPDK 26
			
■			
15,4 mm	18 mm	20 mm	25 mm
4 m	3,2 m	4,5 m	10 m
< 2,5 ms	< 1 ms	< 0,5 ms	< 1 ms
Teach-in	no	Pot, 270°	Pot, 270°
	■	■	■
■	■	■	■
	■		
■	■	■	■
metal	metal	plastic	plastic
378	**382**	**384**	**386**

Retro-reflective sensors

General information

The emitter and receiver are installed in the same housing. The emitted infrared, red or laser light is returned by a triple reflector or a reflective film to the receiver. The output changes its state when the object breaks the light beam (sensor receives no light).



Applications

- Stack height monitoring
- Detection of objects located at any position on a conveyor belt
- Detection of transparent objects
- Detection of glossy objects on a conveyor belt
- Retro-reflective laser sensors with single-lens optics permit the precise detection of objects through small openings and the smallest distances between the sensor and the reflector.

Characteristics and advantages

Polarizing filter
Permits objects to be detected regardless of the texture and color of the surface. Glossy and reflective objects are also reliably detected.

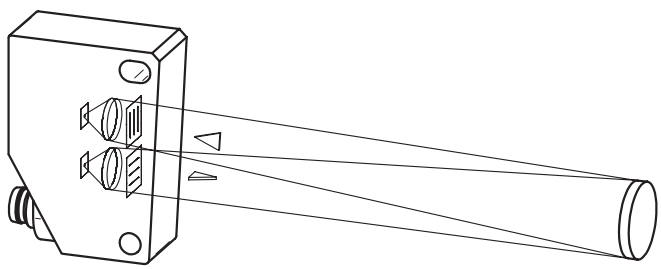
Single-lens optics
The emitted and received beams are on the same axis. The direction of approach of the object is thereby irrelevant and it is possible to view through small openings. Reflectors can also be used in close proximity without a loss of the signal.

Transparent objects
Special versions of retro-reflective sensors can also detect transparent objects such as packaging films, PET bottles and glassware.

Short response times
Retro-reflective laser sensors with response times of 0,05 ms and focused laser beams correctly detect the smallest, quickly-moving objects (0,1 mm diameter).

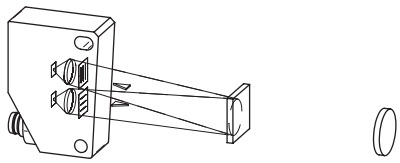
Technology and operation

The polarizing filter permits the emitted light to pass in only one polarization plane. The triple reflector depolarizes the light on reflection. A part of the light reflected back to the receiver passes the second polarization filter, offset by 90°, and is detected by the receiver.



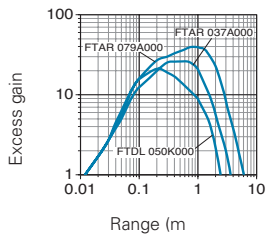
Technology and operation

A glossy object in the light beam reflects the light without changing its polarization plane. This light cannot pass through the polarization filter in front of the receiver. A glossy object therefore also breaks the light beam.

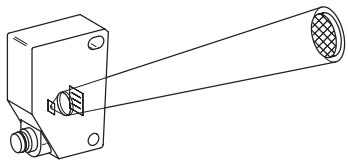


Mounting and adjustment

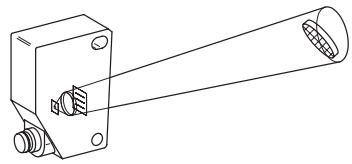
Each sensor has a separate excess gain curve. As the operating reliability depends heavily on the ambient conditions, it must be ensured that the sensor operates with the highest possible excess signal gain.



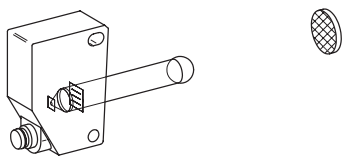
With narrow light beams as used in laser sensors, the size of the light spot on the reflector in relation to the triple structure is important for the choice of the reflector or the reflective film. A spot diameter of up to 1,5 mm, a reflective film should be used, and up to a spot diameter of 3 mm, reflectors with microstructures. It should also be ensured that the reflective film or reflector is not placed close to the focus.

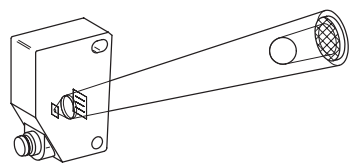


The reflector is aligned and centered.

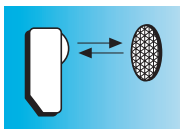


The reflector may not be tilted by more than 15°.





For a correct function, the object must cover the reflector or at least have the size of the beam diameter.

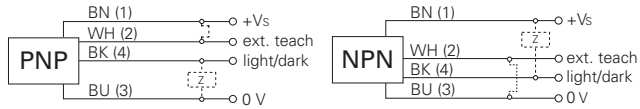


Sb = 0,5 m

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	0,5 m
nominal range Sn	0,6 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	17,8 mm
depth	12,6 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

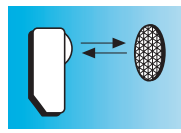
connection diagrams



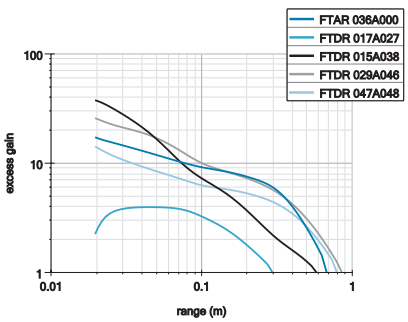
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

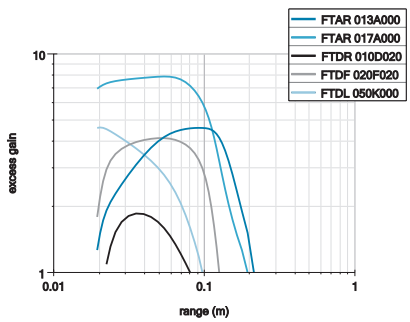
accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

order reference	connection types	output circuit
FPCK 07N6901	cable rear side	NPN
FPCK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FPCK 07P6901	cable rear side	PNP
FPCK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



excess gain curve

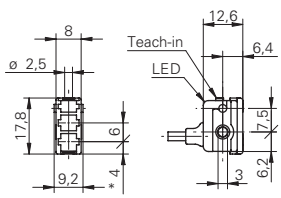




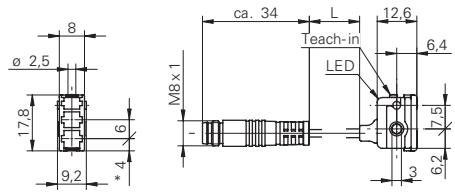
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDL 050K000/... m	tape 50 mm x ... m
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

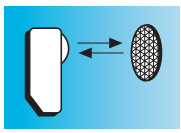
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

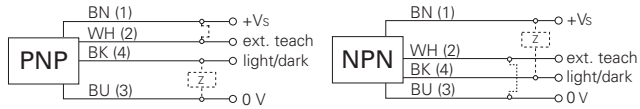


Sb = 0,5 m

- ultra compact housing
- sensing distance adjustable via Teach-in
- suppression of mutual optical interference

general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	0,5 m
nominal range Sn	0,6 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	8 mm
height / length	17,8 mm
depth	12,6 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

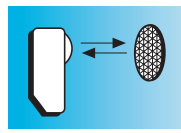
connection diagrams



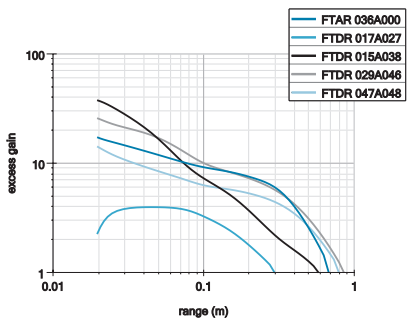
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

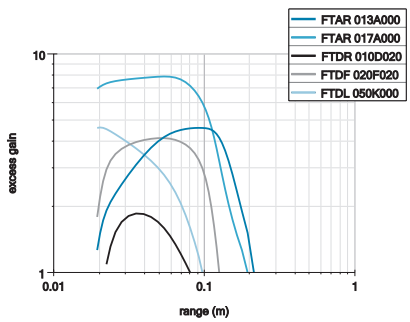
accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

order reference	connection types	output circuit
FPDK 07N6901	cable bottom side	NPN
FPDK 07N6901/KS35A	flylead connector M8, 4 pin	NPN
FPDK 07P6901	cable bottom side	PNP
FPDK 07P6901/KS35A	flylead connector M8, 4 pin	PNP



excess gain curve

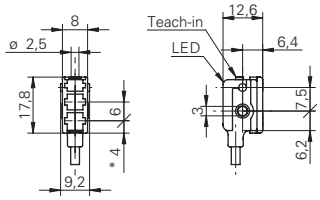




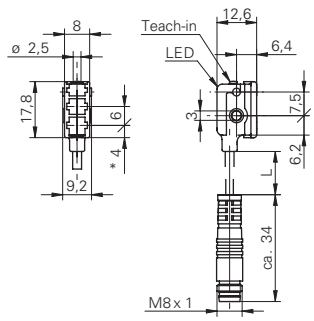
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDL 050K000/... m	tape 50 mm x ... m
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

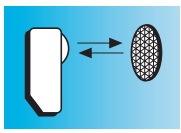
dimension drawings



* emitter axis



* emitter axis cable length L = 200 mm

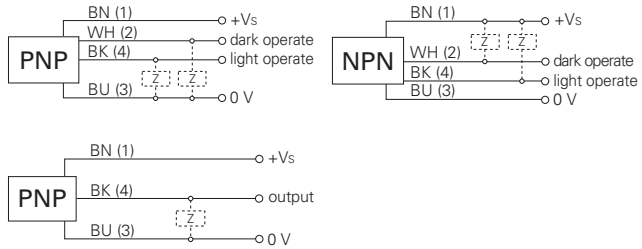


Sb = 1,8 m

- subminiature housing
- polarization filter to detect shiny objects
- suppression of mutual optical interference

general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	1,8 m
nominal range Sn	2,2 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

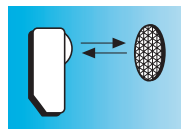
connection diagrams



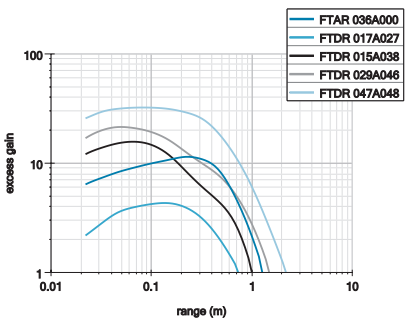
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

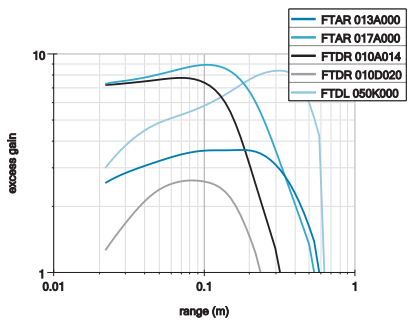
accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

order reference	connection types	output circuit	output function	protection class
FPDK 10N5101	cable 4 pin	NPN	light / dark operate	IP 65
FPDK 10N5101/S35A	connector M8, 4 pin	NPN	light / dark operate	IP 67
FPDK 10P3101/KS35	flylead connector M8, 3 pin	PNP	dark operate	IP 65
FPDK 10P5101	cable 4 pin	PNP	light / dark operate	IP 65
FPDK 10P5101/S35A	connector M8, 4 pin	PNP	light / dark operate	IP 67



excess gain curve

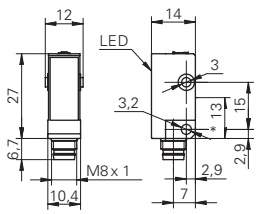




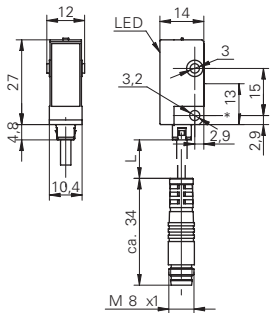
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

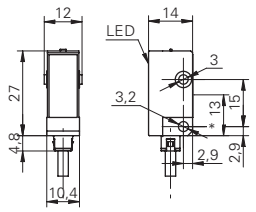
dimension drawings



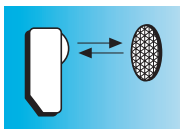
* emitter axis



* emitter axis cable length L = 200 mm



* emitter axis

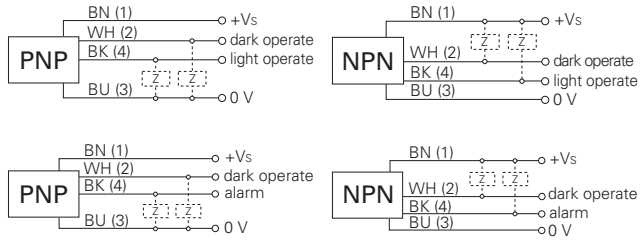


Sb = 5,1 m

- rugged miniature metal housing
- polarization filter to detect shiny objects
- available with alarm output

general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	5,1 m
nominal range Sn	5,5 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
wave length	660 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

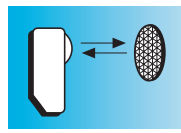
connection diagrams



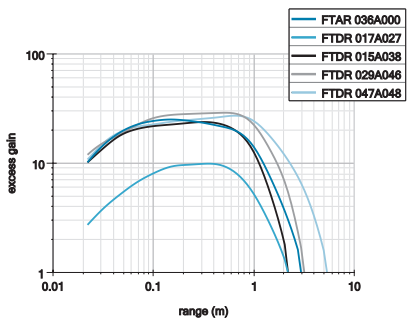
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

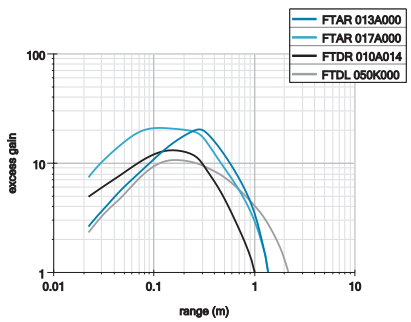
accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

order reference	connection types	output circuit	output function	sensitivity adjustment	suppression of reciprocal influence
FPDM 12N3401	cable 4 pin	NPN	alarm output dark	no	yes
FPDM 12N3401/S35A	connector M8, 4 pin	NPN	alarm output dark	no	yes
FPDM 12N5101	cable 4 pin	NPN	light / dark operate	no	yes
FPDM 12N5101/S35A	connector M8, 4 pin	NPN	light / dark operate	no	yes
FPDM 12P3401	cable 4 pin	PNP	alarm output dark	no	yes
FPDM 12P3401/S35A	connector M8, 4 pin	PNP	alarm output dark	no	yes
FPDM 12P5101	cable 4 pin	PNP	light / dark operate	no	yes
FPDM 12P5101/S35A	connector M8, 4 pin	PNP	light / dark operate	no	yes
FPDM 12P5105/S35A	connector M8, 4 pin	PNP	light / dark operate	Pot, 5 turn	-



excess gain curve

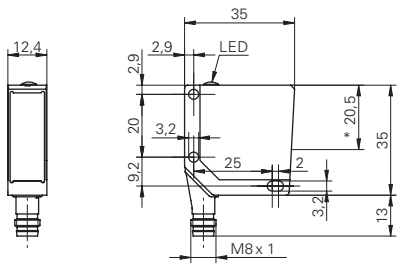




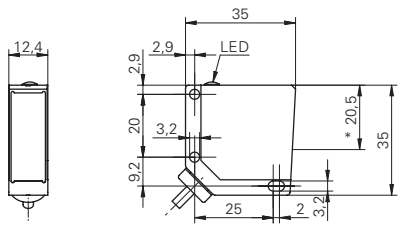
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

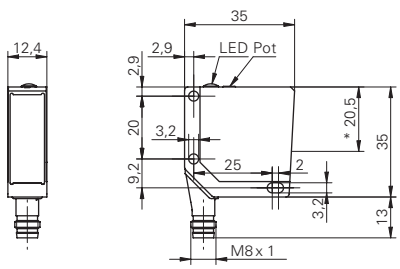
dimension drawings



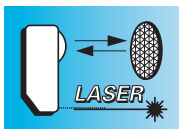
* emitter axis



* emitter axis



* emitter axis



Sb = 11 m

- rugged miniature metal housing
- single lens optics
- short response time

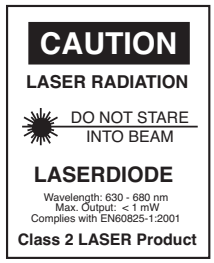
general data	
type	retro-reflective laser sensor
version	single lens optics
light source	pulsed red laser diode
repeatability	< 0,1 mm at laser focus
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	no
laser class	2
wave length	675 nm
actual range Sb = 1 m	
nominal range Sn	1,2 m
distance to laser focus	100 mm
actual range Sb = 5 m	
nominal range Sn	5,5 m
distance to laser focus	400 mm
actual range Sb = 11 m	
nominal range Sn	13 m
distance to laser focus	parallel beam
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

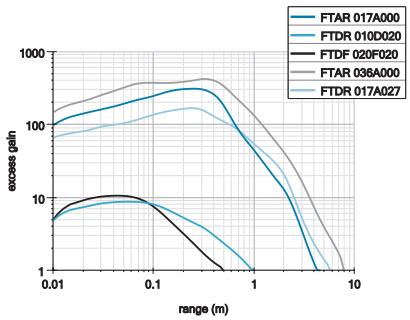
laser warning



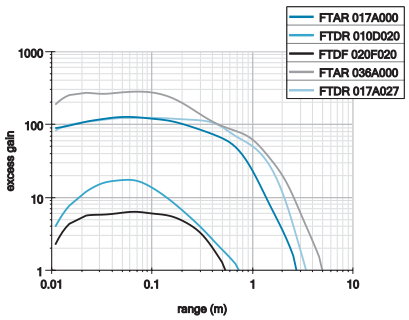
order reference	actual range Sb	connection types	output circuit	response time / release time
OPDM 12N5101	5 m	cable 4 pin	NPN	< 0,1 ms
OPDM 12N5101/S35A	5 m	connector M8, 4 pin	NPN	< 0,1 ms
OPDM 12P5101	5 m	cable 4 pin	PNP	< 0,1 ms
OPDM 12P5101/S35A	5 m	connector M8, 4 pin	PNP	< 0,1 ms
OPDM 12P5102/S35A	1 m	connector M8, 4 pin	PNP	< 0,1 ms
OPDM 12P5103/S35A	11 m	connector M8, 4 pin	PNP	< 0,1 ms
OPDM 12P5104/S35A	1 m	connector M8, 4 pin	PNP	< 0,05 ms

excess gain curve

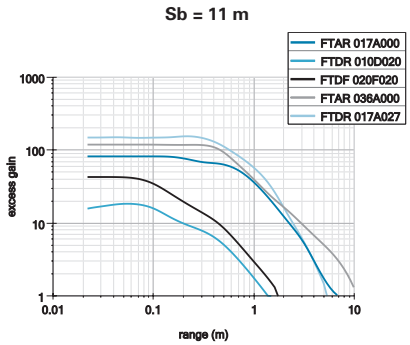
Sb = 5 m



Sb = 1 m



Sb = 11 m

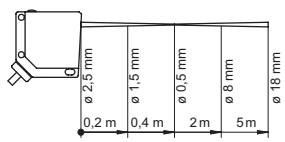


reflectors

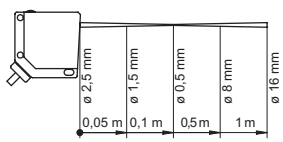
FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

beam characteristic

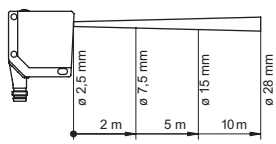
Sb = 5 m



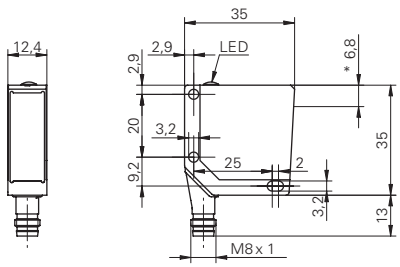
Sb = 1 m



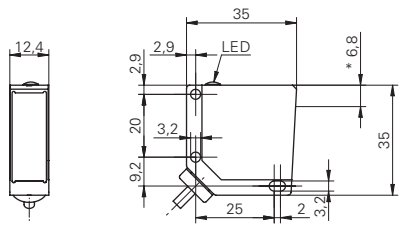
Sb = 11 m



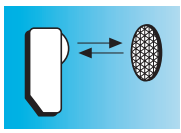
dimension drawings



* emitter and receiver axis



* emitter and receiver axis



Sb = 7,2 m

- polarization filter to detect shiny objects
- single lens optics
- suppression of mutual optical interference

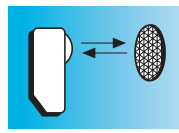
general data	
type	retro-reflective sensor
light source	pulsed red LED
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
wave length	660 nm
suppression of reciprocal influence	yes
actual range Sb = 4 m	
version	single lens optics
nominal range Sn	4,5 m
actual range Sb = 7,2 m	
nominal range Sn	8 m
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

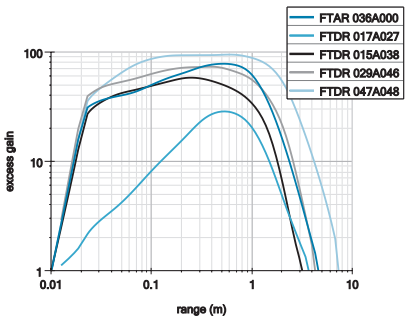
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

order reference	actual range Sb	output circuit
FPDK 14N5101/S35A	7,2 m	NPN
FPDK 14N5111/S35A	4 m	NPN
FPDK 14P5101/S35A	7,2 m	PNP
FPDK 14P5111/S35A	4 m	PNP

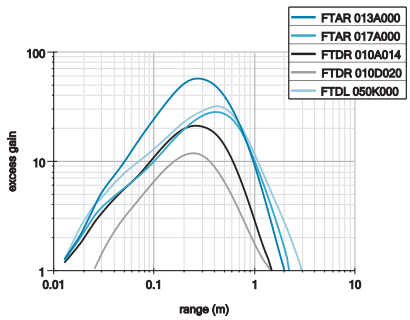


excess gain curve

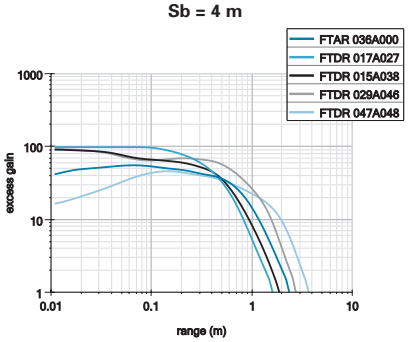
Sb = 7,2 m



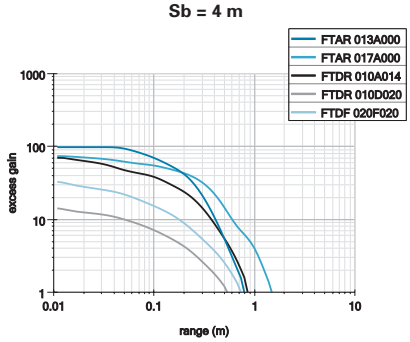
Sb = 7,2 m



Sb = 4 m



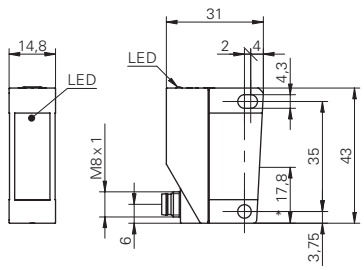
Sb = 4 m



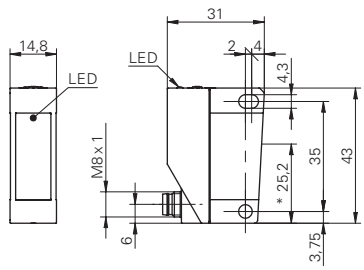
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

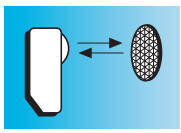
dimension drawings



* emitter axis



* emitter and receiver axis



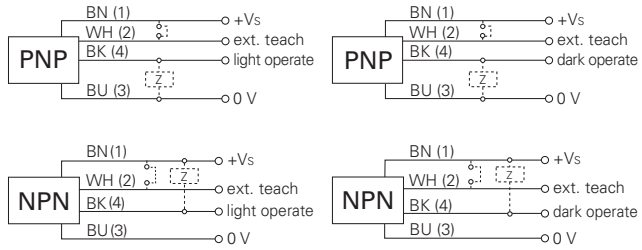
Sb = 1 m

IO-Link

- designed for detection of transparent objects
- sensitivity adjustable via Teach-in
- short response time

general data	
type	retro-reflective sensor
special type	for transparent objects
light source	pulsed red LED
actual range Sb	1 m
nominal range Sn	1,5 m
polarization filter	no
light indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
electrical data	
response time / release time	< 0,1 ms
Teach-in signal time	> 500 µs
adaption time	< 20 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	40 mA
current consumption typ.	35 mA
voltage drop Vd	< 2,2 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

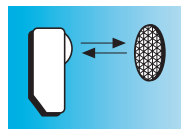
connection diagrams



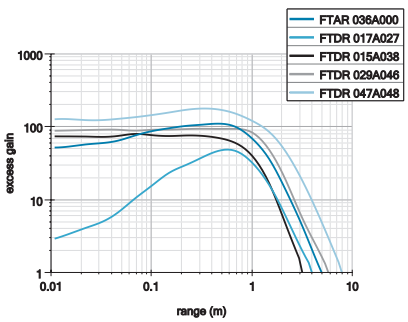
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

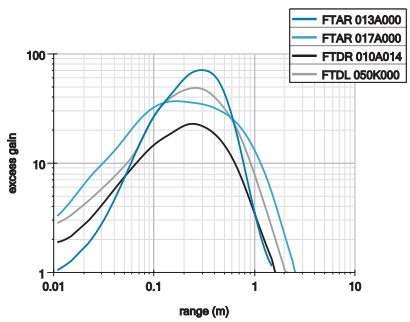
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

order reference	output circuit	output function	teach value stored after power-off
FRDK 14N1902/S35A	NPN	light operate	volatile
FRDK 14N1903/S35A	NPN	light operate	non volatile
FRDK 14N3902/S35A	NPN	dark operate	volatile
FRDK 14N3903/S35A	NPN	dark operate	non volatile
FRDK 14P1902/S35A	PNP	light operate	volatile
FRDK 14P1903/S35A	PNP	light operate	non volatile
FRDK 14P3902/S35A	PNP	dark operate	volatile
FRDK 14P3903/S35A	PNP	dark operate	non volatile



excess gain curve

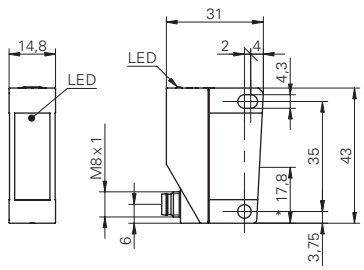




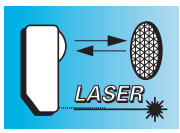
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

dimension drawing



* emitter axis

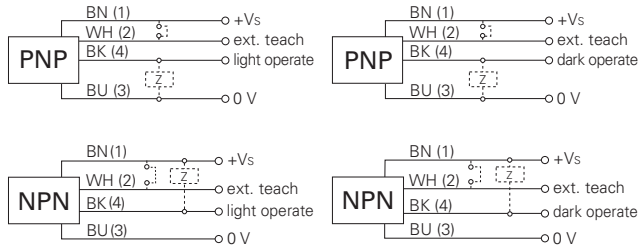


Sb = 10 m

- single lens optics
- long sensing range
- short response time

general data	
type	retro-reflective laser sensor
version	single lens optics
light source	pulsed red laser diode
actual range Sb	10 m
nominal range Sn	11 m
repeatability	< 0,1 mm at laser focus
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Teach-in
laser class	1
distance to laser focus	400 mm
wave length	650 nm
electrical data	
response time / release time	< 0,25 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 2,2 VDC
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

connection diagrams



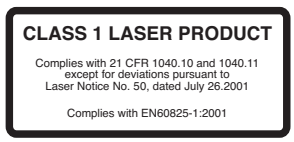
connectors

ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

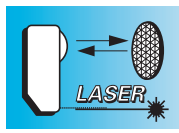
accessories

SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

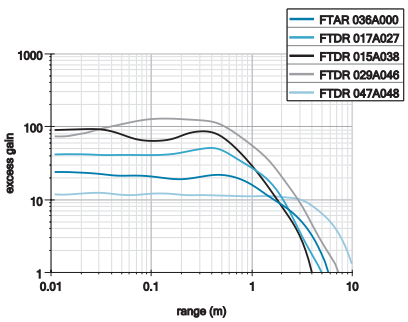
laser warning

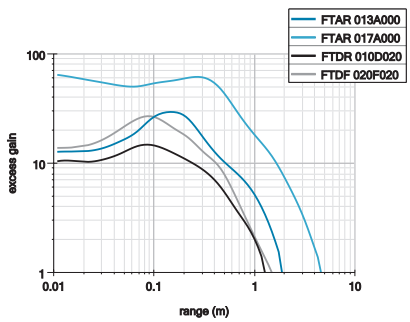


order reference	output circuit	output function
OPDK 14N1901/S35A	NPN	light operate
OPDK 14N3901/S35A	NPN	dark operate
OPDK 14P1901/S35A	PNP	light operate
OPDK 14P3901/S35A	PNP	dark operate



excess gain curve

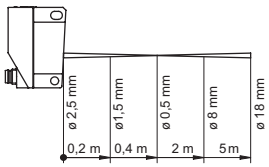




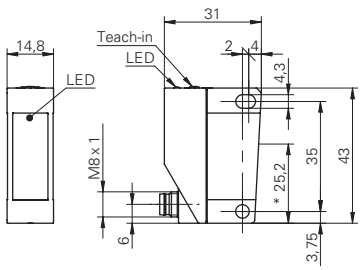
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

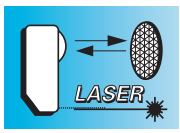
beam characteristic



dimension drawing



* emitter and receiver axis



Sb = 1 m

- designed for detection of transparent objects
- single lens optics
- short response time

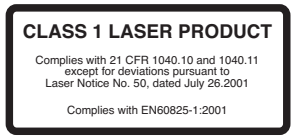
general data	
type	retro-reflective laser sensor
special type	for transparent objects
version	single lens optics
light source	pulsed red laser diode
actual range Sb	1 m
nominal range Sn	1,5 m
repeatability	< 0,1 mm at laser focus
polarization filter	yes
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Teach-in
laser class	1
distance to laser focus	100 mm
wave length	650 nm
electrical data	
response time / release time	< 0,25 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 2,2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

connection diagrams

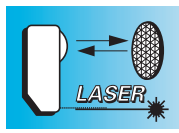
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

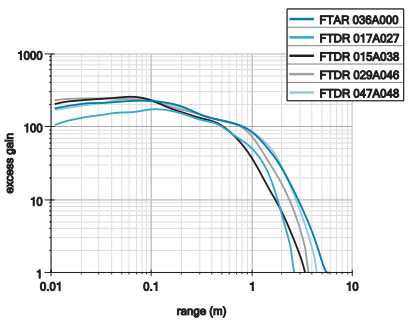
laser warning

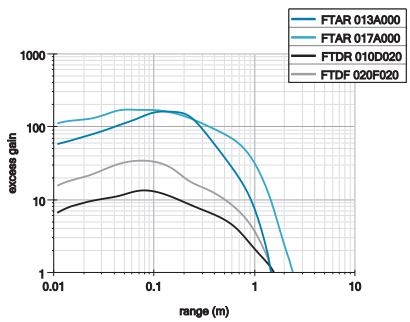


order reference	output function	teach value stored after power-off
OPDK 14P1902/S35A	light operate	volatile
OPDK 14P1903/S35A	light operate	non volatile
OPDK 14P3902/S35A	dark operate	volatile
OPDK 14P3903/S35A	dark operate	non volatile



excess gain curve

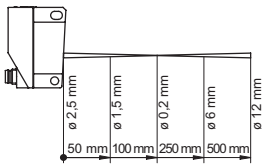




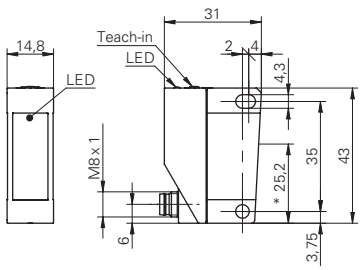
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

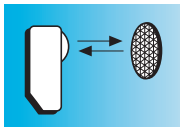
beam characteristic



dimension drawing



* emitter and receiver axis



Sb = 7,3 m

- rugged metal housing
- sensing range adjustable via potentiometer
- polarization filter to detect shiny objects

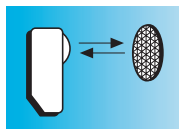
general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	7,3 m
nominal range Sn	9 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	36 mA
current consumption typ.	26 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

connection diagrams

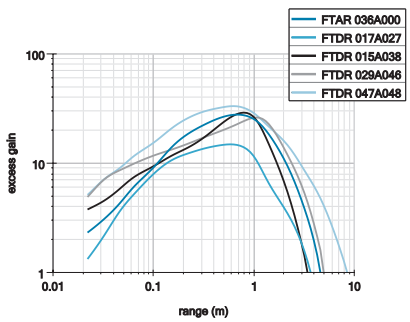
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

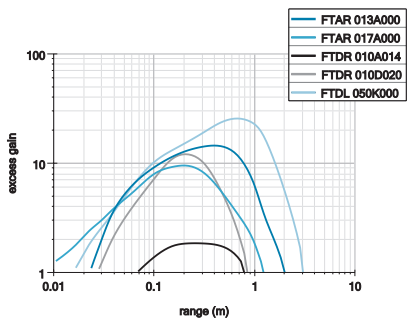
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

order reference	connection types	output circuit	sensitivity adjustment
FPDM 16N5101	cable 4 pin	NPN	no
FPDM 16N5101/S14	connector M12, 4 pin	NPN	no
FPDM 16N5105	cable 4 pin	NPN	Pot, 10 turn
FPDM 16N5105/S14	connector M12, 4 pin	NPN	Pot, 10 turn
FPDM 16P5101	cable 4 pin	PNP	no
FPDM 16P5101/S14	connector M12, 4 pin	PNP	no
FPDM 16P5105	cable 4 pin	PNP	Pot, 10 turn
FPDM 16P5105/S14	connector M12, 4 pin	PNP	Pot, 10 turn



excess gain curve

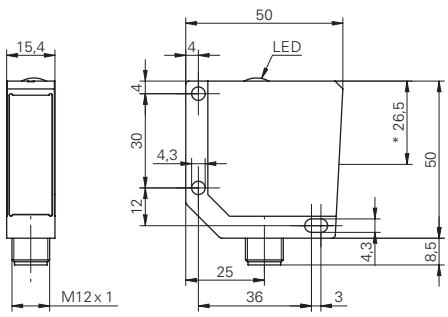




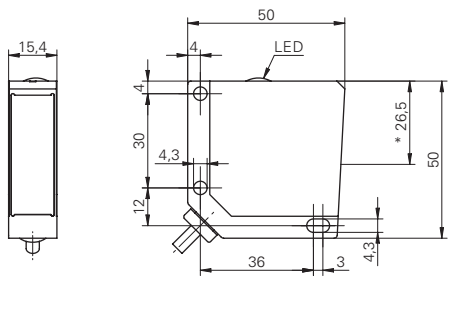
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

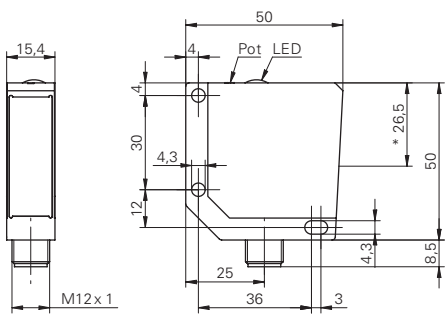
dimension drawings



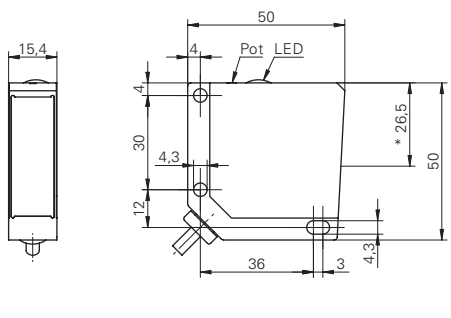
* emitter axis



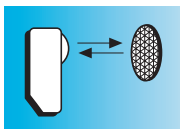
* emitter axis



* emitter axis



* emitter axis



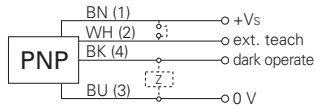
Sb = 6 m

- rugged metal housing
- designed for detection of transparent objects
- sensitivity adjustable via Teach-in

general data	
type	retro-reflective sensor
special type	for transparent objects
light source	pulsed red LED
actual range Sb	4 m
nominal range Sn	6 m
polarization filter	yes
light indicator	LED yellow
sensitivity adjustment	Teach-in
wave length	660 nm
electrical data	
response time / release time	< 2,5 ms
adaption time	< 25 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	dark operate
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
connection types	connector M12, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

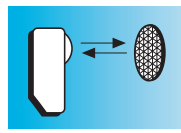
order reference
FPDM 16P3921/S14

connection diagram

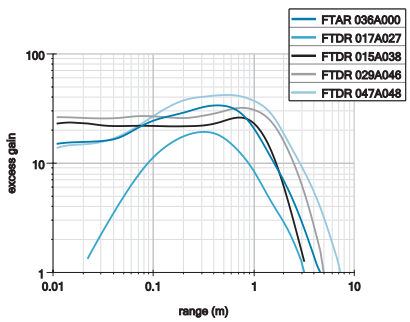


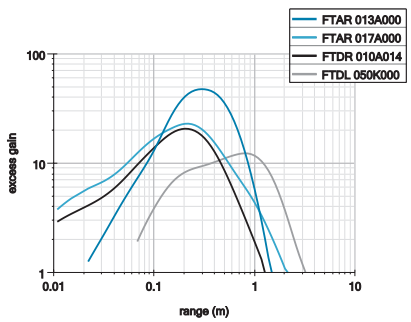
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	



excess gain curve

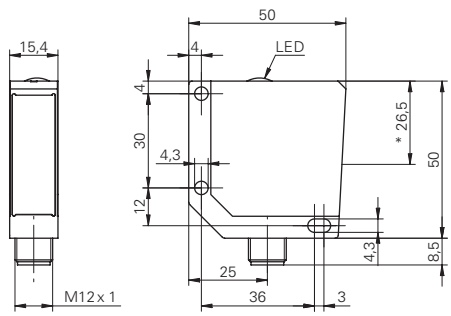




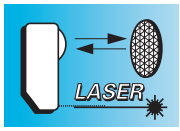
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

dimension drawing



* emitter axis

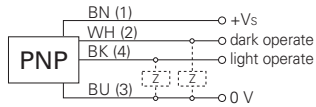


Sb = 11 m

- rugged metal housing
- high repeatability
- short response time

general data	
type	retro-reflective laser sensor
light source	pulsed red laser diode
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
laser class	1
wave length	675 nm
actual range Sb = 1 m	
nominal range Sn	1,3 m
repeatability	< 0,1 mm at laser focus
sensitivity adjustment	Pot, 270°
distance to laser focus	80 mm
actual range Sb = 11 m	
nominal range Sn	12 m
repeatability	< 1,5 mm at 0 ... 0,5 m
sensitivity adjustment	no
distance to laser focus	400 mm
electrical data	
response time / release time	< 0,1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	70 mA
current consumption typ.	60 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

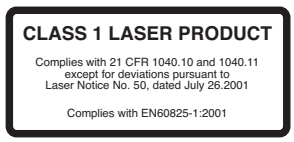
connection diagram



connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

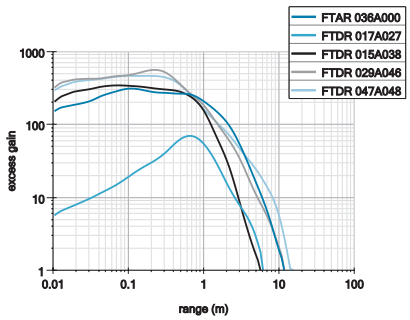
laser warning



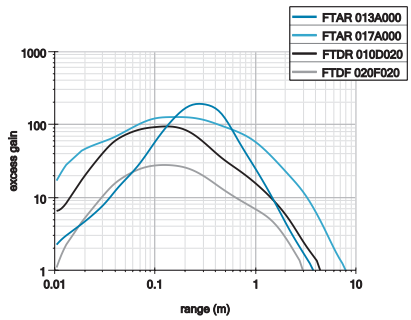
order reference	actual range Sb	connection types
OPDM 16P5102	11 m	cable 4 pin
OPDM 16P5102/S14	11 m	connector M12, 4 pin
OPDM 16P5103	1 m	cable 4 pin
OPDM 16P5103/S14	1 m	connector M12, 4 pin

excess gain curve

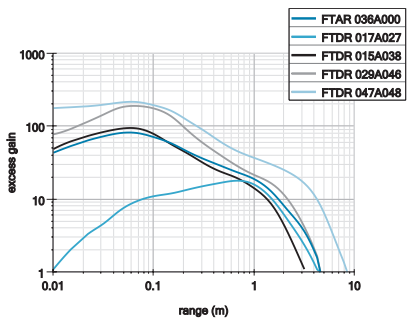
Sb = 11 m



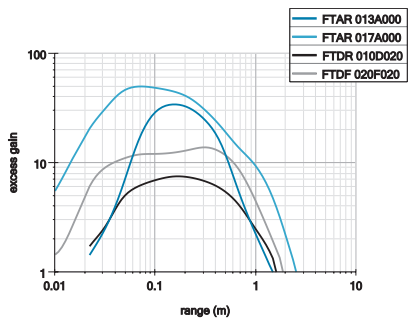
Sb = 11 m



Sb = 1 m



Sb = 1 m

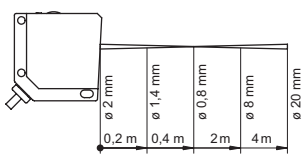


reflectors

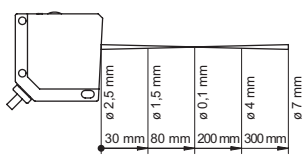
FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDF 020F020	tape 20 x 20 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

beam characteristic

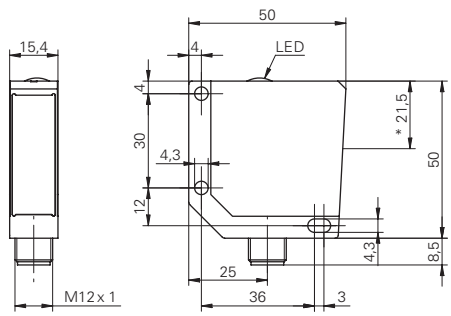
Sb = 11 m



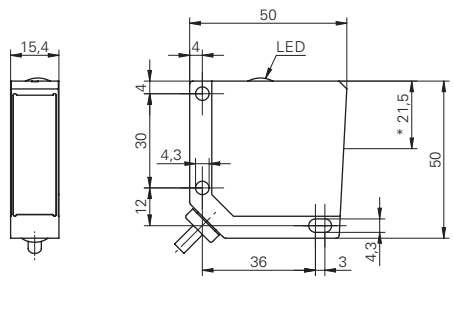
Sb = 1 m



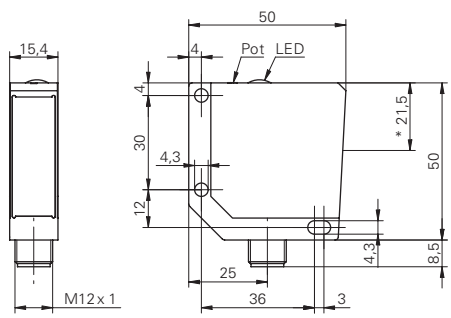
dimension drawings



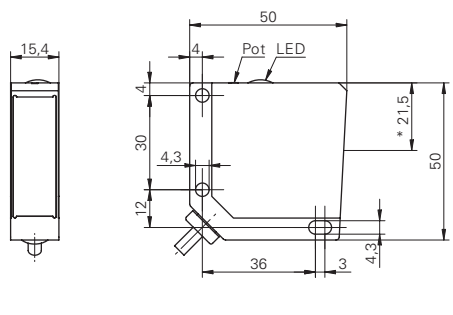
* emitter axis



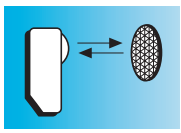
* emitter axis



* emitter axis



* emitter axis

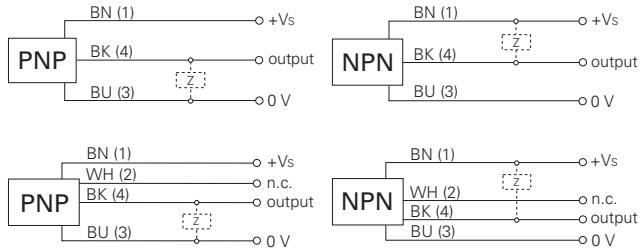


Sb = 3,2 m

- rugged metal housing
- polarization filter to detect shiny objects

general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	3,2 m
nominal range Sn	4 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	22 mA
voltage drop Vd	< 1,8 VDC
output function	dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67

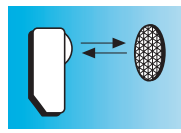
connection diagrams



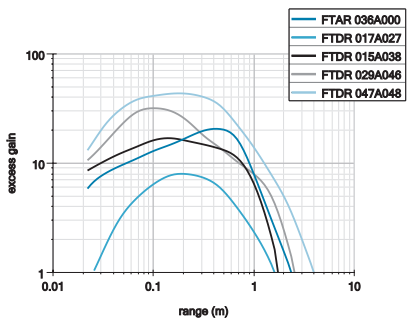
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

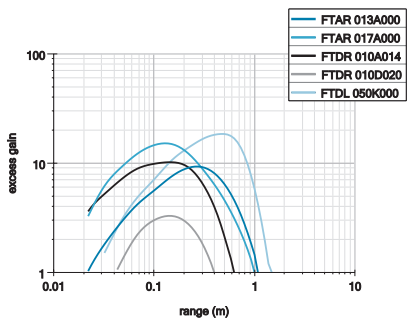
accessories	
SENSOFIX mounting kit	151658
glass cover	103068
doubling lens	107250
cap nut	115913
for details, see accessories section	

order reference	connection types	height / length	output circuit
FPAM 18N3151	cable 3 pin	57 mm	NPN
FPAM 18N3151/S14	connector M12, 4 pin	67 mm	NPN
FPAM 18P3151	cable 3 pin	57 mm	PNP
FPAM 18P3151/S14	connector M12, 4 pin	67 mm	PNP



excess gain curve

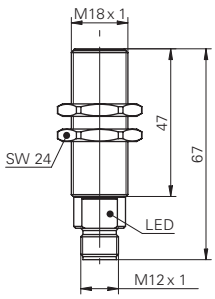


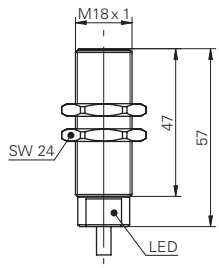


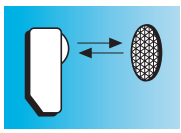
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 010D020	15 x 25 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

dimension drawings







Sb = 4,5 m

- cross-technology housing concept
- polarization filter to detect shiny objects
- small mounting depth

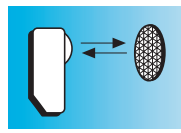
general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	4,5 m
nominal range Sn	5 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	25 mA
current consumption typ.	22 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	20 mm
height / length	42 mm
depth	15 mm
type	rectangular
housing material	plastic (PBT-ASA)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

order reference	output circuit
FPDK 20N5101/S35A	NPN
FPDK 20P5101/S35A	PNP

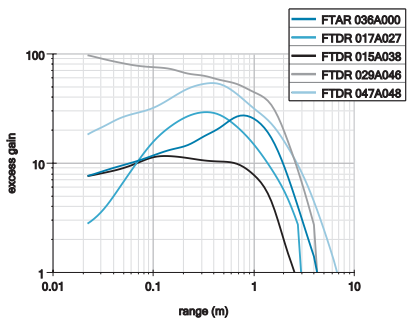
connection diagrams

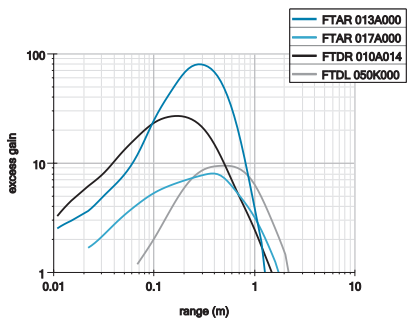
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
for details, see accessories section	



excess gain curve

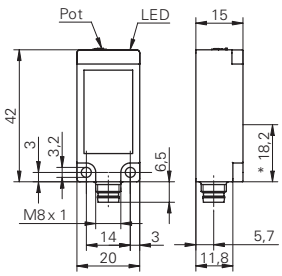




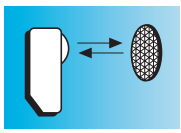
reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

dimension drawing



* emitter axis



Sb = 10 m

- long sensing range
- polarization filter to detect shiny objects

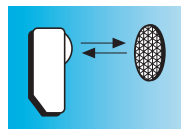
general data	
type	retro-reflective sensor
light source	pulsed red LED
actual range Sb	10 m
nominal range Sn	11 m
polarization filter	yes
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
wave length	660 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	55 mA
current consumption typ.	45 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	25 mm
height / length	80 mm
depth	58 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
connection types	connector M12, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

order reference	output circuit
FPDK 26N5103/S14	NPN
FPDK 26P5103/S14	PNP

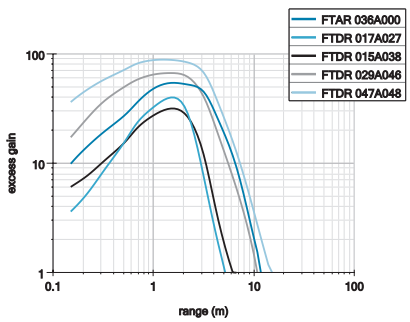
connection diagrams

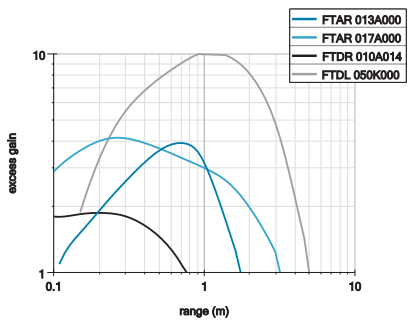
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
mounting bracket	112477
for details, see accessories section	



excess gain curve

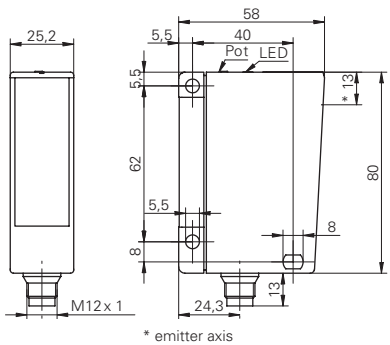


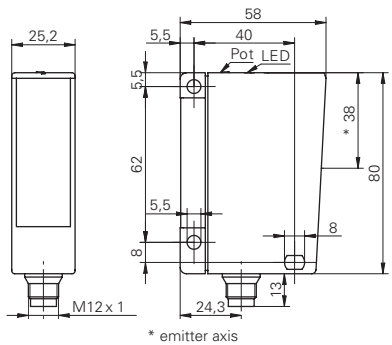


reflectors

FTAR 013A000	ø 15 mm
FTAR 017A000	ø 20,7 mm
FTAR 020A000	ø 25,2 mm
FTAR 036A000	ø 46 mm
FTDL 050K000/... m	tape 50 x ... mm
FTDR 010A014	12,8 x 16,8 mm
FTDR 015A038	18 x 40 mm
FTDR 017A027	20 x 42 mm
FTDR 029A046	32,5 x 48 mm
FTDR 047A048	54 x 75 mm

dimension drawings





red light LED version

product family	FSCK 07 / FECK 07	FSDK 07 / FEDK 07	FSDM 08 / FEDM 08	FSDM 08 / FEDM 08	FSAM 08 / FEAM 08	FSDK 10 / FEDK 10	FSDM 12 / FEDM 12
							
width / diameter	8 mm	8 mm	8 mm	8 mm	8 mm	10,4 mm	12,4 mm
actual range Sb	2 m	2 m	0,7 m	2,5 m	2,5 m	5 m	6 m
response time / release time	< 0,5 ms	< 0,5 ms	< 2,5 ms	< 2,5 ms	< 2,5 ms	< 1,4 ms	< 1 ms
sensitivity adjustment	Teach-in	Teach-in	no	no	no	Pot, 270°	no
NPN	■	■				■	■
PNP	■	■	■	■	■	■	■
cable	■	■	■	■	■	■	■
connector	■	■	■	■	■	■	■
housing material	plastic	plastic	metal	metal	metal	plastic	metal
Page	**392**	**394**	**396**	**398**	**400**	**402**	**406**

laser version

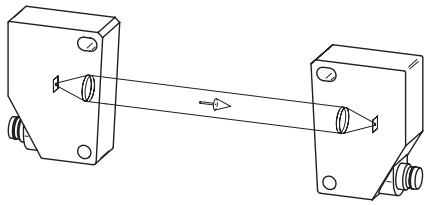
product family	OSDK 10 / OEDK 10	OSDK 14 / OEDK 14	OSDM 16 / OEDM 16
			
width / diameter	10,4 mm	14,8 mm	15,4 mm
actual range Sb	8 m	8 m	8 m
response time / release time	< 0,2 ms	< 0,5 ms	< 0,1 ms
sensitivity adjustment	Pot, 270°	no	Pot, 270°
NPN	■	■	
PNP	■	■	■
cable	■		■
connector	■	■	■
housing material	plastic	plastic	metal
Page	**404**	**410**	**414**

FSDK 14 / FEDK 14	FSDM 16 / FEDM 16	FSAM 18 / FEAM 18	FSDK 20 / FEDK 20	FSDK 26 / FEDK 26
				
14,8 mm	15,4 mm	18 mm	20 mm	25 mm
12 m	3 m 8 m	16 m	6 m	20 m
< 1,2 ms	0 ms	< 1 ms	< 0,5 ms	< 1 ms
no	no Pot, 10 turn	Pot, 270°	Pot, 270°	no
■		■	■	
■	■	■	■	■
	■	■		
■	■	■	■	■
plastic	metal	metal	plastic	plastic
408	**412**	**416**	**418**	**420**

Through beam sensors

General information

An emitter in a separate housing transmits the light to a separate receiver. The object is detected when it breaks the emitted beam.



Applications

- Detection of objects at a great distance – through beam sensors have the longest ranges.
- Monitoring of doors and entrances
- Due to the good repeatability throughout the entire range, positioning of objects
- Reliable detection of high-gloss objects such as mirrors, wafers or chrome-plated surfaces

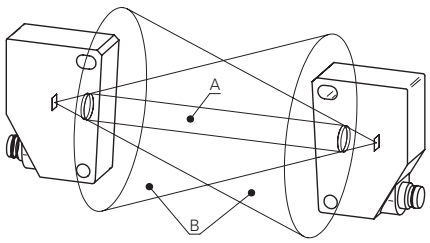
Characteristics and advantages

- Due to the separated configuration, long ranges with large signal excess gain can be achieved in comparison with equivalent retro-reflective systems. Through beam sensors are therefore most suitable for operation in unfavorable ambient conditions such as dirt, dust and moisture.
- The clearly defined, consistent active zone permits highly constant repeatability throughout the entire sensing distance.
- The switching point is independent of the surface properties of the object.

Through beam sensors

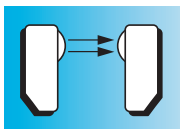
Technology and operation

The active area (A) of a through beam sensor is equal to the diameter of the lens of the receiver or emitter. The acceptance zone (B) of the emitter and receiver is larger. However, this is only important for adjustment and for operation close to glossy surfaces. With focused through beam laser sensors, the active area is the diameter of the laser beam if this is smaller than the receiver lens or the front opening at the receiver end.



Mounting and adjustment

The emitter and receiver must be aimed at each other. The narrower the angle of radiation and reception, the more accurately this must be conducted.

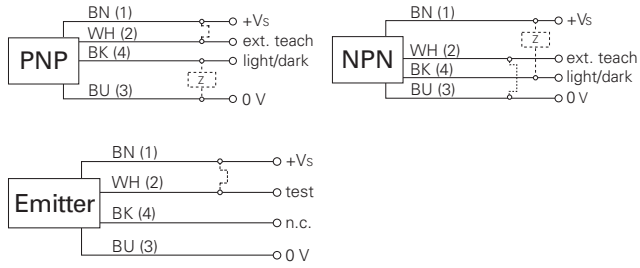


Sb = 2 m

- ultra compact housing
- sensing range adjustable via Teach-in
- test input

general data	
type	through beam sensor
actual range Sb	2 m
nominal range Sn	2,5 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	20 mA
reverse polarity protection	yes
receiver	
response time / release time	< 0,5 ms
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption typ.	12 mA
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

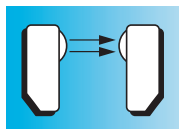
connection diagrams



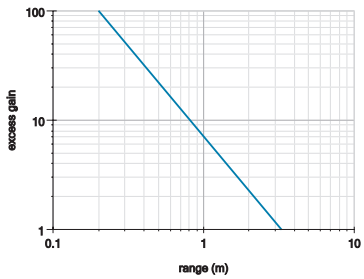
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

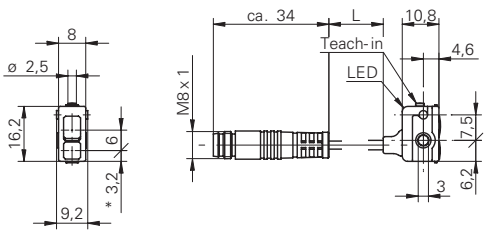
order reference	emitter / receiver	connection types	output circuit
FECK 07N6901	receiver	cable rear side	NPN
FECK 07N6901/KS35A	receiver	flylead connector M8, 4 pin	NPN
FECK 07P6901	receiver	cable rear side	PNP
FECK 07P6901/KS35A	receiver	flylead connector M8, 4 pin	PNP
FSCK 07D9601	emitter	cable rear side	-
FSCK 07D9601/KS35A	emitter	flylead connector M8, 4 pin	-



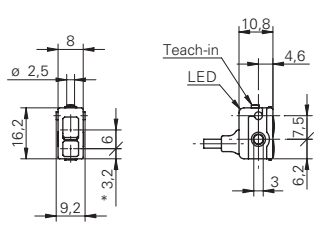
excess gain curve



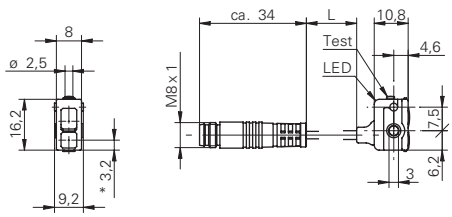
dimension drawings



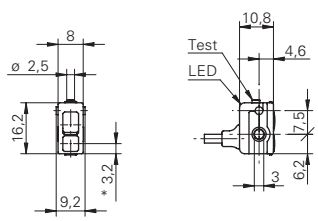
* receiver axis cable length L = 200 mm



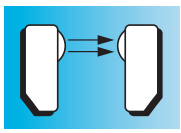
* receiver axis



* emitter axis cable length L = 200 mm



* emitter axis

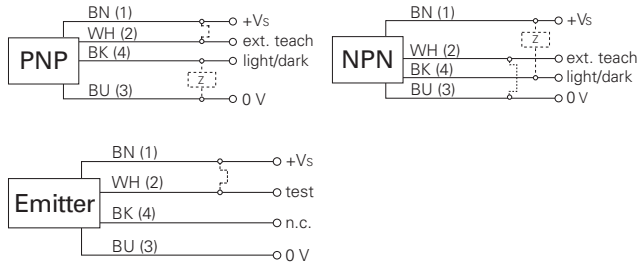


Sb = 2 m

- ultra compact housing
- sensing range adjustable via Teach-in
- test input

general data	
type	through beam sensor
actual range Sb	2 m
nominal range Sn	2,5 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Teach-in
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	20 mA
reverse polarity protection	yes
receiver	
response time / release time	< 0,5 ms
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption typ.	12 mA
mechanical data	
width / diameter	8 mm
height / length	16,2 mm
depth	10,8 mm
type	rectangular
housing material	plastic (PMMA, MABS, PA)
front (optics)	PMMA
ambient conditions	
operating temperature	-20 ... +50 °C
protection class	IP 65

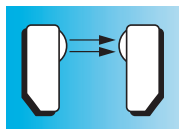
connection diagrams



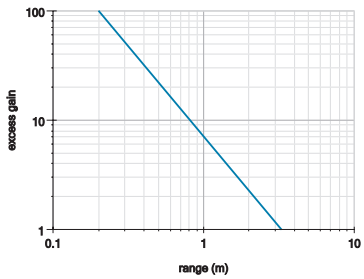
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
MINOFIX mounting kit	150844
for details, see accessories section	

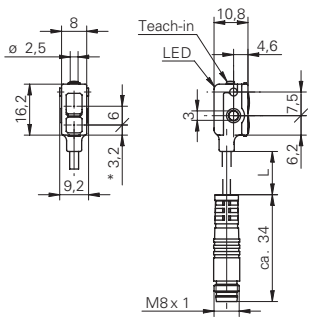
order reference	emitter / receiver	connection types	output circuit
FEDK 07N6901	receiver	cable bottom side	NPN
FEDK 07N6901/KS35A	receiver	flylead connector M8, 4 pin	NPN
FEDK 07P6901	receiver	cable bottom side	PNP
FEDK 07P6901/KS35A	receiver	flylead connector M8, 4 pin	PNP
FSDK 07D9601	emitter	cable bottom side	-
FSDK 07D9601/KS35A	emitter	flylead connector M8, 4 pin	-



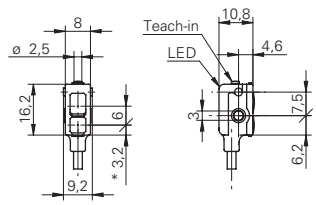
excess gain curve



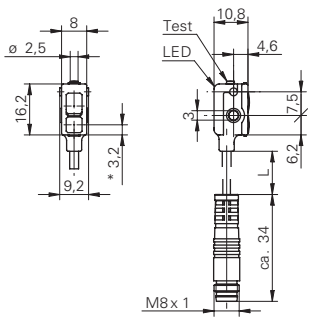
dimension drawings



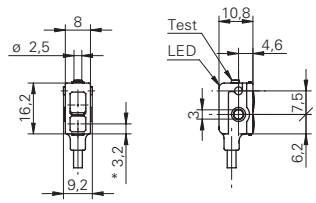
* receiver axis cable length L = 200 mm



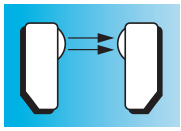
* receiver axis



* emitter axis cable length L = 200 mm



* emitter axis

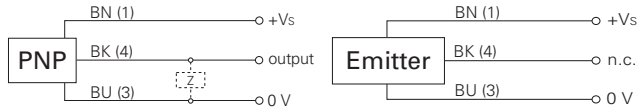


Sb = 0,7 m

- subminiature metal housing
- small rectangular design

general data	
type	through beam sensor
actual range Sb	0,7 m
nominal range Sn	1 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED red
sensitivity adjustment	no
emitter	
light source	pulsed infrared diode
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 2,5 ms
current consumption max.	24 mA
current consumption typ.	24 mA
voltage drop Vd	< 2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	48 mA
current consumption typ.	17 mA
mechanical data	
width / diameter	8 mm
height / length	58 mm
depth	12 mm
type	rectangular
housing material	aluminum anodized
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

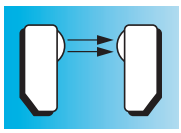
connection diagrams



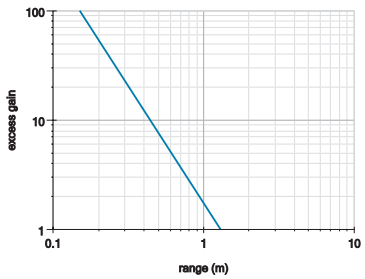
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151719
for details, see accessories section	

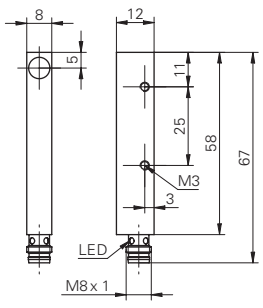
order reference	emitter / receiver	connection types	output function
FEDM 08P1001	receiver	cable 3 pin	light operate
FEDM 08P1001/S35L	receiver	connector M8, 3 pin	light operate
FEDM 08P3001	receiver	cable 3 pin	dark operate
FEDM 08P3001/S35L	receiver	connector M8, 3 pin	dark operate
FSDM 08D9001	emitter	cable 3 pin	-
FSDM 08D9001/S35	emitter	connector M8, 3 pin	-



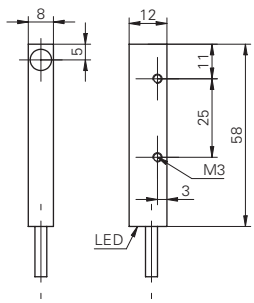
excess gain curve



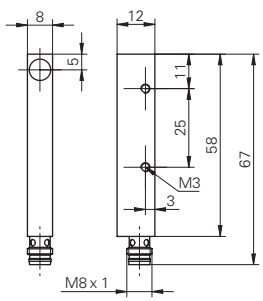
dimension drawings



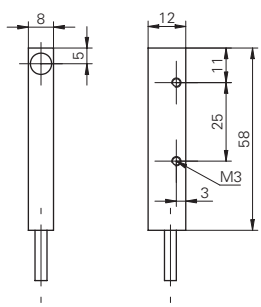
receiver



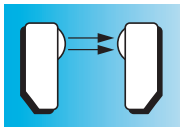
receiver



emitter



emitter

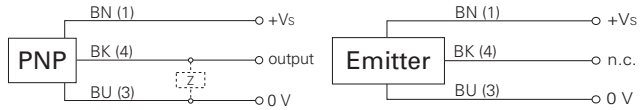


Sb = 2,5 m

- subminiature metal housing
- small rectangular design

general data	
type	through beam sensor
actual range Sb	2,5 m
nominal range Sn	3 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED red
sensitivity adjustment	no
emitter	
light source	pulsed infrared diode
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 2,5 ms
current consumption max.	24 mA
current consumption typ.	24 mA
voltage drop Vd	< 2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	48 mA
current consumption typ.	17 mA
mechanical data	
width / diameter	8 mm
height / length	58 mm
depth	15 mm
type	rectangular
housing material	aluminum anodized
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

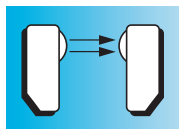
connection diagrams



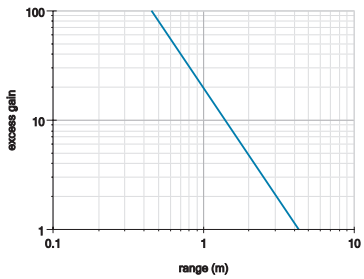
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151719
for details, see accessories section	

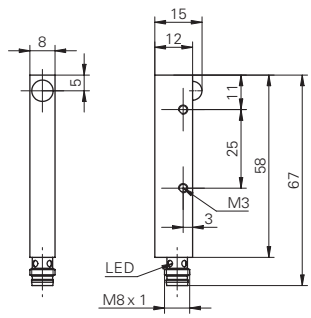
order reference	emitter / receiver	connection types	output function
FEDM 08P1002	receiver	cable 3 pin	light operate
FEDM 08P1002/S35L	receiver	connector M8, 3 pin	light operate
FEDM 08P3002	receiver	cable 3 pin	dark operate
FEDM 08P3002/S35L	receiver	connector M8, 3 pin	dark operate
FSDM 08D9002	emitter	cable 3 pin	-
FSDM 08D9002/S35	emitter	connector M8, 3 pin	-



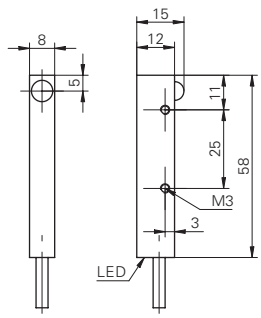
excess gain curve



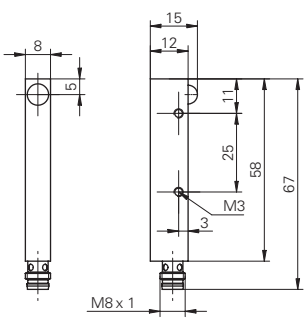
dimension drawings



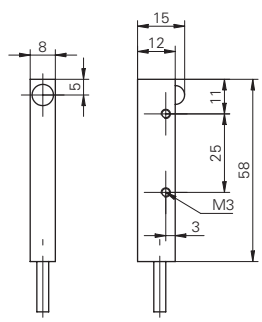
receiver



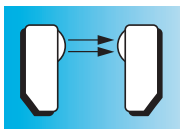
receiver



emitter



emitter

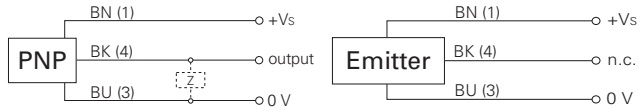


Sb = 2,5 m

- subminiature metal housing
- cylindrical design

general data	
type	through beam sensor
actual range Sb	2,5 m
nominal range Sn	3 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED red
sensitivity adjustment	no
emitter	
light source	pulsed infrared diode
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 2,5 ms
current consumption max.	24 mA
current consumption typ.	24 mA
voltage drop Vd	< 2 VDC
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	48 mA
current consumption typ.	17 mA
mechanical data	
width / diameter	8 mm
type	cylindrical
housing material	brass nickel plated
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65

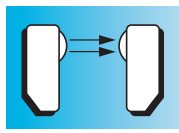
connection diagrams



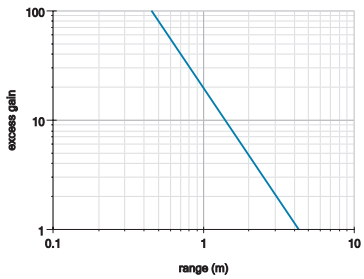
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151719
for details, see accessories section	

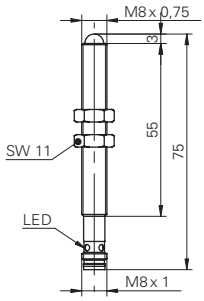
order reference	emitter / receiver	connection types	height / length	output function
FEAM 08P1002	receiver	cable 3 pin	59 mm	light operate
FEAM 08P1002/S35L	receiver	connector M8, 3 pin	75,5 mm	light operate
FEAM 08P3002	receiver	cable 3 pin	59 mm	dark operate
FEAM 08P3002/S35L	receiver	connector M8, 3 pin	75,5 mm	dark operate
FSAM 08D9002	emitter	cable 3 pin	59 mm	-
FSAM 08D9002/S35	emitter	connector M8, 3 pin	75,5 mm	-



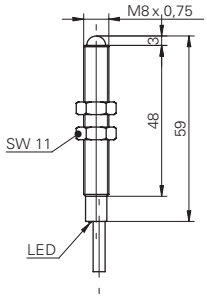
excess gain curve



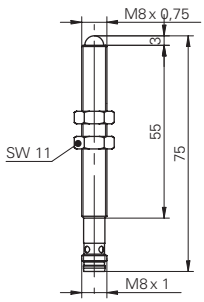
dimension drawings



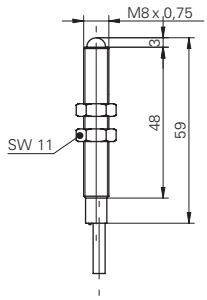
receiver



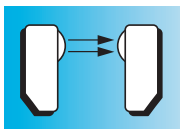
receiver



emitter



emitter

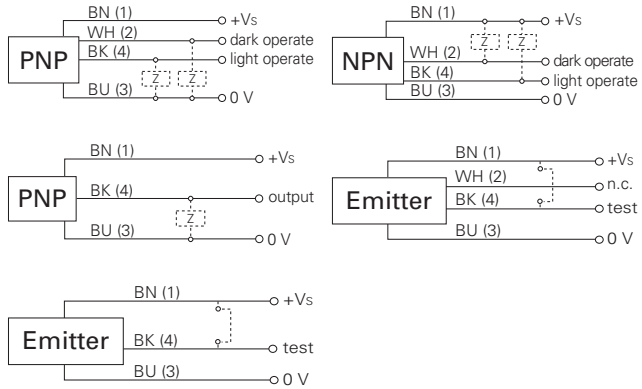


Sb = 5 m

- subminiature housing
- sensing range adjustable via potentiometer
- test input

general data	
type	through beam sensor
actual range Sb	5 m
nominal range Sn	6 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 1,4 ms
current consumption max.	16 mA
current consumption typ.	16 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	23 mA
current consumption typ.	15 mA
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C

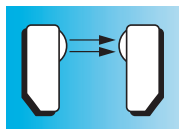
connection diagrams



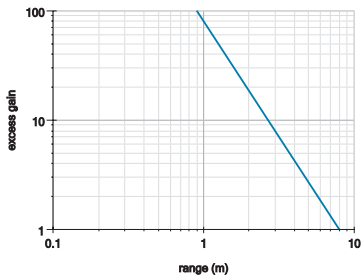
connectors		
ESG 32SH0200	3 pin	2 m straight
ESW 31SH0200	3 pin	2 m angular
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

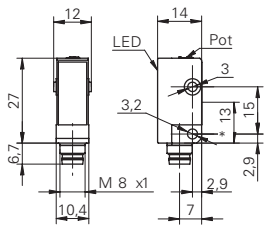
order reference	emitter / receiver	connection types	output circuit	output function	protection class
FEDK 10N5101	receiver	cable 4 pin	NPN	light / dark operate	IP 65
FEDK 10N5101/S35A	receiver	connector M8, 4 pin	NPN	light / dark operate	IP 67
FEDK 10P1101/KS35	receiver	flylead connector M8, 3 pin	PNP	light operate	IP 65
FEDK 10P3101/KS35	receiver	flylead connector M8, 3 pin	PNP	dark operate	IP 65
FEDK 10P5101	receiver	cable 4 pin	PNP	light / dark operate	IP 65
FEDK 10P5101/S35A	receiver	connector M8, 4 pin	PNP	light / dark operate	IP 67
FSDK 10D9001/KS35	emitter	flylead connector M8, 3 pin	-	-	IP 65
FSDK 10D9601	emitter	cable 4 pin	-	-	IP 65
FSDK 10D9601/S35A	emitter	connector M8, 4 pin	-	-	IP 67



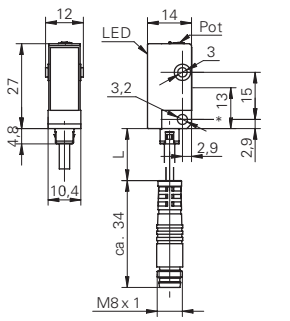
excess gain curve



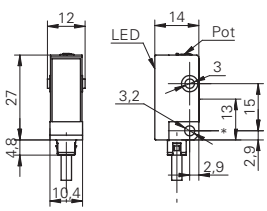
dimension drawings



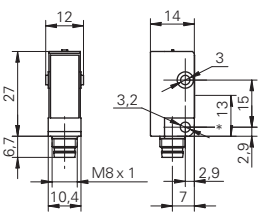
* receiver axis



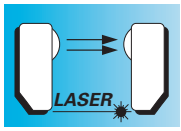
* receiver axis cable length L = 200 mm



* receiver axis



* emitter axis

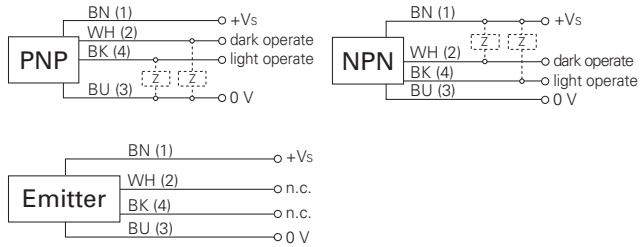


Sb = 8 m

- long range
- short response time

general data	
type	through beam laser sensor
actual range Sb	8 m
nominal range Sn	10 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
emitter	
light source	pulsed red laser diode
laser class	2
distance to laser focus	parallel beam
wave length	675 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 0,2 ms
current consumption max.	16 mA
current consumption typ.	15 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	50 mA
current consumption typ.	40 mA
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
receiver	
depth	14 mm
emitter	
depth	16,3 mm
ambient conditions	
receiver	
operating temperature	-25 ... +65 °C
emitter	
operating temperature	-10 ... +50 °C

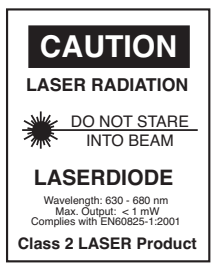
connection diagrams



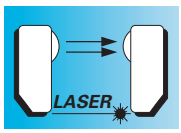
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

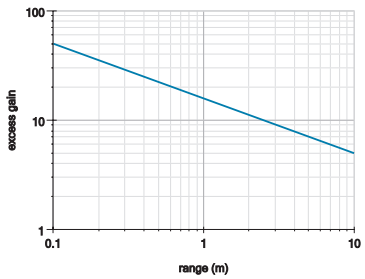
laser warning



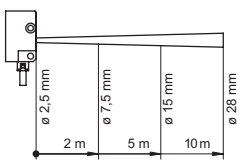
order reference	emitter / receiver	connection types	output circuit	protection class
OEDK 10N5101	receiver	cable 4 pin	NPN	IP 65
OEDK 10N5101/S35A	receiver	connector M8, 4 pin	NPN	IP 67
OEDK 10P5101	receiver	cable 4 pin	PNP	IP 65
OEDK 10P5101/S35A	receiver	connector M8, 4 pin	PNP	IP 67
OSDK 10D9001	emitter	cable 4 pin	-	IP 65
OSDK 10D9001/S35A	emitter	connector M8, 4 pin	-	IP 67



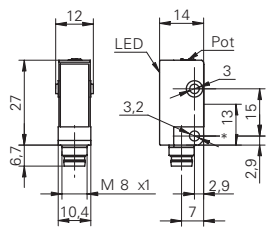
excess gain curve



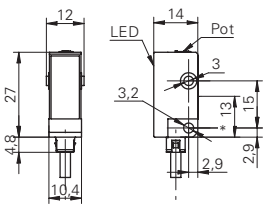
beam characteristic



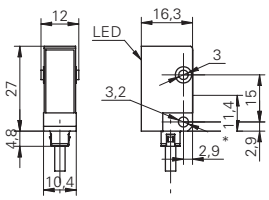
dimension drawings



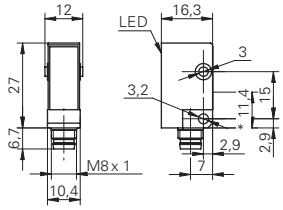
* receiver axis



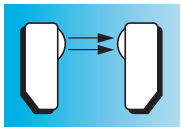
* receiver axis



* emitter axis



* emitter axis

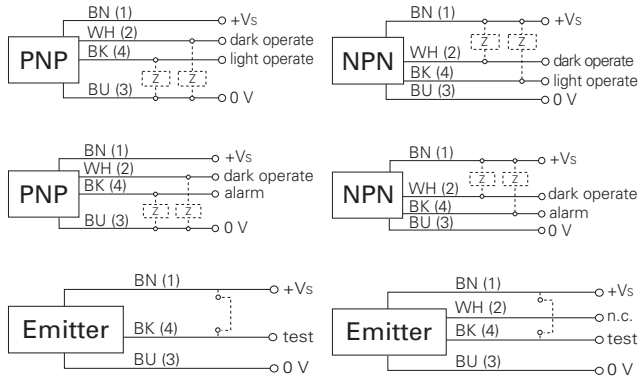


Sb = 6 m

- rugged miniature metal housing
- test input

general data	
type	through beam sensor
actual range Sb	6 m
nominal range Sn	7,5 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 1 ms
current consumption max.	17 mA
current consumption typ.	17 mA
voltage drop Vd	< 1,8 VDC
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	30 mA
current consumption typ.	18 mA
mechanical data	
width / diameter	12,4 mm
height / length	35 mm
depth	35 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

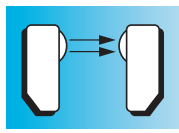
connection diagrams



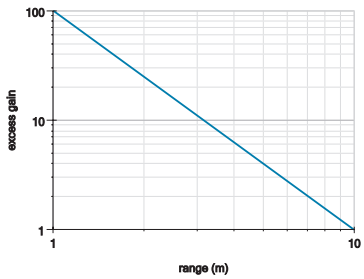
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150328
mounting bracket	113873
for details, see accessories section	

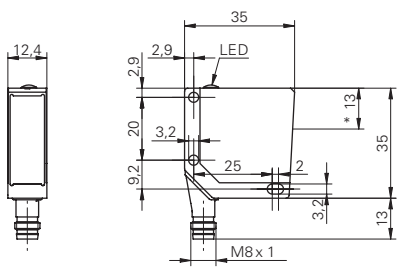
order reference	emitter / receiver	connection types	output circuit	output function
FEDM 12N3401	receiver	cable 4 pin	NPN	alarm output dark
FEDM 12N3401/S35A	receiver	connector M8, 4 pin	NPN	alarm output dark
FEDM 12N5101	receiver	cable 4 pin	NPN	light / dark operate
FEDM 12N5101/S35A	receiver	connector M8, 4 pin	NPN	light / dark operate
FEDM 12P3401	receiver	cable 4 pin	PNP	alarm output dark
FEDM 12P3401/S35A	receiver	connector M8, 4 pin	PNP	alarm output dark
FEDM 12P5101	receiver	cable 4 pin	PNP	light / dark operate
FEDM 12P5101/S35A	receiver	connector M8, 4 pin	PNP	light / dark operate
FSDM 12D9601	emitter	cable 3 pin	-	-
FSDM 12D9601/S35A	emitter	connector M8, 4 pin	-	-



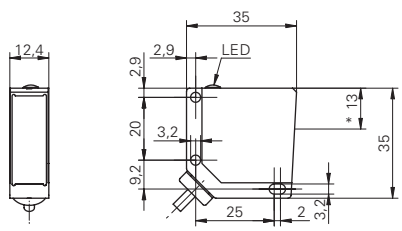
excess gain curve



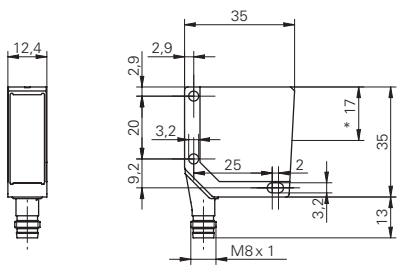
dimension drawings



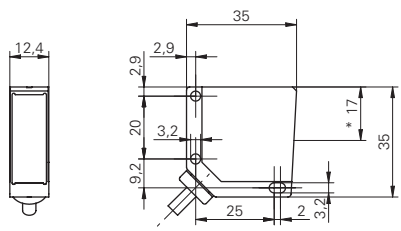
* receiver axis



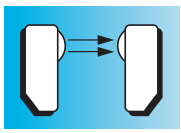
* receiver axis



* emitter axis



* emitter axis

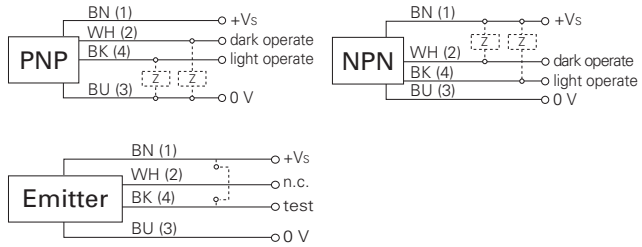


Sb = 12 m

- long range
- test input

general data	
type	through beam sensor
actual range Sb	12 m
nominal range Sn	15 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	20 mA
reverse polarity protection	yes
receiver	
response time / release time	< 1,2 ms
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption typ.	12 mA
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

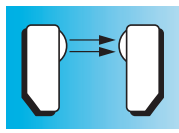
connection diagrams



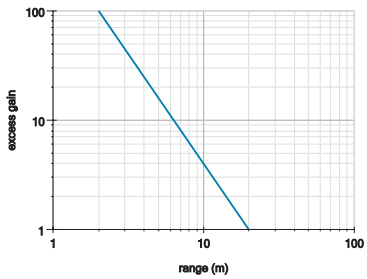
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
slot aperature stickers	144075
for details, see accessories section	

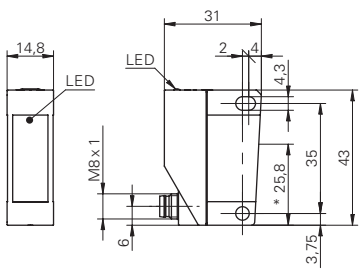
order reference	emitter / receiver	output circuit
FEDK 14N5101/S35A	receiver	NPN
FEDK 14P5101/S35A	receiver	PNP
FSDK 14D9601/S35A	emitter	-



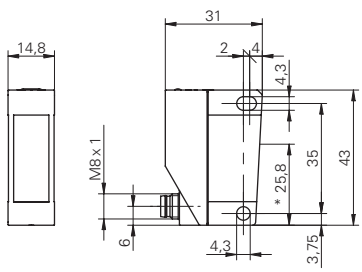
excess gain curve



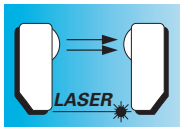
dimension drawings



* receiver axis



* emitter axis

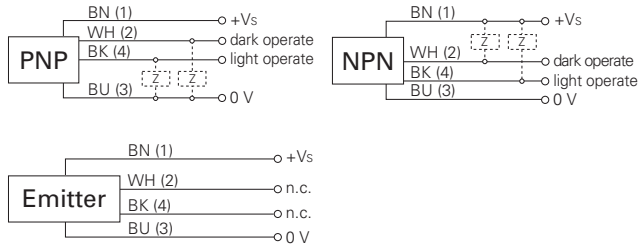


Sb = 8 m

- long range
- short response time

general data	
type	through beam laser sensor
actual range Sb	8 m
nominal range Sn	10 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
emitter	
light source	pulsed red laser diode
power on indication	LED green
laser class	1
distance to laser focus	parallel beam
wave length	650 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 0,5 ms
current consumption max.	20 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	35 mA
current consumption typ.	25 mA
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
protection class	IP 67
receiver	
operating temperature	-25 ... +65 °C
emitter	
operating temperature	10 ... +50 °C

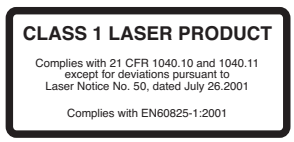
connection diagrams



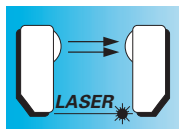
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

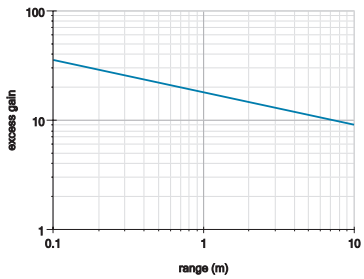
laser warning



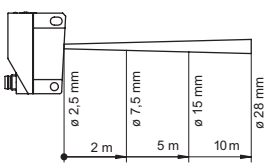
order reference	emitter / receiver	output circuit
OEDK 14N5101/S35A	receiver	NPN
OEDK 14P5101/S35A	receiver	PNP
OSDK 14D9001/S35A	emitter	-



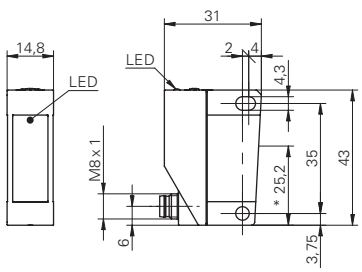
excess gain curve



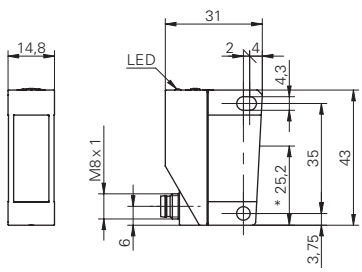
beam characteristic



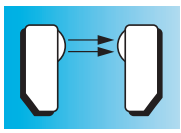
dimension drawings



* receiver axis



* emitter axis

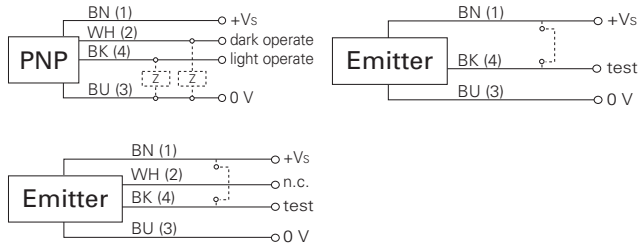


Sb = 8 m

- rugged metal housing
- sensing range adjustable via potentiometer

general data	
type	through beam sensor
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 1 ms
current consumption max.	17 mA
current consumption typ.	17 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
emitter	
current consumption max.	30 mA
current consumption typ.	18 mA
test input	Disable emitter: +Vs Enable emitter: 0 V
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	PMMA
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

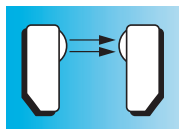
connection diagrams



connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

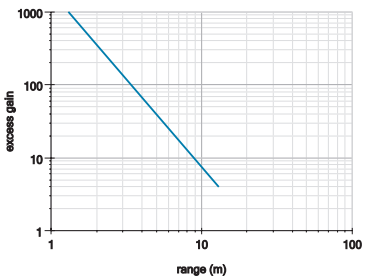
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

order reference	emitter / receiver	nominal range Sn	actual range Sb	connection types	sensitivity adjustment
FEDM 16P5101	receiver	10 m	8 m	cable 4 pin	no
FEDM 16P5101/S14	receiver	10 m	8 m	connector M12, 4 pin	no
FEDM 16P5105	receiver	3,5 m	3 m	cable 4 pin	Pot, 10 turn
FEDM 16P5105/S14	receiver	3,5 m	3 m	connector M12, 4 pin	Pot, 10 turn
FSDM 16D9601	emitter	10 m	8 m	cable 3 pin	-
FSDM 16D9601/S14	emitter	10 m	8 m	connector M12, 4 pin	-

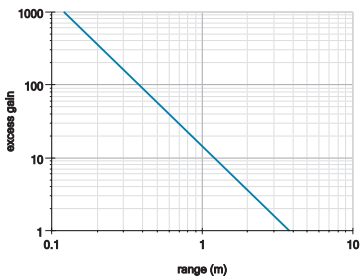


excess gain curve

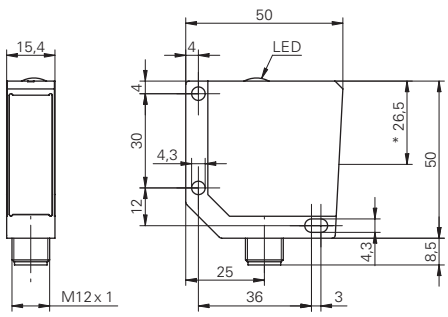
Sb = 8 m



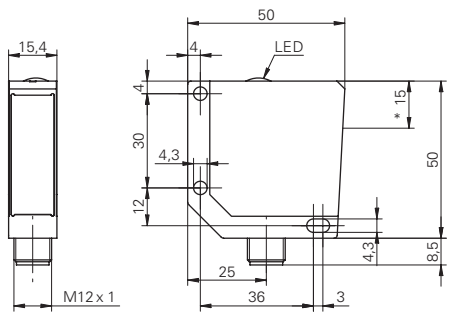
Sb = 3 m



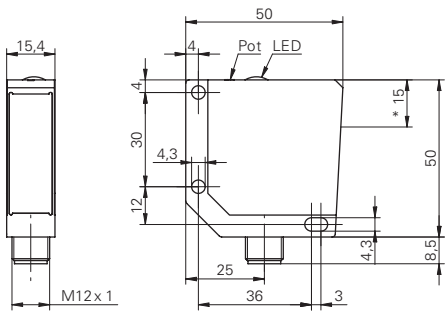
dimension drawings



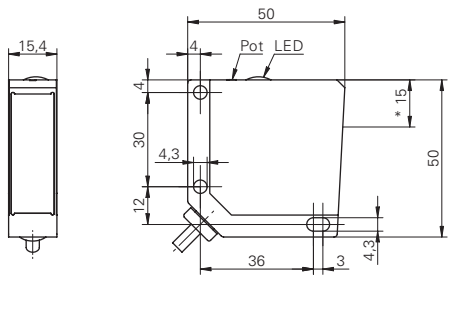
* receiver axis



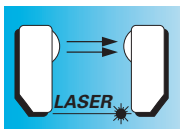
* receiver axis



* receiver axis



* receiver axis

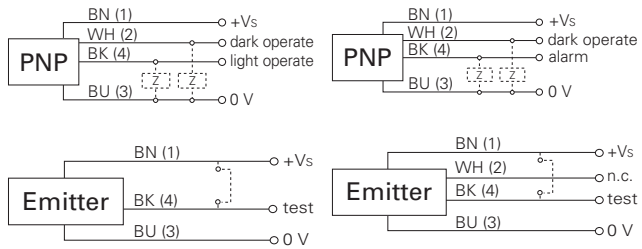


Sb = 8 m

- long range
- short response time

general data	
type	through beam laser sensor
actual range Sb	8 m
receiver	
nominal range Sn	10 m
alignment / soiled lens indicator	LED green
output indicator	LED yellow
sensitivity adjustment	Pot, 270°
emitter	
light source	pulsed red laser diode
repeatability	< 0,4 mm at laser focus
laser class	1
distance to laser focus	400 mm
wave length	675 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 0,1 ms
current consumption max.	30 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
emitter	
current consumption max.	75 mA
current consumption typ.	60 mA
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
protection class	IP 67
receiver	
operating temperature	-25 ... +65 °C
emitter	
operating temperature	10 ... +50 °C

connection diagrams



connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket emitter	119373
mounting bracket receiver	113917
lens cleaning air nozzle bracket	116407
for details, see accessories section	

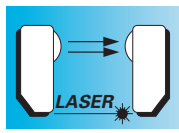
laser warning

CLASS 1 LASER PRODUCT

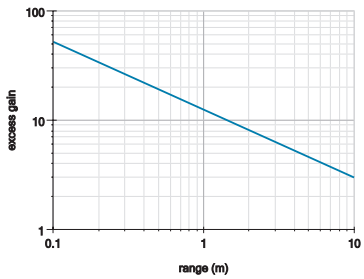
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26.2001

Complies with EN60825-1:2001

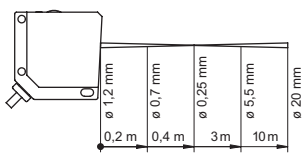
order reference	emitter / receiver	connection types	output function
OEDM 16P3401	receiver	cable 4 pin	alarm output dark
OEDM 16P3401/S14	receiver	connector M12, 4 pin	alarm output dark
OEDM 16P5101	receiver	cable 4 pin	light / dark operate
OEDM 16P5101/S14	receiver	connector M12, 4 pin	light / dark operate
OSDM 16D9601	emitter	cable 3 pin	-
OSDM 16D9601/S14	emitter	connector M12, 4 pin	-



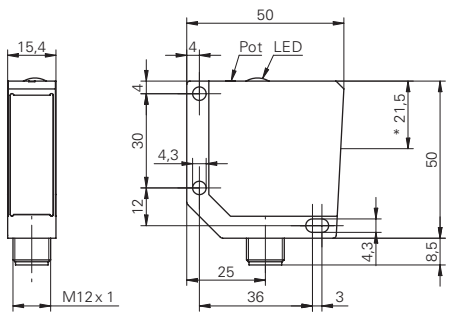
excess gain curve



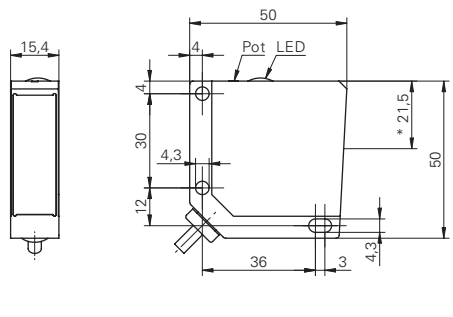
beam characteristic



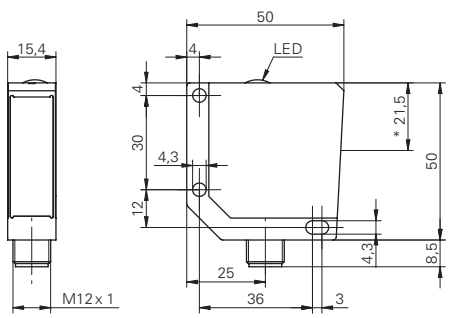
dimension drawings



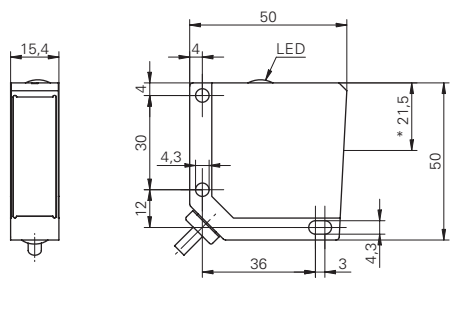
* receiver axis



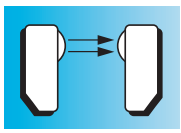
* receiver axis



* emitter axis



* emitter axis

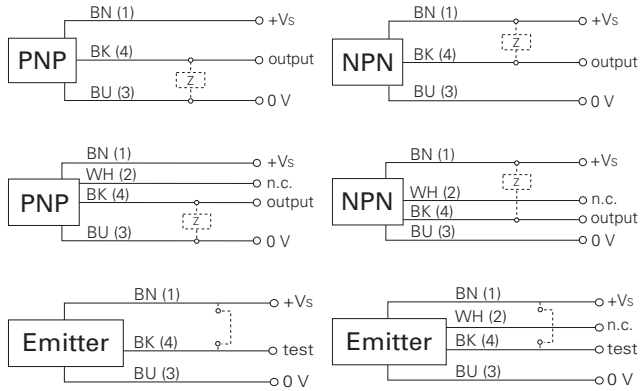


Sb = 16 m

- subminiature metal housing
- cylindrical design

general data	
type	through beam sensor
actual range Sb	16 m
nominal range Sn	20 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
emitter	
light source	pulsed infrared diode
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 1 ms
current consumption max.	20 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	dark operate
output current	< 200 mA
short circuit protection	yes
emitter	
current consumption max.	40 mA
current consumption typ.	30 mA
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
front (optics)	PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67

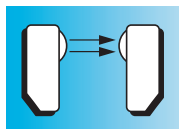
connection diagrams



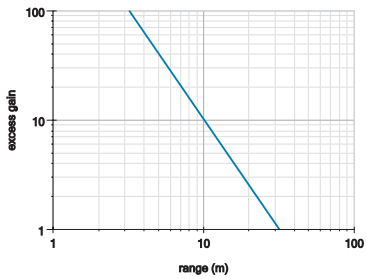
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151658
glass cover	103068
cap nut	101480
for details, see accessories section	

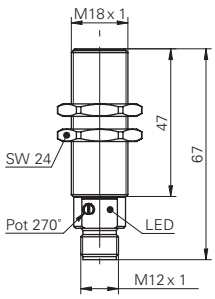
order reference	emitter / receiver	connection types	height / length	output circuit
FEAM 18N3150	receiver	cable 3 pin	57 mm	NPN
FEAM 18N3150/S14	receiver	connector M12, 4 pin	67 mm	NPN
FEAM 18P3150	receiver	cable 3 pin	57 mm	PNP
FEAM 18P3150/S14	receiver	connector M12, 4 pin	67 mm	PNP
FSAM 18D9651	emitter	cable 3 pin	57 mm	-
FSAM 18D9651/S14	emitter	connector M12, 4 pin	67 mm	-



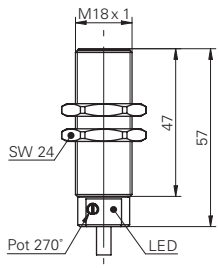
excess gain curve



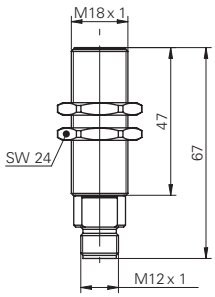
dimension drawings



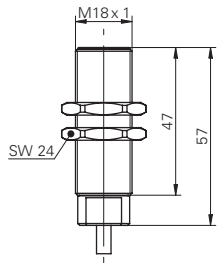
receiver



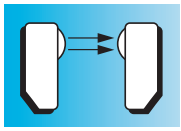
receiver



emitter



emitter

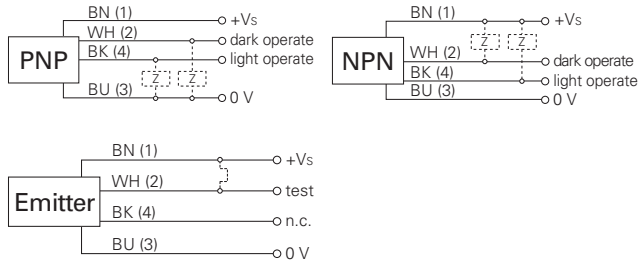


Sb = 6 m

- cross-technology housing concept
- small mounting depth
- test input

general data	
type	through beam sensor
actual range Sb	6 m
nominal range Sn	8 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	Pot, 270°
emitter	
light source	pulsed red LED
wave length	660 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 0,5 ms
current consumption max.	20 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
emitter	
current consumption max.	25 mA
current consumption typ.	22 mA
mechanical data	
width / diameter	20 mm
height / length	42 mm
depth	15 mm
type	rectangular
housing material	plastic (PBT-ASA)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

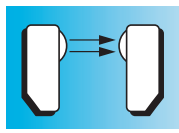
connection diagrams



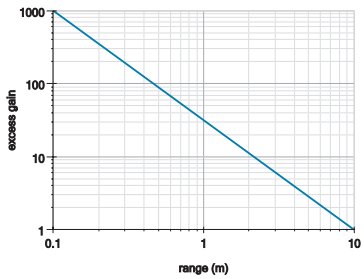
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
for details, see accessories section	

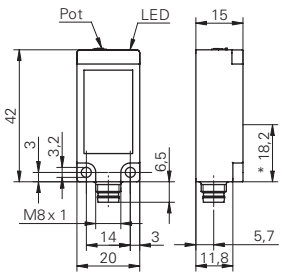
order reference	emitter / receiver	output circuit
FEDK 20N5101/S35A	receiver	NPN
FEDK 20P5101/S35A	receiver	PNP
FSDK 20D9601/S35A	emitter	-



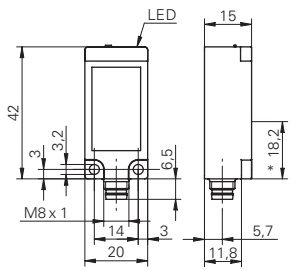
excess gain curve



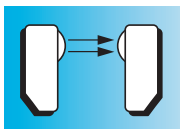
dimension drawings



* receiver axis



* emitter axis



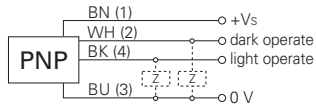
Sb = 20 m

- long range

general data	
type	through beam sensor
actual range Sb	20 m
nominal range Sn	25 m
receiver	
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
sensitivity adjustment	no
emitter	
light source	pulsed infrared diode
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
reverse polarity protection	yes
receiver	
response time / release time	< 1 ms
current consumption max.	20 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output circuit	PNP
output current	< 200 mA
short circuit protection	yes
emitter	
current consumption max.	38 mA
current consumption typ.	28 mA
mechanical data	
width / diameter	25 mm
height / length	80 mm
depth	58 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
connection types	connector M12, 4 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 67

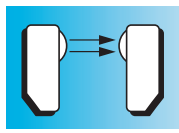
order reference	emitter / receiver
FEDK 26P5103/S14	receiver
FSDK 26D9003/S14	emitter

connection diagrams

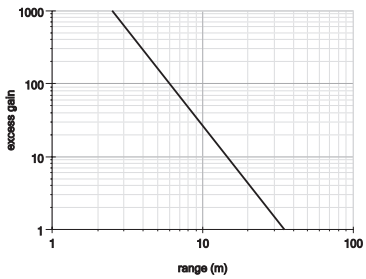


connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

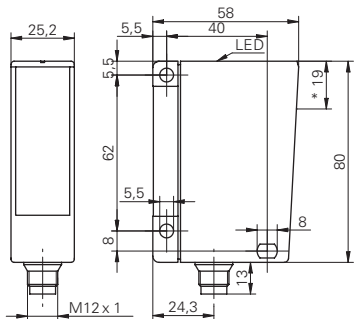
accessories	
mounting bracket	112477
for details, see accessories section	



excess gain curve



dimension drawing



red light LED version

product family	FGUM 030	FGUM 050	FGUM 080	FGUM 020	FGUM 030	FGUM 050	FGUM 080
							
width / diameter	50 mm	70 mm	100 mm	40 mm	50 mm	70 mm	100 mm
fork width Sb	30 mm	50 mm	80 mm	20 mm	30 mm	50 mm	80 mm
response time / release time	< 0,166 ms	< 0,166 ms	< 0,166 ms	< 0,125 ms	< 0,125 ms	< 0,125 ms	< 0,125 ms
sensitivity adjustment	Teach-in: button / remote	Teach-in: button / remote	Teach-in: button / remote	Pot, 270°	Pot, 270°	Pot, 270°	Pot, 270°
PNP	■	■	■	■	■	■	■
cable							
connector	■	■	■	■	■	■	■
housing material	metal	metal	metal	metal	metal	metal	metal
Page	**427**	**428**	**429**	**430**	**431**	**432**	**433**

laser version

product family	OGUM 030	OGUM 050	OGUM 080	OGUM 120
				
width / diameter	60 mm	80 mm	110 mm	150 mm
fork width Sb	30 mm	50 mm	80 mm	120 mm
response time / release time	< 0,166 ms	< 0,166 ms	< 0,166 ms	< 0,166 ms
sensitivity adjustment	Pot, 270°	Pot, 270°	Pot, 270°	Pot, 270°
PNP	■	■	■	■
connector	■	■	■	■
housing material	metal	metal	metal	metal
Page	**435**	**436**	**437**	**438**

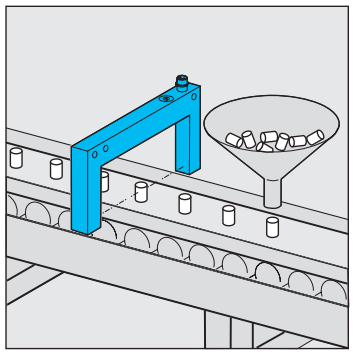
FGUM 120	FGLM 050	FGLM 080	FGLM 120	FEG 12	FGDK 28	FEG 14
						
144 mm	75 mm	105 mm	150 mm	12 mm	28 mm	14 mm
120 mm	60 mm	100 mm	158 mm	3 mm	2,7 mm	3 mm
< 0,25 ms	< 0,125 ms	< 0,125 ms	< 0,25 ms	< 0,01 ms	< 0,01 ms	< 0,01 ms
Pot, 270°	Pot, 270°	Pot, 270°	Pot, 270°	no	no	no
■	■	■	■	■	■	■
				■	■	■
■	■	■	■			
metal	metal	metal	metal	metal	plastic	metal
434	**439**	**440**	**441**	**442**	**443**	**444**

Fork and angle sensors consist of an emitter and a receiver which are already optimally aligned to each other and installed in a torsionally rigid metal housing. This permits highly accurate detection and positioning of objects, as is demanded in automatic feeders, vibration conveyors and other applications. The precision collimator optics ensure high repeatability. Equipped with a laser light source, fork sensors can even position the smallest parts in the micron range. Time-consuming alignment and adjustment as is usual with through beam sensors is unnecessary. In contrast with through beam sensors, the wiring is also limited to just one cable connection.

Typical applications

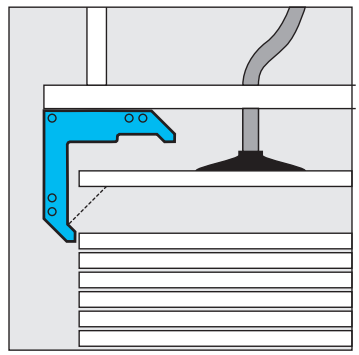
Due to their simple handling and the optimally aligned optics, fork and angle sensors are highly versatile in use. To achieve the best possible installation, different fork spans as well as U and L-shaped versions are available.

Detection and positioning



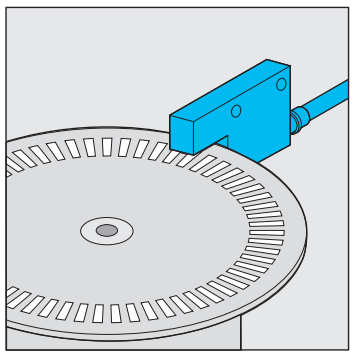
Detection of very small objects down to 50 µm in an automatic feeder

Stack height monitoring



Monitoring stack heights of cardboard sheets

Angular speed monitoring



Angular speed monitoring of shafts using pulse disks

Fork / angle sensors

Characteristics and advantages

Little installation and adjustment work
The emitter and receiver are already optimally aligned to each other in a torsionally rigid metal housing.

Innovative shapes
The special L-shape of the angle sensor permits an optimum approach to the optical axis.

Fast processes
Switching frequencies of up to 50 kHz permit angular speed measurement.

Rugged
Use also in harsh ambient conditions due to metal housing and protection class IP 67.

Technology and operation

The fundamental principle of the fork and angle sensors is equivalent to the through beam sensors.

The scratch-resistant, mineral glass collimator optics used in the fork and angle sensors FGUM/FGLM and OGUM produces a homogenous, very narrow light beam. This feature is the reason for the high detection accuracy of the sensor, which is guaranteed over the entire beam range from all sides. The largest laser fork sensor can reliably and repeatably detect an object 50 µm small over the entire range of 120 mm.

The almost parallel light beam and the small beam angle of the receiver optics makes it possible to install the fork and angle sensors closely adjacent to each other without interfering with each other. In this way, it is possible to implement small light barriers.

For sensitivity adjustment, there is an option between two different adjustment methods – simple manual adjustment of the sensitivity using a potentiometer or variable adjustment facilities by automatic teach-in.

Potentiometer
Simple sensitivity adjustment with mechanical 270° potentiometer directly on the fork sensor.

Teach-In
Rapid and simple commissioning in practical use is possible using the teach-in function. Programming can be conducted either with the integrated Teach-in button or via the external Teach-in cable.

Mounting and adjustment

The almost parallel light beam and the small beam angle of the receiver optics makes it possible to install the fork and angle sensors closely adjacent to each other without interfering with each other. In this way, it is possible to construct small light barriers. Attach the fork / angle sensors so that the object can pass freely through the monitored area. External light impinging directly at the receiver side should be avoided.

Potentiometer adjustment

The sensitivity is highest when the potentiometer is turned fully counter clockwise. The smallest possible parts are thereby detected. The power of the beam is then smallest. When the potentiometer is turned fully clockwise, the sensitivity is lowest. Only larger parts are detected. The power of the beam is highest and the fork / angle sensor has a high excess gain to combat dirt.

Teach-in adjustment

With the dynamic Teach-in, the sensor is able to calculate the optimum sensitivity in the running process. This makes completely new applications possible. For example, the smallest objects can be taught in without precise positioning simply by passing the light beam.

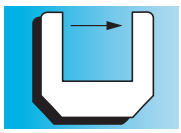
To initiate the dynamic Teach-in procedure, the yellow Teach-in button must be held depressed for 2 seconds. At least two objects should pass the light beam of the fork sensor in the following 2-4 seconds of the active Teach-in phase. The LED indicates the active Teach-in phase by rapid flashing. When the Teach-in procedure has been completed successfully, this is made clearly visible by two flashes of the LED.

The active Teach-in phase can be determined individually by an external Teach-in facility. The longer a pulse is applied to the external Teach-in cable, the longer the sensor learns of its surroundings. When the external Teach-in facility is employed, the Teach-in button can also be automatically disabled.

Adjustment of light/dark switching

The output functions NO (dark-switching) and NC (light-switching) can be adjusted using a rotary switch. The required switch position can be seen from the type plate. To prevent unintended switching, the rotary switch is covered by a rubber cap.

Important: always set the switch for the output function fully clockwise or counter clockwise. Intermediate positions lead to undefined output states.



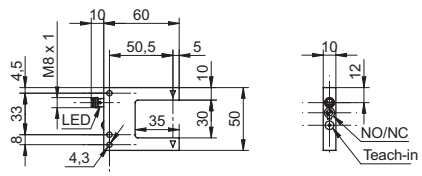
Sb = 30 mm

- fast version available
- smallest detectable object 0,8 mm
- rugged metal housing

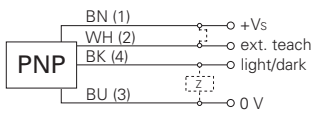
general data	
type	through beam sensor
object size	> 0,3 mm
repeatability	< 0,03 mm
hysteresis	< 0,1 mm
ambient light immunity	20 kLux
sensitivity adjustment	Teach-in: button / remote
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	50 mm
fork width Sb	30 mm
height / length	60 mm
penetration depth	35 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

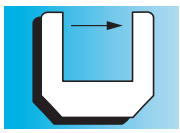
order reference
FGUM 030P6901/S35A

dimension drawing



connection diagram





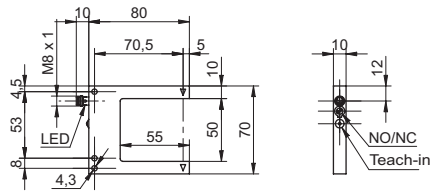
Sb = 50 mm

- fast version available
- smallest detectable object 0,8 mm
- rugged metal housing

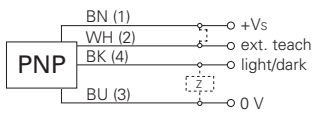
general data	
type	through beam sensor
object size	> 0,3 mm
repeatability	< 0,03 mm
hysteresis	< 0,1 mm
ambient light immunity	20 kLux
sensitivity adjustment	Teach-in: button / remote
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	70 mm
fork width Sb	50 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

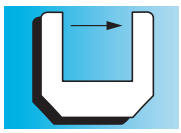
order reference
FGUM 050P6901/S35A

dimension drawing



connection diagram





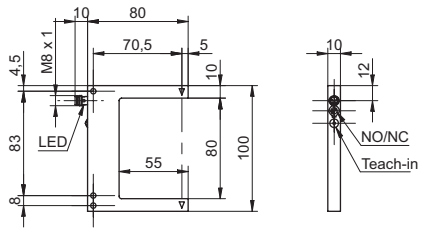
Sb = 80 mm

- fast version available
- smallest detectable object 0,8 mm
- rugged metal housing

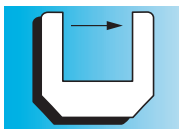
general data	
type	through beam sensor
object size	> 0,3 mm
repeatability	< 0,03 mm
hysteresis	< 0,1 mm
ambient light immunity	20 kLux
sensitivity adjustment	Teach-in: button / remote
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	100 mm
fork width Sb	80 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

order reference
FGUM 080P6901/S35A

dimension drawing



connection diagram

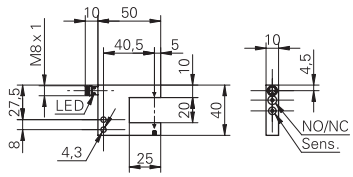


Sb = 20 mm

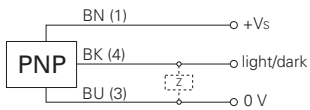
- sensitivity adjustable via potentiometer
- fork width 20 mm
- rugged metal housing

general data	
type	through beam sensor
object size	> 0,4 mm
repeatability	< 0,02 mm
hysteresis	< 0,1 mm
ambient light immunity	50 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	40 mm
fork width Sb	20 mm
height / length	50 mm
penetration depth	25 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

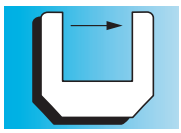
dimension drawing



connection diagram



order reference
FGUM 020P8001/S35L



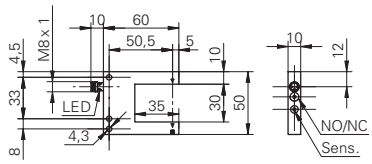
Sb = 30 mm

- sensitivity adjustable via potentiometer
- fork width 30 mm
- rugged metal housing

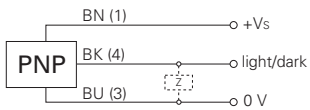
general data	
type	through beam sensor
object size	> 0,5 mm
repeatability	< 0,02 mm
hysteresis	< 0,25 mm
ambient light immunity	140 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	50 mm
fork width Sb	30 mm
height / length	60 mm
penetration depth	35 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

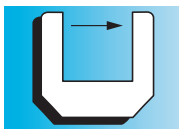
order reference
FGUM 030P8001/S35L

dimension drawing



connection diagram



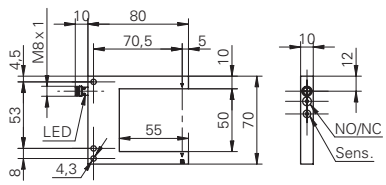


Sb = 50 mm

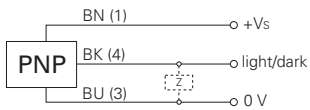
- sensitivity adjustable via potentiometer
- fork width 50 mm
- rugged metal housing

general data	
type	through beam sensor
object size	> 0,5 mm
repeatability	< 0,04 mm
hysteresis	< 0,25 mm
ambient light immunity	80 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	70 mm
fork width Sb	50 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

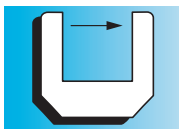
dimension drawing



connection diagram



order reference
FGUM 050P8001/S35L



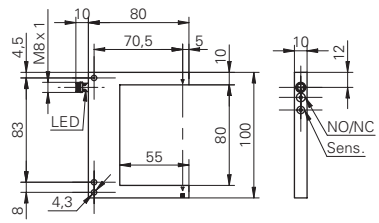
Sb = 80 mm

- sensitivity adjustable via potentiometer
- fork width 80 mm
- rugged metal housing

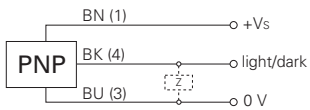
general data	
type	through beam sensor
object size	> 0,5 mm
repeatability	< 0,06 mm
hysteresis	< 0,25 mm
ambient light immunity	80 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	100 mm
fork width Sb	80 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

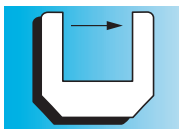
order reference
FGUM 080P8001/S35L

dimension drawing



connection diagram



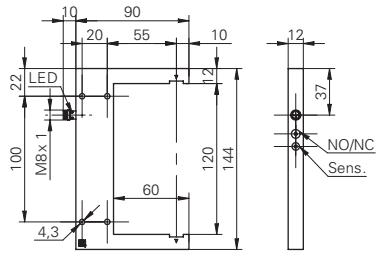


Sb = 120 mm

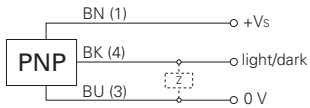
- sensitivity adjustable via potentiometer
- fork width 120 mm
- rugged metal housing

general data	
type	through beam sensor
object size	> 0,8 mm
repeatability	< 0,06 mm
hysteresis	< 0,25 mm
ambient light immunity	50 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,25 ms
switching frequency	< 2 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	40 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	144 mm
fork width Sb	120 mm
height / length	90 mm
penetration depth	60 mm
depth	12 mm
type	U profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

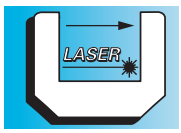
dimension drawing



connection diagram



order reference
FGUM 120P8001/S35L

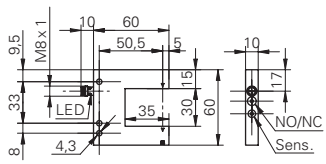


Sb = 30 mm

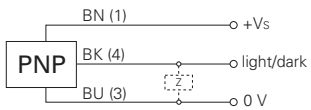
- precise laser fork sensor in rugged metal housing
- smallest detectable object 0.05 mm
- high repeatability

general data	
type	through beam sensor
object size	> 0,05 mm
repeatability	< 0,01 mm
hysteresis	< 0,02 mm
ambient light immunity	100 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red laser diode
wave length	670 nm
laser class	2
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	60 mm
fork width Sb	30 mm
height / length	60 mm
penetration depth	35 mm
depth	10 mm
type	U profile
housing material	aluminum anodized
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	5 ... +45 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

dimension drawing



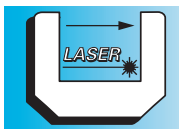
connection diagram



laser warning

order reference

OGUM 030P8001/S35L

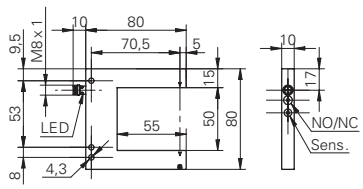


Sb = 50 mm

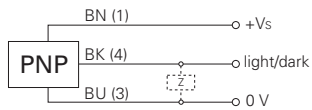
- precise laser fork sensor in rugged metal housing
- smallest detectable object 0,05 mm
- high repeatability

general data	
type	through beam sensor
object size	> 0,05 mm
repeatability	< 0,01 mm
hysteresis	< 0,02 mm
ambient light immunity	100 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red laser diode
wave length	670 nm
laser class	2
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	80 mm
fork width Sb	50 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	aluminum anodized
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	5 ... +45 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

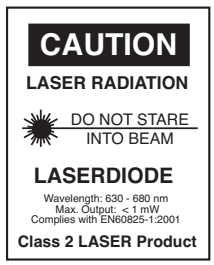
dimension drawing



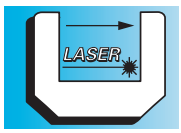
connection diagram



laser warning



order reference
OGUM 050P8001/S35L

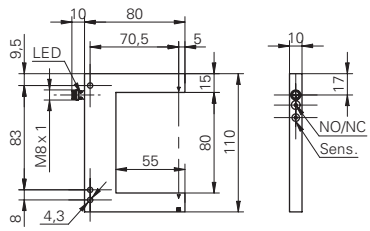


Sb = 80 mm

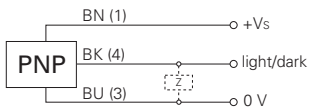
- precise laser fork sensor in rugged metal housing
- smallest detectable object 0,05 mm
- high repeatability

general data	
type	through beam sensor
object size	> 0,05 mm
repeatability	< 0,01 mm
hysteresis	< 0,02 mm
ambient light immunity	100 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red laser diode
wave length	670 nm
laser class	2
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	110 mm
fork width Sb	80 mm
height / length	80 mm
penetration depth	55 mm
depth	10 mm
type	U profile
housing material	aluminum anodized
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	5 ... +45 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

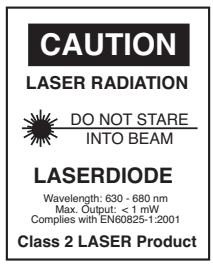
dimension drawing



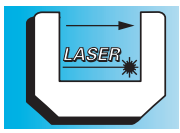
connection diagram



laser warning



order reference
OGUM 080P8001/S35L

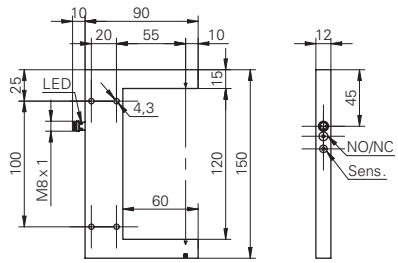


Sb = 120 mm

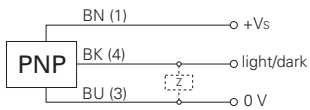
- precise laser fork sensor in rugged metal housing
- smallest detectable object 0,05 mm
- high repeatability

general data	
type	through beam sensor
object size	> 0,05 mm
repeatability	< 0,01 mm
hysteresis	< 0,02 mm
ambient light immunity	100 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red laser diode
wave length	670 nm
laser class	2
light indicator	LED yellow
electrical data	
response time / release time	< 0,166 ms
switching frequency	< 3 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	150 mm
fork width Sb	120 mm
height / length	90 mm
penetration depth	60 mm
depth	12 mm
type	U profile
housing material	aluminum anodized
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	5 ... +45 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

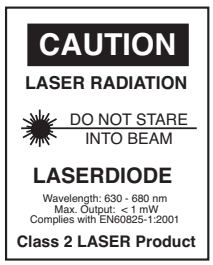
dimension drawing



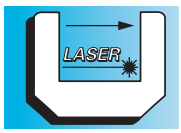
connection diagram



laser warning



order reference
OGUM 120P8001/S35L



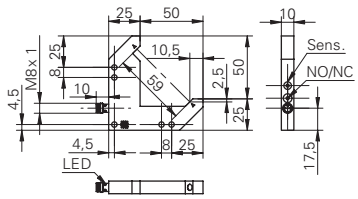
Sb = 60 mm

- optical axis approachable in x-, y- and z-direction
- smallest detectable object 0,5 mm
- rugged metal housing

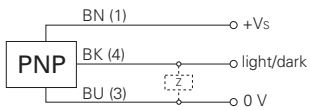
general data	
type	through beam sensor
object size	> 0,5 mm
repeatability	< 0,06 mm
hysteresis	< 0,25 mm
ambient light immunity	80 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	75 mm
fork width Sb	60 mm
height / length	75 mm
penetration depth	50 mm
depth	10 mm
type	L profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

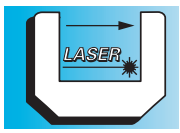
order reference
FGLM 050P8001/S35L

dimension drawing



connection diagram



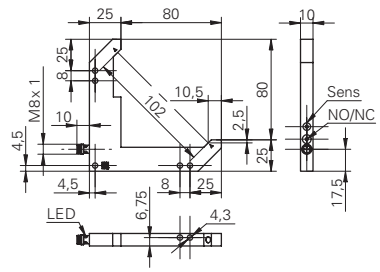


Sb = 100 mm

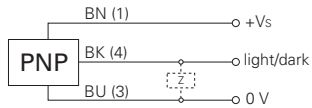
- optical axis approachable in x-, y- and z-direction
- smallest detectable object 0,07 mm
- rugged metal housing

general data	
type	through beam sensor
object size	> 0,7 mm
repeatability	< 0,06 mm
hysteresis	< 0,25 mm
ambient light immunity	70 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,125 ms
switching frequency	< 4 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	30 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	105 mm
fork width Sb	100 mm
height / length	105 mm
penetration depth	80 mm
depth	10 mm
type	L profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

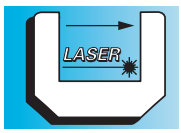
dimension drawing



connection diagram



order reference
FGLM 080P8001/S35L

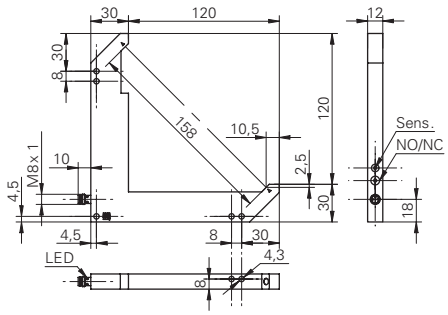


Sb = 158 mm

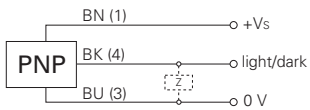
- optical axis approachable in x-, y- and z-direction
- smallest detectable object 1 mm
- rugged metal housing

general data	
type	through beam sensor
object size	> 1 mm
repeatability	< 0,06 mm
hysteresis	< 0,25 mm
ambient light immunity	50 kLux
sensitivity adjustment	Pot, 270°
light source	pulsed red LED
wave length	660 nm
light indicator	LED yellow
electrical data	
response time / release time	< 0,25 ms
switching frequency	< 2 kHz
voltage supply range +Vs	10 ... 35 VDC
current consumption max.	40 mA
output function	light / dark operate switchable
output circuit	PNP
voltage drop Vd	< 2,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	150 mm
fork width Sb	158 mm
height / length	150 mm
penetration depth	120 mm
depth	12 mm
type	L profile
housing material	die-cast zinc
connection types	connector M8, 3 pin
ambient conditions	
operating temperature	-10 ... +60 °C
protection class	IP 67
connectors	
ESG 32SH0200 3 pin	2 m straight
ESW 31SH0200 3 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
PNP to NPN-converter	149587
for details, see accessories section	

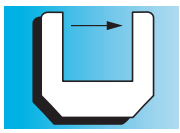
dimension drawing



connection diagram



order reference
FGLM 120P8001/S35L

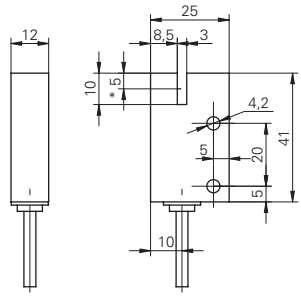


- 3 mm fork opening
- switching frequency up to 50 kHz
- smallest detectable object 0,8 mm

general data	
type	through beam sensor
object size	> 0,8 mm
repeatability	< 0,01 mm
hysteresis	< 0,1 mm
sensitivity adjustment	no
light source	non-pulsed infrared diode
wave length	935 nm
electrical data	
response time / release time	< 0,01 ms
switching frequency	< 50 kHz
voltage supply range +Vs	4,5 ... 30 VDC
current consumption max.	24 mA
output circuit	PNP
voltage drop Vd	< 1 VDC
output current	< 100 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	12 mm
fork width Sb	3 mm
height / length	41 mm
penetration depth	10 mm
depth	25 mm
type	rectangular
housing material	brass nickel plated
connection types	cable 3 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65
accessories	
pulse disk	IPS 70
for details, see accessories section	

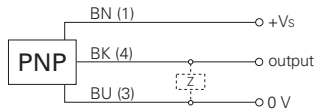
order reference	output function
FEG 12.24.35	dark operate
FEG 12.24.45	light operate

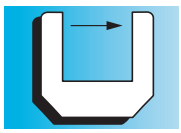
dimension drawing



* emitter axis

connection diagram



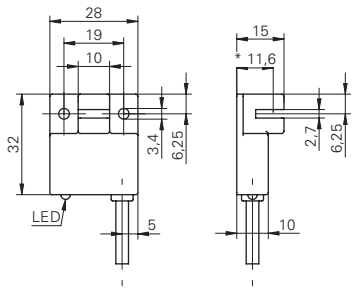


- 2,7 mm fork opening
- switching frequency up to 50 kHz
- smallest detectable object 0,8 mm

general data	
type	through beam sensor
object size	> 0,8 mm
repeatability	< 0,01 mm
hysteresis	< 0,1 mm
sensitivity adjustment	no
light source	non-pulsed infrared diode
wave length	935 nm
output indicator	LED yellow
electrical data	
response time / release time	< 0,01 ms
switching frequency	< 50 kHz
voltage supply range +Vs	4,5 ... 30 VDC
current consumption max.	25 mA
output circuit	PNP
voltage drop Vd	< 1 VDC
output current	< 100 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	28 mm
fork width Sb	2,7 mm
height / length	32 mm
penetration depth	5 mm
depth	15 mm
type	rectangular
housing material	polyamid
connection types	cable 3 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 65
accessories	
pulse disk	IPS 70
for details, see accessories section	

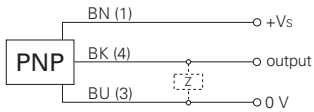
order reference	output function
FGDK 28P1001	light operate
FGDK 28P3001	dark operate

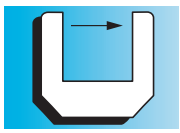
dimension drawing



* emitter axis

connection diagram



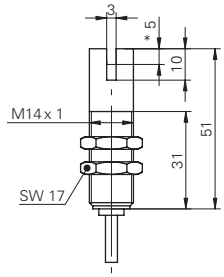


- 3 mm fork opening
- switching frequency up to 50 kHz
- smallest detectable object 0,8 mm

general data	
type	through beam sensor
object size	> 0,8 mm
repeatability	< 0,01 mm
hysteresis	< 0,1 mm
sensitivity adjustment	no
light source	non-pulsed infrared diode
wave length	935 nm
electrical data	
response time / release time	< 0,01 ms
switching frequency	< 50 kHz
voltage supply range +Vs	4,5 ... 30 VDC
current consumption max.	24 mA
output function	dark operate
output circuit	PNP
voltage drop Vd	< 1 VDC
output current	< 100 mA
short circuit protection	no
reverse polarity protection	yes, Vs to GND
mechanical data	
width / diameter	14 mm
fork width Sb	3 mm
height / length	51 mm
penetration depth	10 mm
type	cylindrical
housing material	brass nickel plated
connection types	cable 3 pin
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65
accessories	
pulse disk	IPS 70
for details, see accessories section	

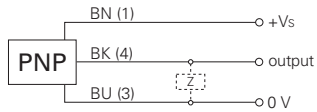
order reference
FEG 14.24.35

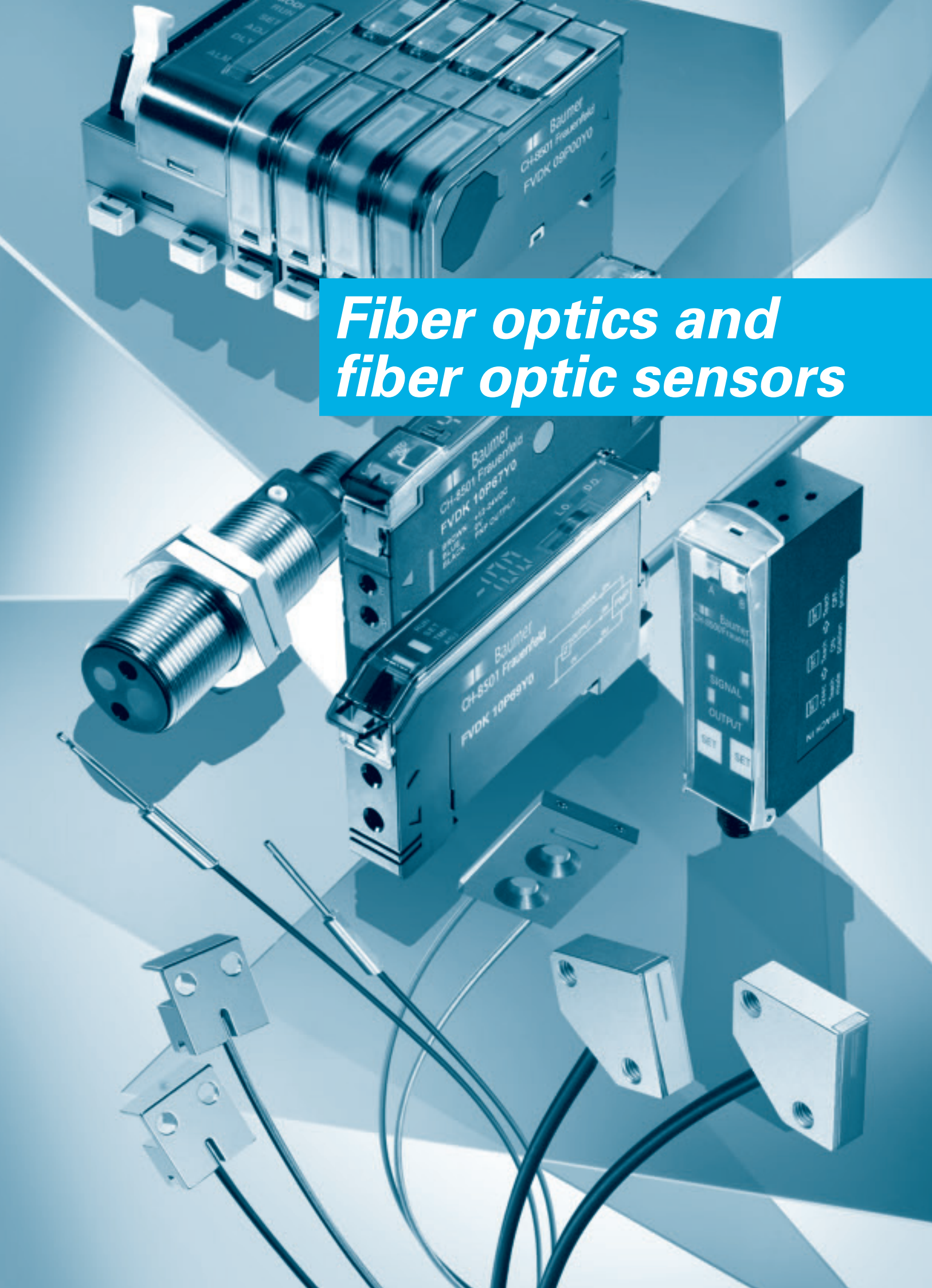
dimension drawing



* emitter axis

connection diagram





Fiber optics and fiber optic sensors

product family	FVDK 10	FVDK 67	FVDK 67	FVDK 67	FVDK 69	FVDK 60	FVDK 12
							
width / diameter	10,4 mm	10 mm	10 mm	10 mm	10 mm	10 mm	12 mm
actual range Sb (FSE 200C1002)	160 mm	1200 mm	1200 mm	1200 mm	1400 mm	320 mm	320 mm
sensing distance Tw (FUE 200C1003)	45 mm	300 mm	300 mm	300 mm	340 mm	90 mm	90 mm
response time / release time	< 1 ms	0,05 ... 5 ms (adjustable) 0,058 ... 5 ms (adjustable)	0,05 ... 5 ms (adjustable) 0,058 ... 5 ms (adjustable)	0,14 ... 5 ms (adjustable)	0,12 ... 5 ms (adjustable)	< 0,5 ms	< 1 ms
analog 1 ... 5 VDC							
NPN	■	■	■	■	■	■	■
PNP	■	■	■	■	■	■	■
cable	■	■	■	■	■	■	■
connector	■	■			■	■	■
housing material	plastic	plastic	plastic	plastic	plastic	plastic	plastic
Page	**452**	**454**	**455**	**456**	**457**	**458**	**459**

product family	FVDK 12	FVDK 22	FVDK 31	FVDK 09	FVDK 80	FWDK 84
						
width / diameter	12 mm	22 mm	31 mm	9 mm	10 mm	10 mm
actual range Sb (FSE 200C1002)	140 mm	320 mm		320 mm	100 mm 240 mm 440 mm	90 mm
sensing distance Tw (FUE 200C1003)	40 mm	90 mm		90 mm	30 mm 70 mm 120 mm	25 mm
response time / release time	< 0,05 ms	< 1 ms	< 1 ms		< 0,05 ms (release time +0,02 ms) < 0,5 ms	1 ... 50 ms (adjustable)
analog 1 ... 5 VDC						■
NPN		■	■		■	
PNP	■	■	■		■	
cable		■			■	■
connector	■	■	■		■	
housing material	plastic	plastic	plastic	plastic	plastic	plastic
Page	**460**	**461**	**462**	**463**	**464**	**465**

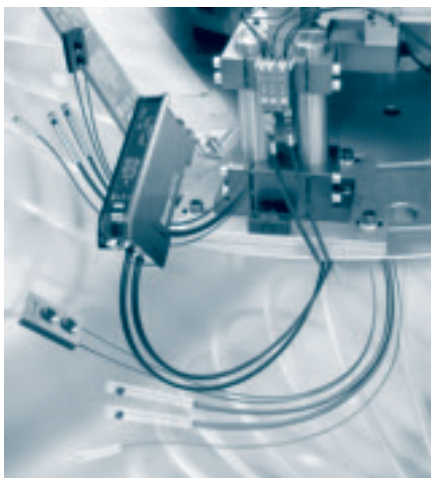
* for fiber optics see page 466 - 473

Plastic fiber optic sensors

General information

Fiber optics are the extended vision of conventional sensors and, due to their miniature construction, can be installed directly in the most difficult ambient conditions. As only light is conveyed, fiber optics are intrinsically safe, which adds to their range of applications.

Plastic fiber optics are characterized primarily by the properties of the employed raw material – the plastic. Advances in the manufacture of plastics permit bending radii of just 1 mm for the optical fibers, which is completely impossible for glass fibers. Fiber materials are now available which are extremely tolerant to bending and thereby make their use in drag chains possible.



Typical applications

Due to their versatility, optical fibers can be used in the most diverse applications. The small, space-saving sensing heads are very suitable for use in very constricted conditions. It is also possible to monitor whole areas or execute precise positioning by the different arrangements of the fibers.

- Due to the light weight and space-saving construction, optical fibers can be integrated directly in pick & place tools
- Detection, differentiation and positioning of the most diverse objects
- Monitoring of whole areas with fiber optic arrays with linear fiber arrangement
- Use at high, low or constantly fluctuating ambient temperatures
- Detection of levels or leaks, including hazardous liquids
- Detection of transparent media such as glass, wafers or films with focused fiber optic reflective types

Characteristics and advantages

Independent of the surroundings
As only light is conveyed, electromagnetic fields, high or low temperatures have no effect on the functional reliability.

Space-saving
The smallest sensing heads have a diameter of 1,5 mm and are only 10 mm long. With bending radii of just 1 mm, it is possible to integrate the eye of the sensor even in the most constricted places.

Precise light spots
Fiber cross-sections of only 0,25 mm generate a fine core beam in fiber optic through beam types, whereas doubling lenses in fiber optic reflective types permit precise light spots of 0,1 mm.

Application-specific fiber arrangement
The coaxial fiber arrangement permits optimum light distribution over the receiver fibers and thereby makes precise positioning of objects possible. Also, fiber optic arrays with a linear fiber arrangement allow a whole area to be monitored or the detection of randomly conveyed objects.

Application feedback
Multi-digit displays integrated in the fiber optic sensors permit the stability of the application to be assessed and make fault analyses possible.

Fast processes
Fiber optic sensors with response times of only 50 microseconds allow the detection of objects even in very fast processes.

Technology and operation

The technology is based on intensity differences. The fiber optic through beam types detect an object breaking the light beam between the emitter and receiver. The fiber optic reflective types evaluate the amount of light reflected back from an object. The high-resolution analog/digital conversion in the fiber optic sensors permits very slight changes to be evaluated. This is important where the detection of small objects or differentiation of the finest contrasts is concerned.

Fundamentally, the fiber optics form a unit with the corresponding processing units, and the type of fiber optic head is mainly decisive for the detection of objects. The table below is intended to provide aid in understanding the large range of different sensing heads:

Version/type	Properties	Field of application	Example types
Standard	Large selection of different shapes. Economical	Standard applications, simple object detection	FUE 200C1002 FUE 200C1004
Coaxial	Homogenous light distribution over all receiver fibers. Lens adaptation possible	Optimally suited for positioning tasks. Highly accurate in combination with focusing lenses	FCE 200C1Y00 FCE 200D1Y00
Side light exit	90° light exit Reduced beam angle More installation space	Constricted conditions	FUE 200C4Y00 FSE 200C4002
Array	Linear arrangement of the fibers. Line lengths of 5,25 - 21mm. Reflective or through beam types	Detection of objects which cannot be precisely conveyed. Measurement of object sizes or edge positions	FUE 200C6Y00 FSE 200C6Y00
Longer range Parallel beam	Integrated lens Small beam angle Long range	Object detection and positioning over a long distance. No influencing by interfering objects close to the optical fiber	FLE 200C1Y00 FPE 200C1Y00
Highly flexible	Min. bending radius down to 1mm Suitable for flexible installation	Constricted conditions	FUE 200E1Y00 FSE 200F6Y00
Bendable	Extremely bendable, designed for bending more than 1 million times.	For use in drag chains or on moving parts	FUE 100E2Y00 FSE 200D1Y50
Small light spot	In combination with focusing lenses, a light spot of only 0,1mm can be produced.	Detection of very small objects Highly accurate edge positioning	FCE 050C1Y10 with lens 134544
Level detection	Special sensing tip to avoid liquid residues. Version for pipe/hose fitting	Detection of levels in different liquids, in or out of contact	FUL 200D2Y00 FSL 500C6Y00

Fiber optic sensors of the ranges FVDK 67 and FVDK 69 – versatile and multifunctional

The generation of multifunction fiber optic sensors is particularly suitable for handling processes, where very fast movements as well as exact positioning or the detection of very small objects is important. A single sensor undertakes the tasks which were formerly performed by many different sensors. The user can choose from 3 to 8 different operating modes from very short response time to high sensitivity to adapt the sensor optimally to his application. Despite the all-in-one concept, the requirement for simple operation is also fulfilled.

Characteristics and advantages

Comprehensive functions

Up to 7 different teach-in functions are integrated. For example, apart from the usual 2-point Teach-in method, there is also electronic background suppression or a dynamic teach-in function with which the fiber optic sensor automatically calculates the optimum switching point from the received signals. Integrated timer functions, closing and opening delays are adjustable in small steps from 250 µs to max. 20 s.

Application feedback

The application feedback is particularly important during commissioning if consistent detection is to be ensured. The switching point and the relative received signal are indicated simultaneously on the 2x4-digit display of the FVDK 67 range. With this information, it can be determined at a glance whether the switching point has been optimally adjusted.

High resolution

Usually, the range is subdivided statically by a 12-bit A/D converter into 4096 individual, processable steps. In contrast to this, the FVDK 69 range offers a dynamic resolution with which the fiber optic sensor automatically selects the optimum resolution according to the range. The advantage of this is clearly in the detection of very small objects or of fine contrasts at short range.

The advantages at a glance

Type FVDK 67

- 8 operating modes and up to 6 different Teach-in functions available
- Switching point adjustment with Teach-in button or directly manual with +/- button
- 2x4-digit display, the switching point and received signal are indicated simultaneously
- Integrated interlock function to prevent undesired manipulation
- Up to 3 optical fibers can be installed directly adjacent to each other without optical interference
- Application-specific versions with external Teach-in and Teach-in feedback output or with 2 individually adjustable switching outputs

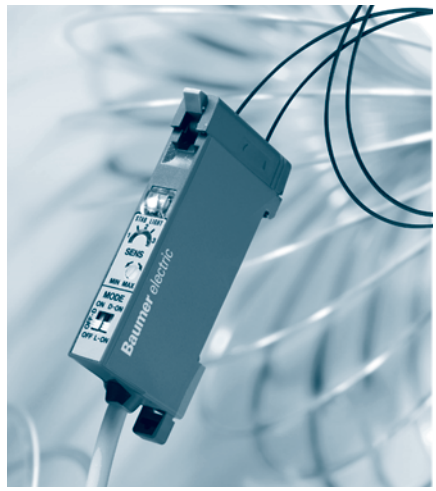
The advantages at a glance

Type FVDK 69

- 3 operating modes and 7 different Teach-in functions available
- Switching point adjustment with push-and-twist knob
- 1x3-digit display indicates the relative receiving signal
- Dynamic 10-bit resolution, optimized for detection of small objects or fine contrasts at close range
- Version with blue light source, permitting red and white marks to be discerned
- Adjustable protection against optical interference between two optical fibers

Teach-in or potentiometer? Just simple operation

The fiber optic sensors of the FVDK12, 22, 60, 80 and FWDK 84 ranges are characterized particularly by their simple handling. The sensitivity can be adjusted either with a potentiometer or a Teach-in button. Differently colored LEDs or simple displays provide the adjustment feedback. The sensor ranges differ primarily in their speed, sensitivity, hysteresis functions and supplementary functions such as timers, external Teach-in or logical output gates. However, all have the same thing in common: regardless of where the sensor is installed, the adjustment can be made practically without the need for operating instructions.



The advantages at a glance

Type FVDK 12

- Integrated, dynamic Teach-in permits the most reliable detection of moving objects or small parts for which it is difficult to find an exact Teach-in position
- High-speed version with a response time of only 50 µs
- Integrated alarm output warns in advance of excessive soiling
- Protection class IP65

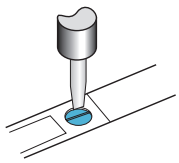
Type FVDK 22

- Two sensors in one housing reduces the necessary wiring
- The two integrated sensors do not interfere with each other
- It is possible to link the two outputs logically
- Version with external Teach-in from the controller

The advantages at a glance

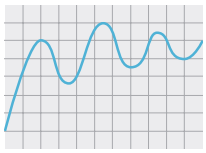
Type FVDK 60

- The switching point and the relative receiving signal are visible on the 1-digit display
- Teach-in errors are indicated directly on the display
- Protection against optical interference between up to 3 optical fibers
- Version with external teach-in from the controller



Type FVDK 80

- 3-turn potentiometer permits accurate adjustment of the sensitivity
- Version with low hysteresis of 10% (full scale) permits accurate positioning
- High-speed version with a response time of only 50 µs
- Integrated alarm output warns in advance of excessive soiling
- Protection against optical interference between up to 3 optical fibers



Type FWDK 84

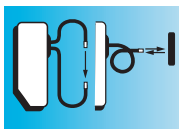
- Analog voltage output 1–5 VDC
- Adjustable resolution of 0,3 to 6% (full scale)
- In combination with a fiber optic array, object sizes or positions can be determined within a range of up to 21 mm

Master/slave sensors – modular construction reduces the necessary wiring

The wiring of a machine represents a cost and time expenditure which must not be underestimated. The power supply and all output signals of the FVDK 31 range are connected to the controller by only one multi-core cable. Sensor groups can also be formed. The sensors are configured via the master, which is equipped with 2 JOG-dial rotary switches. A total of 7 different teach-in functions are available, which can be used individually for your application. The received signal of the individual slave unit is indicated on the easily legible display.

The advantages at a glance

- Up to 16 slaves can be programmed simultaneously via one master
- The 3-digit display indicates the reception level of each selected slave
- The wiring of the individual slave outputs is unnecessary due to plug connectors at the sides
- Up to 5 sensor groups can be formed, which can be connected with a cable of max. 2 m length
- 7 different teach-in functions and adjustable opening/closing delay
- Protection against optical interference between up to 4 optical fibers
- The side plug connector technique permits the replacement of individual units without having to detach the entire block

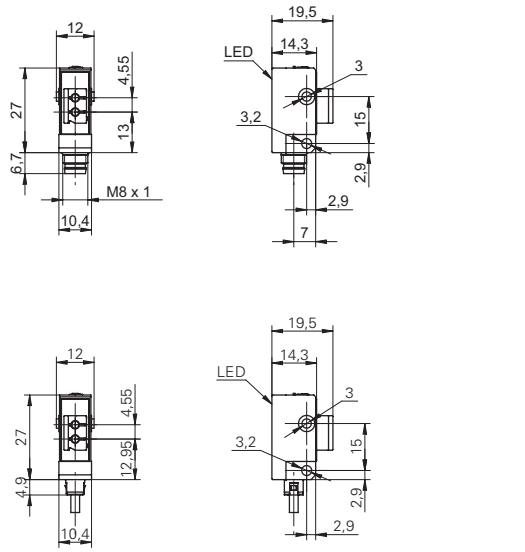


Sb = 160 mm
Tw = 45 mm

- sensitivity adjustable via potentiometer
- suppression of mutual optical interference

general data		
actual range Sb (FSE 200C1002)		160 mm
sensing distance Tw (FUE 200C1003)		45 mm
light source		pulsed red LED
light indicator		LED yellow
alignment / soiled lens indicator		flashing light indicator
adjustment		Pot 270°
wave length		660 nm
suppression of reciprocal influence		yes
electrical data		
response time / release time		< 1 ms
voltage supply range +Vs		10 ... 30 VDC
current consumption max.		30 mA
current consumption typ.		20 mA
voltage drop Vd		< 1,8 VDC
output function		light / dark operate
output current		< 100 mA
short circuit protection		yes
reverse polarity protection		yes
mechanical data		
width / diameter		10,4 mm
height / length		27 mm
depth		14 mm
type		rectangular
housing material		plastic (ASA)
ambient conditions		
operating temperature		-25 ... +55 °C
protection class		IP 40
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		
accessories		
SENSOFIX mounting kit		150326
mounting bracket (cable type)		114501
mounting bracket (connector type)		133792
for details, see accessories section		

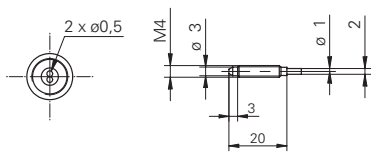
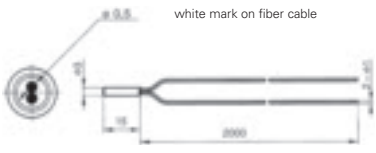
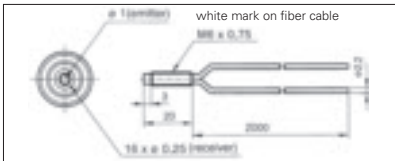
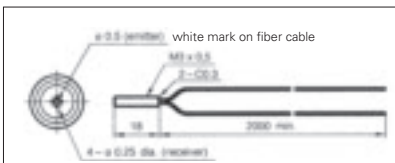
dimension drawings



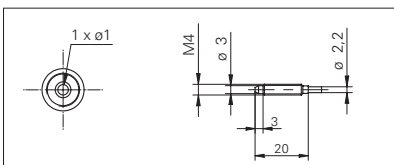
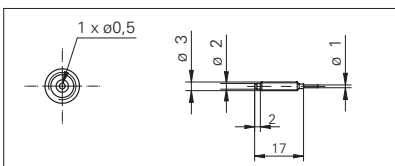
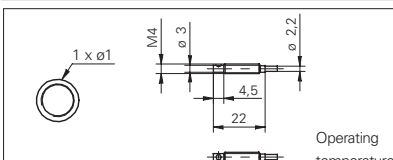
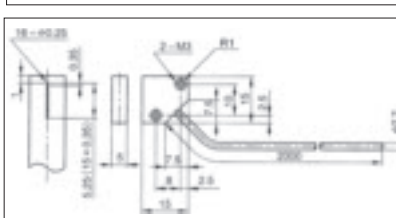
connection diagrams

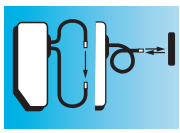
order reference	output circuit	connection types
FVDK 10N5101	NPN	cable
FVDK 10N5101/S35A	NPN	connector M8
FVDK 10P5101	PNP	cable
FVDK 10P5101/S35A	PNP	connector M8

Reflective types (other types on demand)

	Shape	Part number	Tw = sensing distance [mm]
Standard M4 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C1004**	18
Standard ø 3 mm Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200D2Y00**	18
Coaxial M6 Suitable for positioning Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FCE 200C1Y00**	45
Coaxial M3 Suitable for positioning. Spot sizes of 0,4 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FCE 200D1Y00**	10

True beam types (other types on demand)

Model Features	Shape	Part number	Tw = sensing distance [mm]
Standard M4 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C1002**	160
Standard M3 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FSE 200C1004**	50
Side view M4 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C4002**	100
Array (fine light barrier) Reliably detects small, thin or vibrating workpieces in a light curtain of 5,25 mm. Sensing head: brass, Ni plated	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200C6Y00**	100

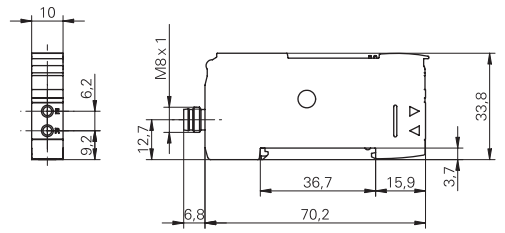


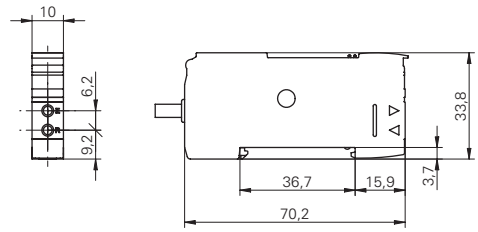
Sb = 1200 mm
Tw = 300 mm

- 2x4 digit display indicates the switching point and receiving light level
- versatile applicable due to 8 operating modes

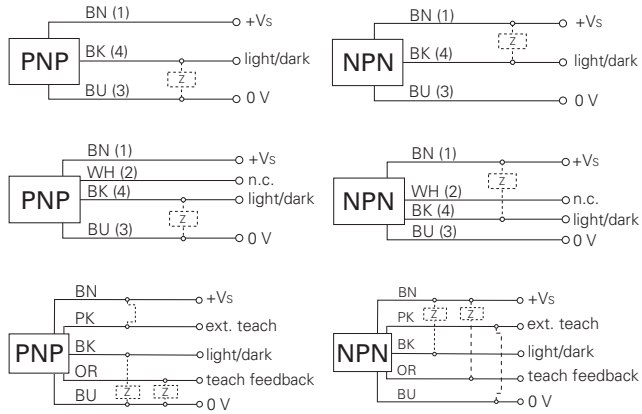
general data	
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket for mounting on DIN Rail	159806
for details, see accessories section	

dimension drawings

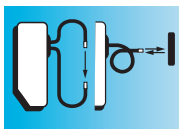




connection diagrams



order reference	adjustment	response time / release time	output circuit	output current	connection types
FVDK 10N67Y0	Teach-in	0,05 ... 5 ms (adjustable)	NPN	< 100 mA	cable
FVDK 10N67Y0/S35A	Teach-in	0,05 ... 5 ms (adjustable)	NPN	< 100 mA	connector M8, 4 pin
FVDK 10N67YR	Teach-in: button / external	0,05 ... 5 ms (adjustable)	NPN	< 50 mA	cable
FVDK 10P67Y0	Teach-in	0,058 ... 5 ms (adjustable)	PNP	< 100 mA	cable
FVDK 10P67Y0/S35A	Teach-in	0,058 ... 5 ms (adjustable)	PNP	< 100 mA	connector M8, 4 pin
FVDK 10P67YR	Teach-in: button / external	0,058 ... 5 ms (adjustable)	PNP	< 50 mA	cable

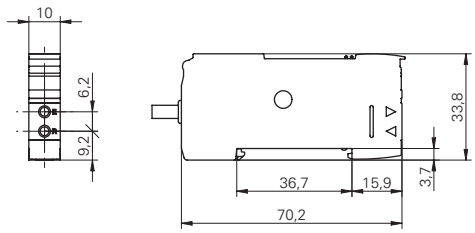


Sb = 1200 mm
Tw = 300 mm

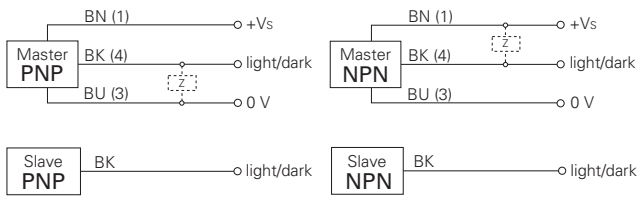
- master/slave system with up to 16 extension units
- integrated dynamic auto-teach-in function
- 2x4 digit display

general data	
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
accessories	
mounting bracket for mounting on DIN Rail	159806
for details, see accessories section	

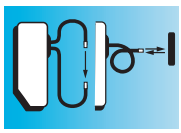
dimension drawing



connection diagrams



order reference	type	response time / release time	output circuit	connection types
FVDK 10N67YM	master	0,05 ... 5 ms (adjustable)	NPN	cable
FVDK 10N67YS	slave	0,05 ... 5 ms (adjustable)	NPN	cable (output only)
FVDK 10P67YM	master	0,058 ... 5 ms (adjustable)	PNP	cable
FVDK 10P67YS	slave	0,058 ... 5 ms (adjustable)	PNP	cable (output only)

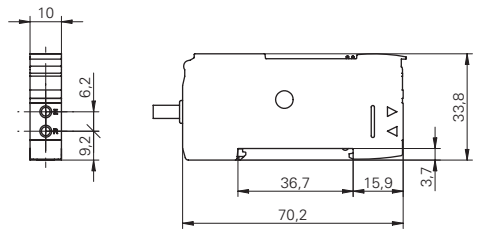


Sb = 1200 mm
Tw = 300 mm

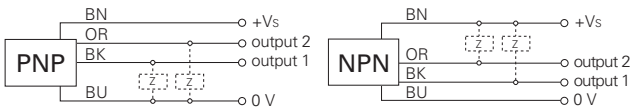
- 2 adjustable outputs
- optional logical output operation
- 2x4 digit display

general data	
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	0,14 ... 5 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
output current	< 30 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
connection types	cable
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
accessories	
mounting bracket for mounting on DIN Rail	159806
for details, see accessories section	

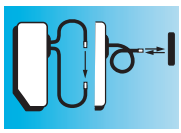
dimension drawing



connection diagrams



order reference	output circuit
FVDK 10N67Y2	NPN
FVDK 10P67Y2	PNP

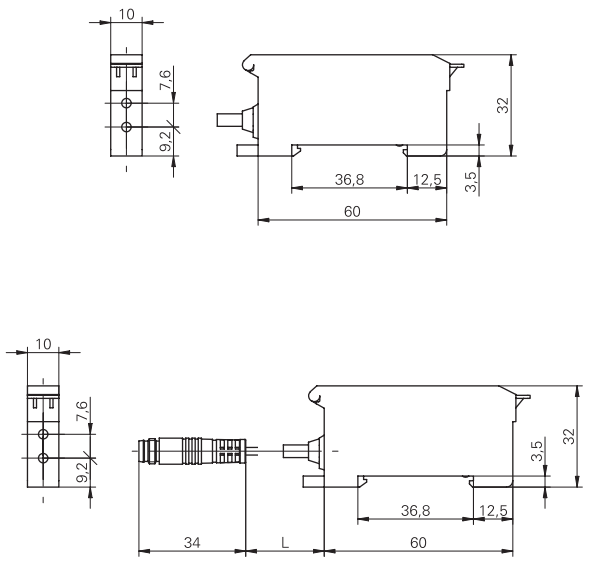


Sb = 1400 mm
Tw = 340 mm

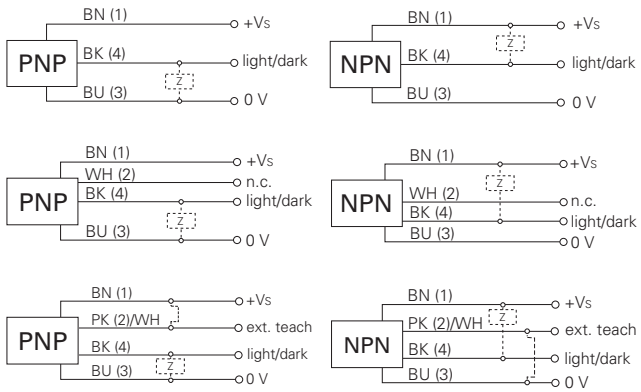
- dynamic resolution principle, optimized for difficult applications
- versatile applicable due to 3 operating modes

general data	
actual range Sb (FSE 200C1002)	1400 mm
sensing distance Tw (FUE 200C1003)	340 mm
light source	pulsed red LED
light indicator	1 x 3-digit display
output indicator	LED orange
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	0,12 ... 5 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	30 mA
voltage drop Vd	< 2 VDC
output function	light / dark operate switchable
on / off delay	1 ... 1000 ms
min. output pulse length	1 ... 1000 ms
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	32 mm
depth	60 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
remarks	
Blue light version on request.	

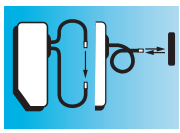
dimension drawings



connection diagrams



order reference	adjustment	output circuit	connection types
FVDK 10N69Y0	Teach-in	NPN	cable
FVDK 10N69Y0/KS35A	Teach-in	NPN	flylead connector M8, 4 pin
FVDK 10N69YR	Teach-in: button / external	NPN	cable
FVDK 10P69Y0	Teach-in	PNP	cable
FVDK 10P69Y0/KS35A	Teach-in	PNP	flylead connector M8, 4 pin
FVDK 10P69YR	Teach-in: button / external	PNP	cable

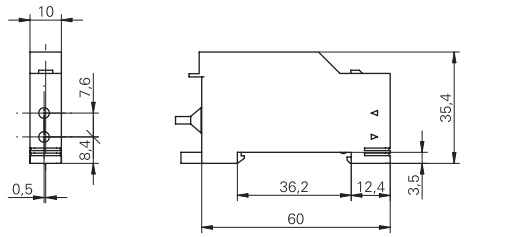


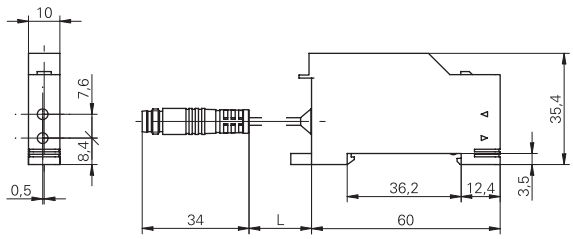
Sb = 320 mm
Tw = 90 mm

- visible excess gain signal on display
- sensitivity adjustable via Teach-in
- external teach-in via PLC

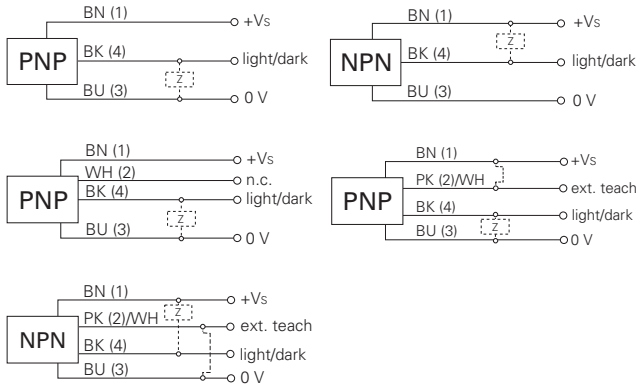
general data		
actual range Sb (FSE 200C1002)		320 mm
sensing distance Tw (FUE 200C1003)		90 mm
light source		pulsed red LED
light indicator		1 x 1-digit display
alignment / soiled lens indicator		LED green
output indicator		LED red
wave length		680 nm
suppression of reciprocal influence		yes
electrical data		
response time / release time		< 0,5 ms
voltage supply range +Vs		10 ... 30 VDC
current consumption max.		50 mA
voltage drop Vd		< 1 VDC
output function		light / dark operate switchable
off delay		40 ms
output current		< 100 mA
short circuit protection		yes
reverse polarity protection		yes
mechanical data		
width / diameter		10 mm
height / length		35,4 mm
depth		60 mm
type		rectangular
housing material		polycarbonate/ABS
ambient conditions		
operating temperature		-20 ... +55 °C
protection class		IP 40
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

dimension drawings

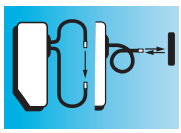




connection diagrams



order reference	adjustment	output circuit	connection types
FVDK 10N60Y0	Teach-in	NPN	cable
FVDK 10N65Y0	Teach-in: button / external	NPN	cable
FVDK 10P60Y0	Teach-in	PNP	cable
FVDK 10P60Y0/KS35A	Teach-in	PNP	flylead connector M8, 4 pin
FVDK 10P65Y0	Teach-in: button / external	PNP	cable
FVDK 10P65Y0/KS35A	Teach-in: button / external	PNP	flylead connector M8, 4 pin

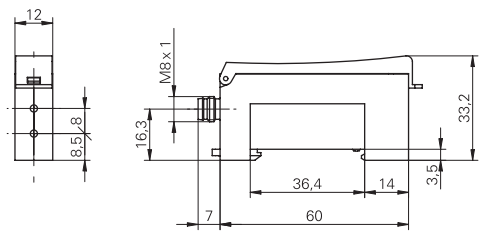


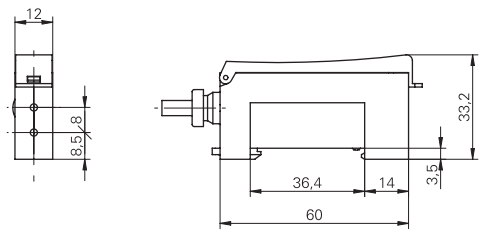
Sb = 320 mm
Tw = 90 mm

- sensitivity adjustable via Teach-in
- integrated alarm output
- protection class IP 65

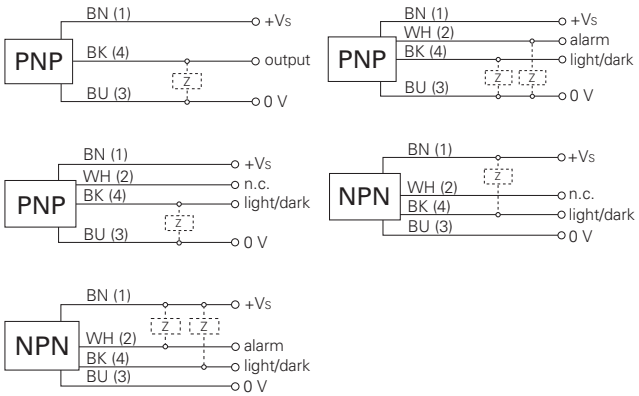
general data	
actual range Sb (FSE 200C1002)	320 mm
sensing distance Tw (FUE 200C1003)	90 mm
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
adjustment	Teach-in
wave length	660 nm
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	46 mA
current consumption typ.	36 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12 mm
height / length	33,2 mm
depth	60 mm
type	rectangular
housing material	PBT / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

dimension drawings

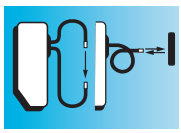




connection diagrams



order reference	min. output pulse length	output circuit	connection types	version
FVDK 12N6101/S35A	-	NPN	connector M8, 4 pin	-
FVDK 12N6401/S35A	-	NPN	connector M8, 4 pin	integrated alarm output
FVDK 12P6101	-	PNP	cable	-
FVDK 12P6101/S35A	-	PNP	connector M8, 4 pin	-
FVDK 12P6401	-	PNP	cable	integrated alarm output
FVDK 12P6401/S35A	-	PNP	connector M8, 4 pin	integrated alarm output
FVDK 12P6501/S35A	40 ms	PNP	connector M8, 4 pin	integrated alarm output

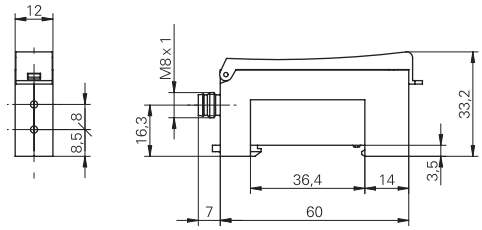


Sb = 140 mm

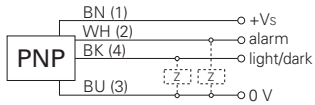
- Teach-in
- fast version available
- alarm output

general data	
version	fast version
actual range Sb (FSE 200C1002)	140 mm
sensing distance Tw (FUE 200C1003)	40 mm
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
adjustment	Teach-in
wave length	660 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12 mm
height / length	33,2 mm
depth	60 mm
type	rectangular
housing material	PBT / PC
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

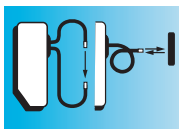
dimension drawing



connection diagram



order reference
FVDK 12P6410/S35A

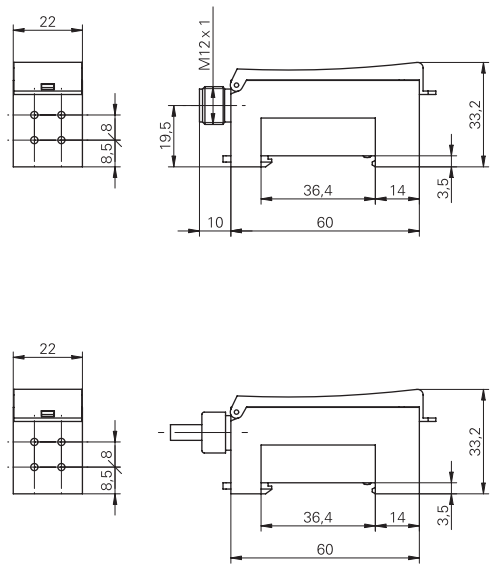


Sb = 320 mm
Tw = 90 mm

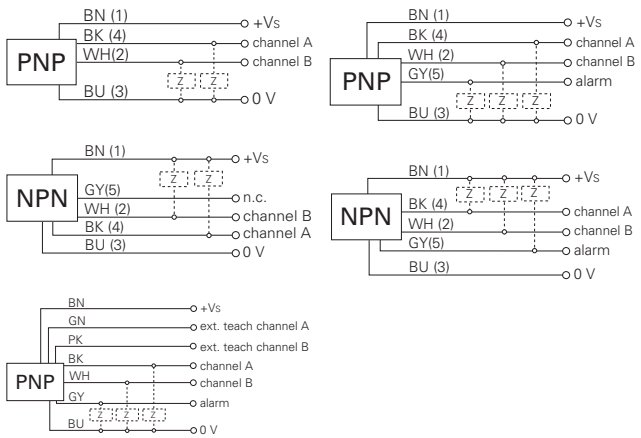
- 2 sensors in one housing
- sensitivity adjustable via Teach-in
- optional logical output operation

general data	
actual range Sb (FSE 200C1002)	320 mm
sensing distance Tw (FUE 200C1003)	90 mm
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	68 mA
current consumption typ.	50 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	22 mm
height / length	33,2 mm
depth	60 mm
type	rectangular
housing material	PBT / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
connectors	
ES 34CP2	5 pin 2 m straight
ES 33CP2	5 pin 2 m angular
additional cable connectors and field wireable connectors, see accessories	

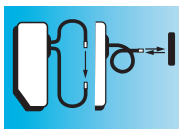
dimension drawings



connection diagrams



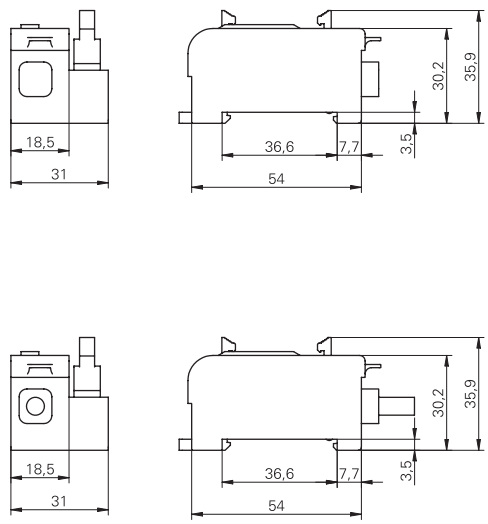
order reference	adjustment	min. output pulse length	output circuit	connection types	version
FVDK 22N6101/S14C	Teach-in	-	NPN	connector M12, 5 pin	-
FVDK 22N6401/S14C	Teach-in	-	NPN	connector M12, 5 pin	integrated alarm output
FVDK 22P6101	Teach-in	-	PNP	cable	-
FVDK 22P6101/S14C	Teach-in	-	PNP	connector M12, 5 pin	-
FVDK 22P6401	Teach-in	-	PNP	cable	integrated alarm output
FVDK 22P6401/S14C	Teach-in	-	PNP	connector M12, 5 pin	integrated alarm output
FVDK 22P6420	Teach-in: button / external	-	PNP	cable	integrated alarm output
FVDK 22P6501/S14C	Teach-in	40 ms	PNP	connector M12, 5 pin	integrated alarm output



- master/slave system with up to 16 extension units
- all sensors can be set at the same time
- 3 digit display

general data	
type	master
light indicator	1 x 3-digit display
adjustment	Teach-in
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	12 ... 24 VDC
current consumption max.	60 mA
voltage drop Vd	< 1 VDC
on / off delay	1 ... 1000 ms
min. output pulse length	1 ... 1000 ms
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	31 mm
height / length	35,9 mm
depth	54 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +40 °C
protection class	IP 40
accessories	
ribbon shielded cable 20 pin 2 m	141139
ribbon shielded cable 20 pin 5 m	141140
ribbon shielded cable 20 pin 10 m	144161
for details, see accessories section	

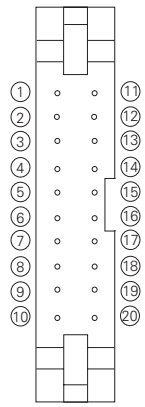
dimension drawings



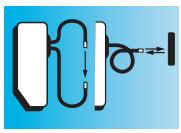
connection diagram

Pin no.	Version	
	NPN	PNP
①	output 1	
②	output 2	
③	output 3	
④	output 4	
⑤	output 5	
⑥	output 6	
⑦	output 7	
⑧	output 8	
⑨	+Vs	0 V
⑩	0 V	+Vs

Pin no.	Version	
	NPN	PNP
⑪	output 9	
⑫	output 10	
⑬	output 11	
⑭	output 12	
⑮	output 13	
⑯	output 14	
⑰	output 15	
⑱	output 16	
⑲	+Vs	0 V
⑳	0 V	+Vs



order reference	output circuit	connection types
FVDK 31N06Y0	NPN	cable / MIL connector
FVDK 31P06Y0	PNP	cable / MIL connector
FVDK 31P06Y1	PNP	MIL connector

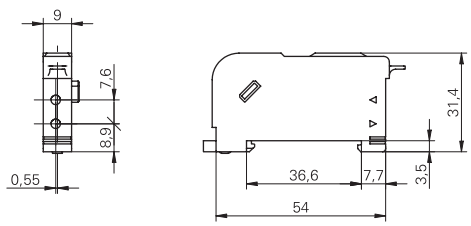


Sb = 320 mm
Tw = 90 mm

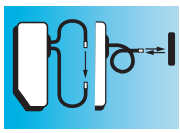
- FVDK 31 slave unit for master
- up to 16 slaves can be mounted
- reduced wiring

general data	
type	slave
actual range Sb (FSE 200C1002)	320 mm
sensing distance Tw (FUE 200C1003)	90 mm
light source	pulsed red LED
output indicator	LED orange
adjustment	no
wave length	680 nm
suppression of reciprocal influence	yes
electrical data	
current consumption max.	35 mA
output function	light / dark operate switchable
mechanical data	
width / diameter	9 mm
height / length	31,4 mm
depth	54 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +40 °C
protection class	IP 40

dimension drawing



order reference
FVDK 09P00Y0

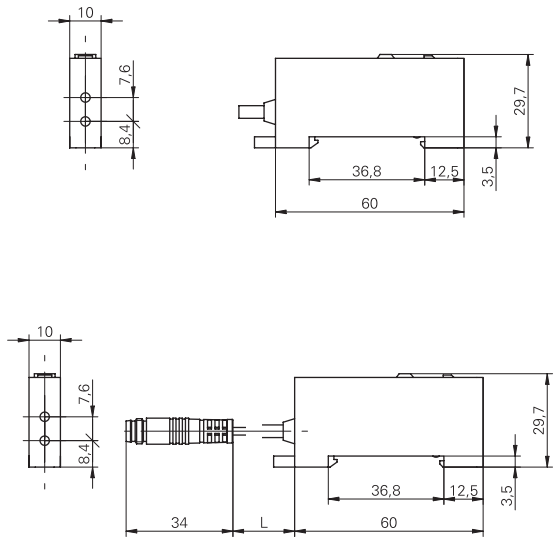


Sb = 440 mm
Tw = 120 mm

- sensitivity adjustable via potentiometer
- fast and high sensitivity version available
- integrated alarm output

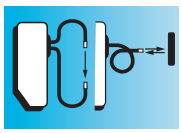
general data	
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED red
adjustment	potentiometer
wave length	680 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
voltage drop Vd	< 1 VDC
output function	light / dark operate switchable
off delay	40 ms
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	29,7 mm
depth	60 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +60 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

dimension drawings



connection diagrams

order reference	actual range Sb (FSE 200C1002)	sensing distance Tw (FUE 200C1003)	response time / release time	output circuit	connection types	version
FVDK 10N81Y0	240 mm	70 mm	< 0,5 ms	NPN	cable	small hysteresis
FVDK 10N82Y0	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	NPN	cable	fast version
FVDK 10N83Y0	440 mm	120 mm	< 0,5 ms	NPN	cable	high sensitivity
FVDK 10P81Y0	240 mm	70 mm	< 0,5 ms	PNP	cable	small hysteresis
FVDK 10P81Y0/KS35A	240 mm	70 mm	< 0,5 ms	PNP	flylead connector M8, 4 pin	small hysteresis
FVDK 10P82Y0	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	PNP	cable	fast version
FVDK 10P82Y0/KS35A	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	PNP	flylead connector M8, 4 pin	fast version
FVDK 10P83Y0	440 mm	120 mm	< 0,5 ms	PNP	cable	high sensitivity
FVDK 10P83Y0/KS35A	440 mm	120 mm	< 0,5 ms	PNP	flylead connector M8, 4 pin	high sensitivity



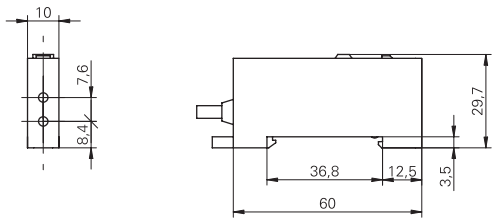
Sb = 90 mm
Tw = 25 mm

- analog output 1-5 VDC
- adjustable resolution

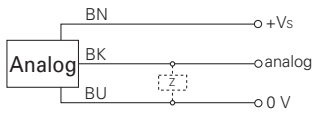
general data	
actual range Sb (FSE 200C1002)	90 mm
sensing distance Tw (FUE 200C1003)	25 mm
light source	pulsed red LED
alignment / soiled lens indicator	LED red
output indicator	LED green
adjustment	potentiometer
resolution	0,3 ... 6 % (Full Scale)
wave length	680 nm
electrical data	
response time / release time	1 ... 50 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max.	40 mA
output circuit	analog 1 ... 5 VDC
load resistance	> 10 kOhm
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	29,7 mm
depth	60 mm
type	rectangular
housing material	polycarbonate/ABS
connection types	cable
ambient conditions	
operating temperature	-20 ... +60 °C
protection class	IP 40

order reference
FWDK 10U84Y0

dimension drawing



connection diagram



Plastic fiber optics
Reflective types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

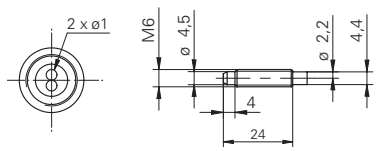
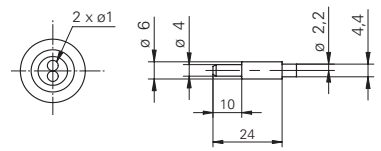
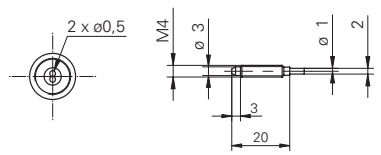
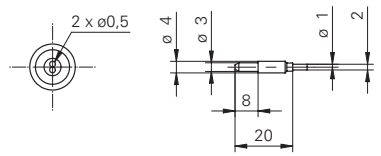
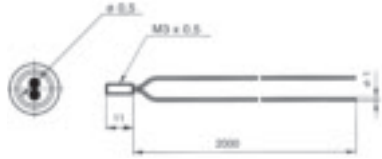
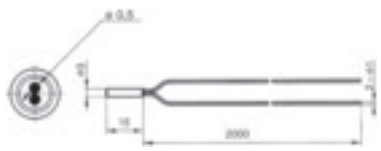
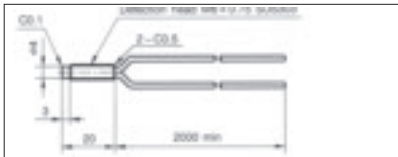
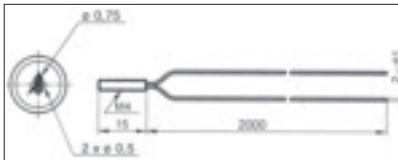
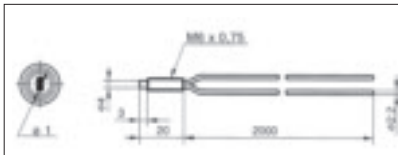
FVDK 84
Analog output

FVDK 12/22/31/60
Teach-in/Master-Slave

FVDK 67
Dual Display

FVDK 69
High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Tw = sensing distance [mm]
Standard M6 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C1003**	70 30 120 25 90 33/260/300 55/260/340
Standard ø 6 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C2003**	70 30 120 25 90 33/260/300 55/260/340
Standard M4 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C1004**	25 12 45 10 35 12/100/120 20/100/140
Standard ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C2004**	25 12 45 10 35 12/100/120 20/100/140
Standard M3 Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200D1Y00**	25 12 45 10 35 12/100/120 20/100/140
Standard ø 3 mm Smooth sensing head without thread Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200D2Y00**	25 12 45 10 35 12/100/120 20/100/140
Long-distance M6 Longer sensing distance than with the standard version. With integrated lens. Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FLE 200C1Y00**	120 55 240 45 160 57/400/550 95/400/650
Long-distance M4 Longer sensing distance than with the standard version. With integrated lens. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FLE 200D1Y00**	50 25 100 18 70 27/190/230 45/190/270
Ultra flexible M6 Ultra flexible type with bending radius of 2 mm Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FUE 200E1Y00**	44 20 85 16 60 24/180/220 40/180/260

Plastic fiber optics
Reflective types

FVDK 81 Low hysteresis

FVDK 82 Fast version

FVDK 83 High sensitivity

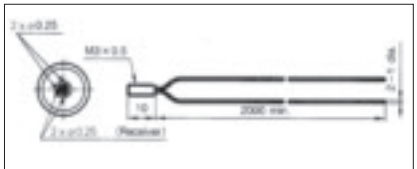
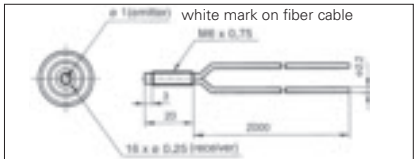
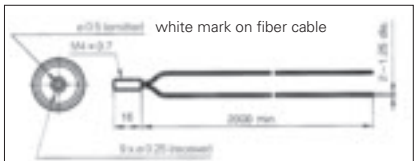
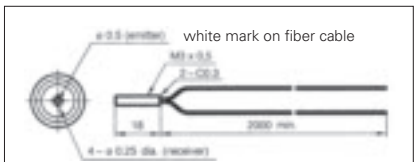
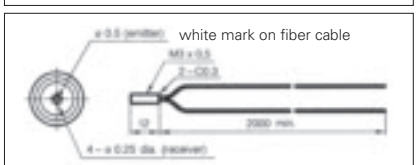
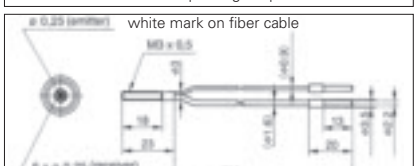
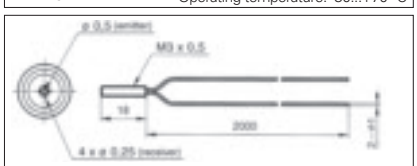
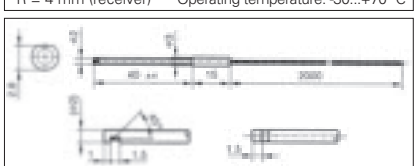
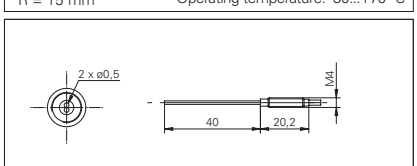
FVDK 84 Analog output

FVDK 12/22/31/60 Teach-in/Master-Slave

FVDK 67 Dual Display

FVDK 69 High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Tw = sensing distance [mm]
Ultra flexible, pliable M3 Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 200F1Y00**	12 6 20 - 15 5/40/50 9/40/60
Coaxial M6 Suitable for positioning Sensing head: stainless steel	 white mark on fiber cable R = 20 mm Operating temperature: -30...+70 °C	**FCE 200C1Y00**	70 30 120 25 90 33/260/300 55/260/340
Coaxial M4 Suitable for positioning Sensing head: stainless steel	 white mark on fiber cable R = 15 mm Operating temperature: -30...+70 °C	**FCE 200C1Y01**	20 12 40 8 25 12/80/110 20/80/120
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 white mark on fiber cable R = 15 mm Operating temperature: -30...+70 °C	**FCE 200D1Y00**	15 8 30 5 20 8/65/95 12/65/110
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 white mark on fiber cable R = 15 mm Operating temperature: -30...+70 °C	**FCE 200D1Y01**	15 8 30 5 20 8/65/95 12/65/110
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 white mark on fiber cable R = 15 mm Operating temperature: -30...+70 °C	**FCE 050C1Y10**	15 8 30 5 20 6/50/70 10/50/80
Coaxial, ultra flexible M3 Ultra flexible. Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 1 mm (emitter) R = 4 mm (receiver) Operating temperature: -30...+70 °C	**FCE 200E1Y00**	13 6 26 4 18 6/50/70 10/50/80
Side view ø 2 mm Smaller outside diameter, suitable for constrained conditions. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C4Y00**	9 3 14 - 10 4/30/45 6/30/50
Smaller sensing head, flexible Chrome nickel sensing head which can be bent once. R > 7.5 mm. Other sensing head lengths on request. Sensing head: chrome nickel/brass	 2 x ø0,5 M4 40 20,2 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C1012**	25 12 45 10 35 12/100/120 20/100/140

Plastic fiber optics
Reflective types

FVDK 81
Low hysteresis

FVDK 12/22/31/60
Teach-in/Master-Slave

FVDK 82
Fast version

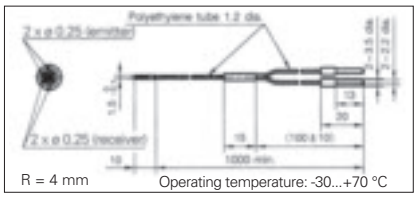
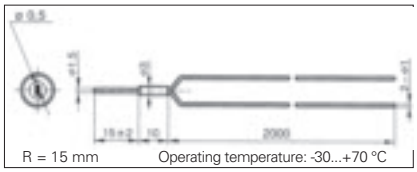
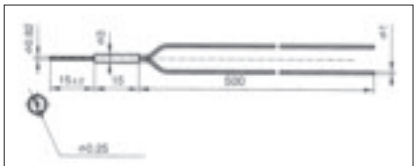
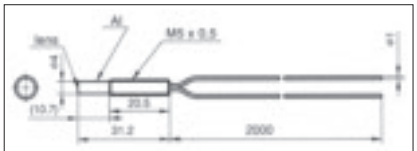
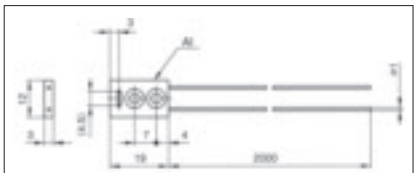
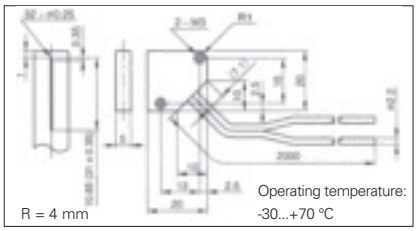
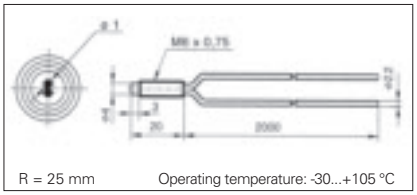
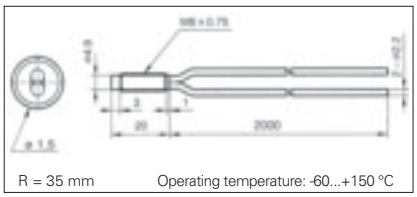
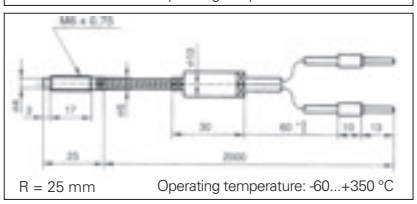
FVDK 67
Dual Display

FVDK 83
High sensitivity

FVDK 69
High Performance

FVDK 84
Analog output

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Tw = sensing distance [mm]
Small sensing head ø 1,5 mm Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 100E2Y00**	12 6 20 - 15 5/40/50 9/40/60
Small sensing head ø 1,5 mm Suitable for small spaces Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C2Y00**	25 12 45 9 35 12/90/120 20/90/140
Small sensing head ø 0,82 mm Suitable for small spaces Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70°C	**FUE 050C2Y10**	5 2 12 - 8 3/20/30 5/20/35
Parallel beam M5 Sharp beam eliminates the influence of reflections from periphery. Spot size 3 mm at a distance of 20 mm. Sensing head: stainl. steel / Al	 R = 15 mm Operating temperature: -30...+70°C	**FKE 200D1Y00**	15 8 30 5 20 8/60/70 12/60/80
Focus Suitable for detection of highly transparent objects (glass, foils) Sensing distance: 2,5 mm ±0,5 Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70°C	**FFE 200D6Y00**	2.5 - 2.5 - 2.5 2.5 2.5
Array Reliably detects small, thin or vibrating workpieces in an area of 10,85 mm. Sensing head: brass, Ni plated	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 200C6Y00**	70 30 120 20 80 30/200/270 50/200/320
Heat resistant M6 Heat resistant up to +105 °C Sensing head: stainless steel	 R = 25 mm Operating temperature: -30...+105 °C	**FUA 200C1Y00**	50 25 100 18 70 27/200/220 45/200/260
Heat and cold resistant M6 Continuous use from -60 °C up to +150 °C Sensing head: stainless steel	 R = 35 mm Operating temperature: -60...+150 °C	**FUB 200C1Y00**	80 40 160 28 110 42/300/400 70/300/460
Heat and cold resistant M6 Continuous use from -60 °C up to +350 °C (Glass fiber optics) Sensing head: stainless steel	 R = 25 mm Operating temperature: -60...+350 °C	**FUG 200C1Y00**	50 25 100 18 70 27/180/220 45/180/260

Plastic fiber optics
Reflective types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

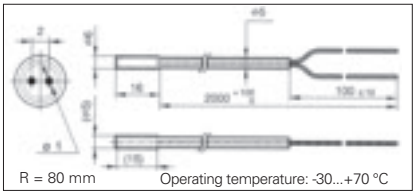
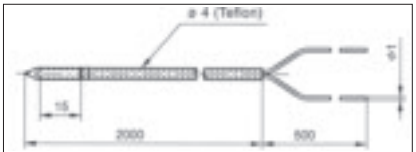
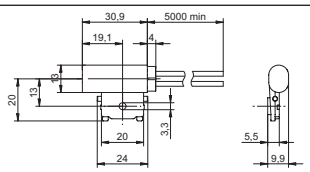
FVDK 84
Analog output

FVDK 12/22/31/60
Teach-in/Master-Slave

FVDK 67
Dual Display

FVDK 69
High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	**Shape**	**Part number**	**Tw = sensing distance [mm]**
Chemical proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in Teflon PFA. Sensing head: stainless steel / Teflon PFA	 R = 80 mm Operating temperature: -30...+70 °C	**FUC 200C2Y00**	40 20 70 12 50 18/150/185 30/150/220
Level recognition Detection of diverse liquids. Resistant to chemicals due to Teflon PFA sheath. Heat resistant up to +105 °C Sensing head: Teflon	 R = 15 mm / 30 mm tip auf 40 mm length Operating temperature: -30...+105 °C	**FUL 200D2Y00**	Switches when immersed in liquid. Recommend fiber optic sensor Series 67. Do not use with Series 82! More information about liquid level recogniton or leak detection, see chapter «level monitoring and leak detecting sensors».
Leak monitoring Detects liquids escaping from tanks and trays. Resistant to chemicals due to Teflon PFA sheath. Heat resistant up to +105 °C Sensing head: Teflon	 R = 20 mm Operating temperature: -30...+70 °C	**FOC 500C6Y00**	Fiber optic sensor is mounted directly on the floor or a base and switches on contact with escaping liquids. Recommend fiber optic sensor Series 67. Do not use with Series 82! More information can be found in chapter «Level and leak sensors».

Plastic fiber optics
Through beam types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

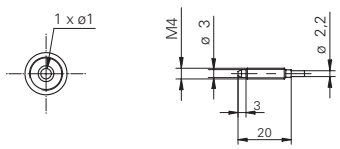
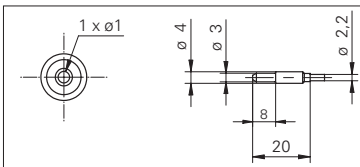
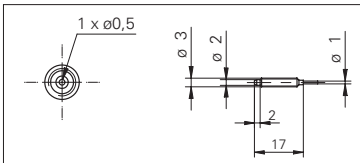
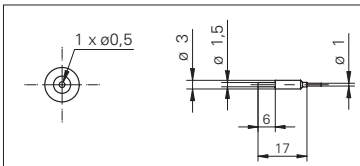
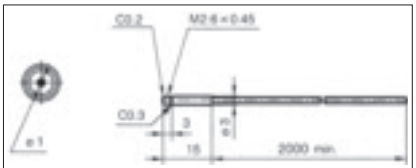
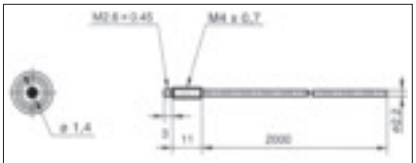
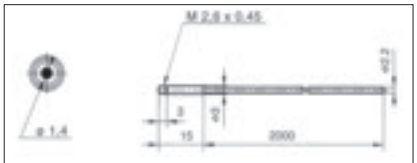
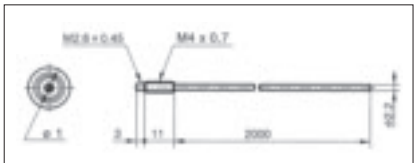
FVDK 84
Analog output

FVDK 12/22/31/60
Teach-in/Master-Slave

HS nL HP
FVDK 67
Dual Display

HS nL HP
FVDK 69
High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Sb = actual range [mm]
Standard M4 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C1002**	240 100 440 90 320 130/900/1200 190/900/1400
Standard M4 Shorter version Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FSE 200C1Y00**	240 100 440 90 320 130/900/1200 190/900/1400
Standard ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C2002**	240 100 440 90 320 130/900/1200 190/900/1400
Standard M3 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FSE 200C1004**	70 30 140 28 100 40/290/340 60/290/400
Standard ø 3 mm Smooth sensing head without thread Sensing head: aluminum	 R = 8 mm Operating temperature: -30...+70 °C	**FSE 200C2004**	70 30 140 28 100 40/290/340 60/290/400
Standard ø 3 mm Shorter version Smooth sensing head without thread	 R = 20 mm Operating temperature: -30...+70 °C	**FSE 200C2Y00**	240 100 440 90 100 130/900/1200 190/900/1400
Long distance M4 Twice the range of an M4 standard fiber optic sensor with integrated lens Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FWE 200C1Y00**	510 220 950 190 680 260/1600/2350 380/1600/2800
Long distance ø 3 mm Smooth sensing head without thread, with integrated lens Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FWE 200C2Y00**	510 220 950 190 680 260/1600/2350 380/1600/2800
Ultra flexible M4 Ultra flexible type with bending radius of 2 mm Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FSE 200E1Y00**	200 90 380 75 270 100/700/920 160/700/1100

Plastic fiber optics
Through beam types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

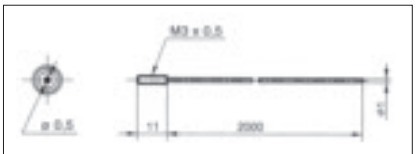
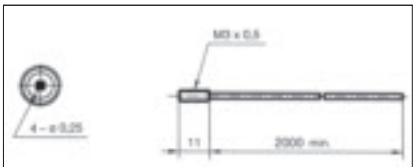
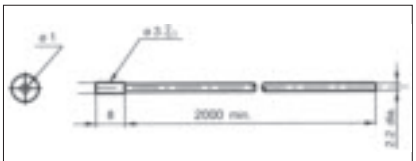
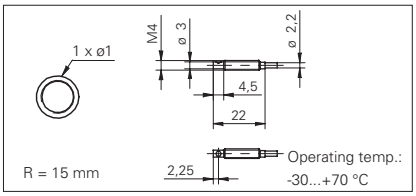
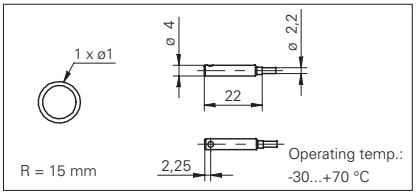
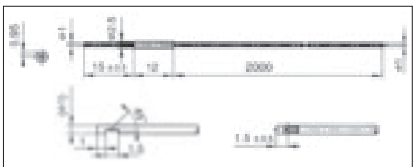
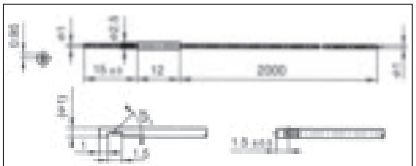
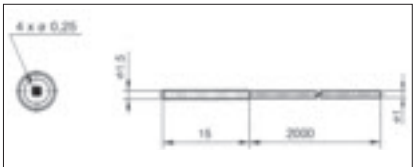
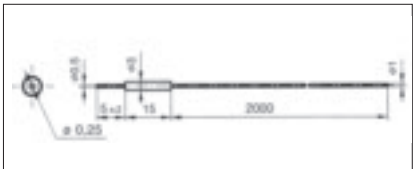
FVDK 84
Analog output

FVDK 12/22/31/60
Teach-in/Master-Slave

FVDK 67
Dual Display

FVDK 69
High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Sb = actual range [mm]
Ultra flexible M3 Highly flexible fiber with a min. bending radius of 1 mm Sensing head: stainless steel	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F1Y00**	23 10 43 8 30 14/95/140 20/95/165
Highly flexible, pliable M3 Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200D1Y50**	40 20 100 20 45 18/120/180 22/120/210
Ultra flexible, 3 mm Highly flexible, extremely pliable fiber with a min. bending radius of 2 mm. Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FSE 200E2Y00**	200 90 380 75 270 100/700/920 160/700/1100
Side view M4 Sensing head: brass	 R = 15 mm Operating temp.: -30...+70 °C	**FSE 200C4002**	150 60 280 55 200 80/600/750 120/600/880
Side view ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temp.: -30...+70 °C	**FSE 200C4001**	150 60 280 55 200 80/600/750 120/600/880
Side view ø 1 mm **Small sensing head** Small target object detection Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200D4Y00**	38 16 70 14 50 20/130/160 30/130/200
Side light exit, small sensing head 4 mm diameter, highly flexible Small target object detection Sensing head: stainless steel	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F4Y00**	11 5 22 4 15 5/40/55 9/40/65
Small sensing head ø 1,5 mm Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200D2Y00**	40 18 80 15 55 20/140/190 30/140/230
Small sensing head ø 0,5 mm Detection of very small objects. Light spot diameter 0,25 mm Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200D2Y50**	11 5 21 4 15 5/35/52 9/35/60

Plastic fiber optics
Through beam types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

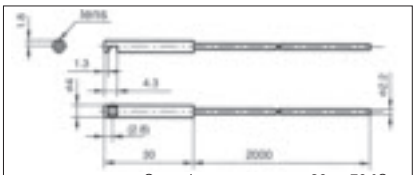
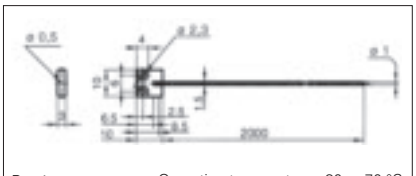
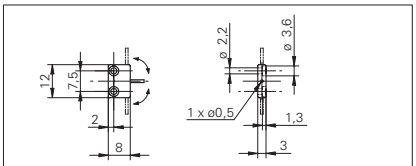
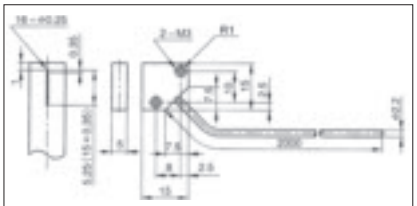
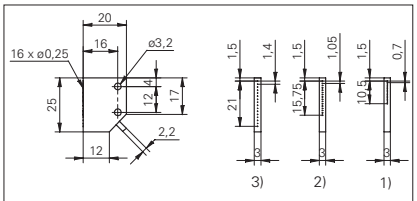
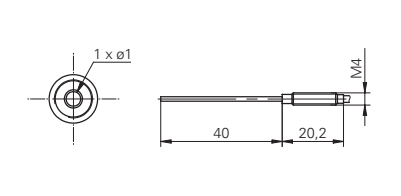
FVDK 84
Analog output

FVDK 12/22/31/60
Teach-in/Master-Slave

FVDK 67
Dual Display

FVDK 69
High Performance

Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Sb = actual range [mm]
Parallel beam M4, exit angle ± 2° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FPE 200C1Y00**	1050 460 2000 390 1400 490/3000/4000 700/3000/4000
Parallel beam M4, exit angle ± 1° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FPE 200D1Y00**	600 260 1100 220 800 340/2400/3600 480/2400/4000
Parallel beam, side view ± 2° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 30 mm Operating temperature: -30...+70 °C	**FPE 200C4Y00**	750 340 1600 280 1000 450/3000/4000 600/3000/4000
Flat sensing head, highly flexible fiber Can be mounted directly on a plate.Highly flexible fiber with a min. bending radius of 1 mm. Sensing head: brass, Ni plated	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F6Y00** With similar dimensions also available with an inexpensive POM sensing head: FSE 100F6Y01	30 13 55 11 40 17/110/140 24/110/165
Flat sensing head, highly flexible fiber Highly flexible fiber with a min. bending radius of 1 mm. Sensing head: POM	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 100F6Y01**	30 13 55 11 40 17/110/140 24/110/165
Array (fine light barrier) Reliably detects small, thin or vibrating workpieces in a light curtain of 5,25 mm. Sensing head: brass, Ni plated	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200C6Y00**	150 65 280 55 200 85/600/790 120/600/920
Array (fine light barrier) Reliably detects small, thin or vibrating workpieces in a light curtain: of 10,5, 15,75 and 21 mm. Sensing head: aluminum	 R = 4 mm Operating temperature: -30...+70 °C	1) **FSE 200C6Y01** 2) **FSE 200C6Y15** 3) **FSE 200C6Y02**	150 65 280 55 200 85/600/790 120/600/920
Small, bendable sensing head Chrome nickel sensing head which can be bent once. R > 7.5 mm. Other sensing head lengths on request. Sensing head: chrome nickel / brass	 R = 8 mm	**FSE 200C1013**	70 30 140 28 100 40/290/340 60/290/400

Through beam types

Plastic fiber optics

Plastic fiber optics
Through beam types

FVDK 81
Low hysteresis

FVDK 82
Fast version

FVDK 83
High sensitivity

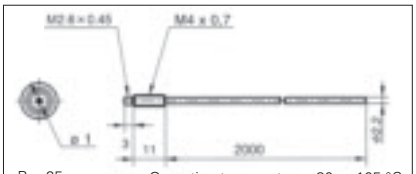
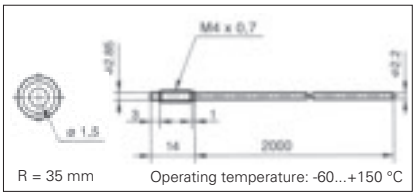
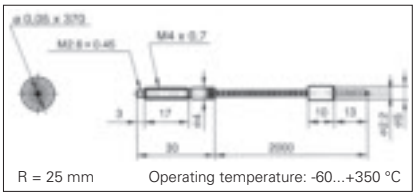
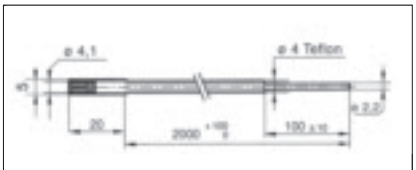
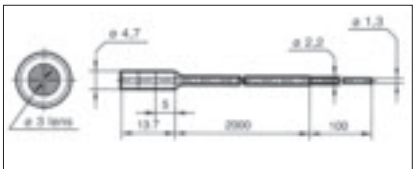
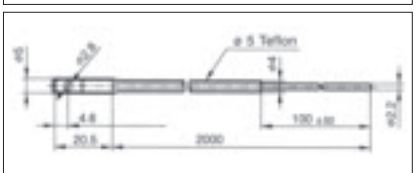
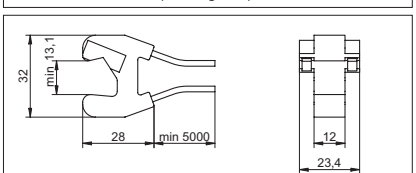
FVDK 84
Analog output

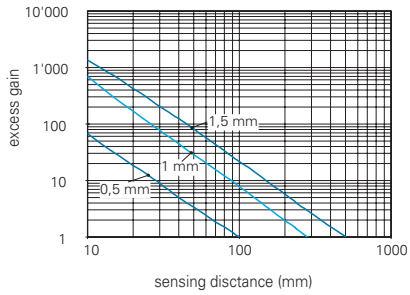
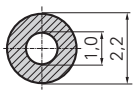
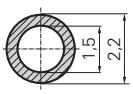
FVDK 12/22/31/60
Teach-in/Master-Slave

HS nL HP
FVDK 67
Dual Display

HS nL HP
FVDK 69
High Performance

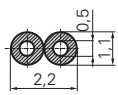
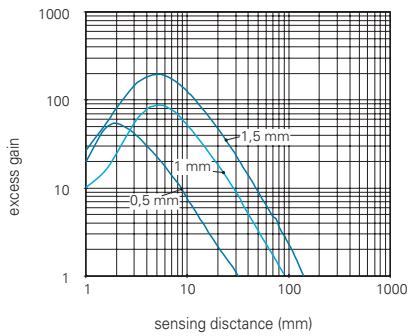
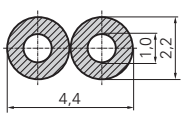
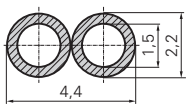
Legend of operating modes
HS High Speed
nL Standard
HP High Sensitivity

Model Features	Shape	Part number	Sb = actual range [mm]
Heat resistant M4 Heat resistant up to +105 °C Sensing head: stainless steel	 R = 25 mm Operating temperature: -30...+105 °C	**FSA 200C1Y00**	160 70 290 60 210 85/550/750 120/550/900
Heat and cold resistant M4 Continuous use from -60 °C up to +150 °C Sensing head: stainless steel	 R = 35 mm Operating temperature: -60...+150 °C	**FSB 200C1Y00**	230 100 430 85 310 120/900/1300 190/900/1500
Heat and cold resistant M4 Continuous use from -60 °C up to +350 °C (Glass fiber optics) Sensing head: stainless steel	 R = 25 mm Operating temperature: -60...+350 °C	**FSG 200C1Y00**	160 70 290 60 210 85/550/750 120/550/900
Chemical and oil proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in Teflon. Sensing head: stainless steel / PFA	 R = 80 mm Operating temperature: -30...+70 °C	**FSC 200C2Y00**	900 400 1700 320 1200 500/3500/4000 720/3500/4000
Chemical and oil proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in Teflon. Sensing head: stainless steel / PFA	 R = 20 mm Operating temperature: -30...+70 °C	**FLC 200D2Y00**	800 360 1600 300 1100 420/3300/4000 640/3300/4000
Chemical and oil proof, side view For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in Teflon. Sensing head: stainless steel / PFA	 R = 80 mm Operating temperature: -30...+70 °C	**FSC 200C4Y00**	200 90 380 75 270 105/750/1020 150/750/1200
Contact-free level detection Detects liquids in (semi-)transparent stand pipes/hoses with 3-13 mm diameter. Sensing head: PFI / PC	 R = 4 mm Operating temperature: -30...+70 °C	**FSL 500C6Y00**	Fiber optic sensor is mounted directly on the hose/stand pipe and switches on contact with escaping liquids. Recommend fiber optic sensor Series 69 and 67. Do not use with Series 82! More information can be found in chapter «Level and leak sensors».

through-beam types	fiber ø	fiber mm²	min. bending radius	part nr. [1]	excess gain curve (2 m cut fiber)
	0,5 mm	≈ 0,2 mm²	8 mm	114158	
	1 mm	≈ 0,8 mm²	15 mm	114157	
	1,5 mm	≈ 1,8 mm²	25 mm	123729	

reduction of sensing distance: 4% per meter
(valid up to 10 m)

Highly flexible version on demand.

reflective types	fiber ø	fiber mm²	min. bending radius	part nr. [1]	excess gain curve (2 m cut fiber)
	2 x 0,5 mm	≈ 2 x 0,2 mm²	8 mm	114594	
	2 x 1 mm	≈ 2 x 0,8 mm²	15 mm	114595	
	2 x 1,5 mm	≈ 2 x 1,8 mm²	25 mm	124878	

reduction of sensing distance: 4% per meter
(valid up to 10 m)

Highly flexible version on demand.

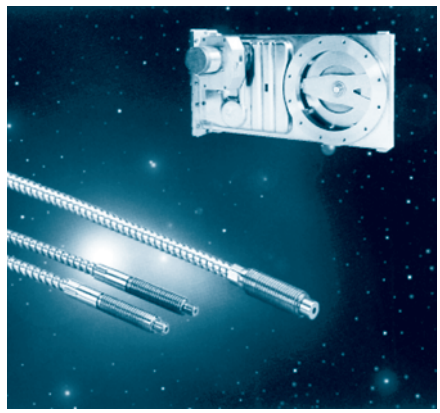
[1] order designation in meters

product family	FZAM 18	FZAM 18	FZAM 18	FZAM 30	FVDM 15
					
width / diameter	18 mm	18 mm	18 mm	30 mm	15 mm
actual range Sb	310 mm	800 mm	800 mm	600 mm 1400 mm	1200 mm
sensing distance Tw	60 mm	150 mm	150 mm	110 mm 230 mm	240 mm
response time / release time	< 0,5 ms	< 1 ms	< 1 ms	< 0,25 ms < 2,5 ms	< 0,1 ms < 1 ms
adjustment	Pot, 15 turn	Pot 270°	Teach-in	Pot, 20 turn	Pot, 20 turn
NPN	■	■	■	■	■
PNP	■	■	■	■	■
cable	■	■	■	■	■
connector		■	■		■
housing material	metal	metal	metal	metal	metal
Page	**478**	**479**	**480**	**481**	**486**

Glass fiber optics

General information

In contrast to plastic fiber optics, glass fiber optics contain hundreds of individual fibers. Each one conveys a part of the emitted light. Depending on the arrangement of the individual fibers, a homogenous light spot or a line can be produced. Also, glass is a high-quality, durable material, which guarantees a long and constant service life. This is only one of the reasons that glass optical fibers are used in the telecommunications industry. The high heat resistance also permits fields of application which are difficult or completely impossible with other sensors.



Typical applications

The wide range of sheath materials and sensing heads make it possible for you to adapt the sensors optimally to your machine concept. A way can always be found to fasten the small fiber optic heads. Due to the different available lengths, the fiber optic sensor can be placed individually at an optimum point.

- Metal-sheathed optical fibers can also be used in harsh conditions
- Detection, differentiation and positioning of different objects
- Monitoring of areas using fiber optic arrays with linear fiber arrangement
- Use at high, low or constantly fluctuating ambient temperatures
- Ranges of up to 1,4 m with fiber optic through beam types

Characteristics and advantages

Independent of the surroundings
As only light is conveyed, electromagnetic fields or high/low temperatures have no effect on the functional reliability.

Rugged
Metal-sheathed optical fibers are protected against mechanical effects (chips etc). All fiber optic sensors are fitted with a rugged metal housing.

Stable operation
High-quality glass fibers ensure stable operation for a long period. All fiber optic sensors are equipped with high-power infrared light sources, which provide sufficient excess gain even with a certain degree of soiling.

Area monitoring
Fiber optic arrays with a linear fiber arrangement permit an area to be monitored or the detection of objects which are not precisely conveyed.

Optimum installation
Apart from the common threaded types, fiber optic sensors with smooth sleeves or side light exit are available.

Fast processes
Fiber optic sensors with response times of only 50 microseconds permit the detection of objects even in very fast processes.

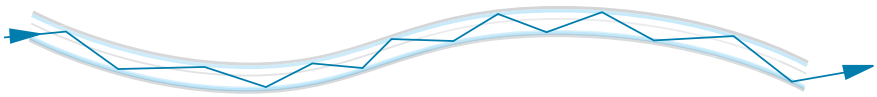
Glass fiber optics

Technology and operation

By exploiting the so-called total reflection, it is possible to convey light in a medium such as glass without great loss.

Explanation of total reflection

When light waves reflect on a barrier layer between two media with different optical densities, they do not simply carry on in a straight line. When they penetrate from an optically denser medium (e.g. glass fiber core) into an optically thinner medium (e.g. glass sheath), there is a smaller angle, the critical angle, under which total reflection occurs. The light wave is reflected back and remains in the optically denser medium.



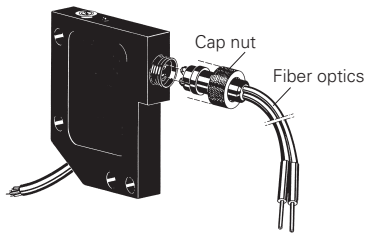
The glass sheath surrounding the core fiber is decisive for the transmission of light waves almost completely without loss. This ensures an optically consistent density of the sheath and the core and thereby permits a practically constant number of total reflections. This also occurs when the optical fiber is slightly bent. If there was no core sheath, it would be highly decisive for the total reflection whether the optical fiber is used in an air medium or, for example, water. The critical angle would then change decisively, which could permit an undesired escape of light under certain circumstances.

In the sensing principle, fiber optic solutions are based on intensity differences. With fiber optic through beam types, an object breaking the light beam between the emitter and receiver is detected. With the fiber optic reflective types, the amount of light reflected by an object is evaluated.

For more information, see the section on plastic fiber optics in this chapter.

Mounting and adjustment

Fiber optics series 15

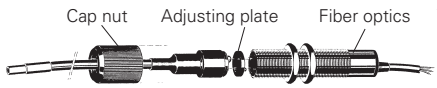


The cap nut to fasten the fiber optics is supplied with every order.

If damaged or lost, the cap nut can be ordered under the following number:

Cap nut 103230

Fiber optics series 18

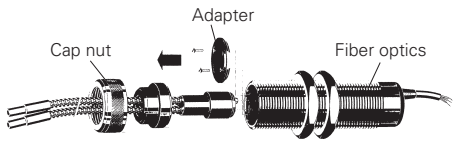


The adjusting plate and cap nut are supplied with every order.

If damaged or lost, they can be ordered under the following part numbers:

Adjusting plate	101958
Cap nut	101480

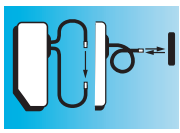
Fiber optics series 30



The adapter and the cap nut must be ordered as accessories with every order.

Adapter	102757
Cap nut	102801

For installation of the fiber optics, the cover must be removed.

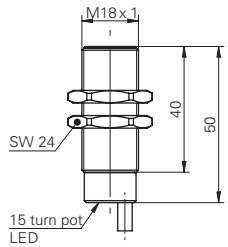


Sb = 310 mm
Tw = 60 mm

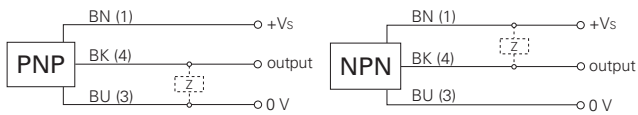
- sensitivity adjustable via potentiometer (axial)
- rugged metal housing
- infrared light source

general data	
actual range Sb	310 mm
sensing distance Tw	60 mm
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	Pot, 15 turn
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
height / length	50 mm
type	cylindrical
housing material	brass nickel plated / PC
connection types	cable 3 pin
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
accessories	
SENSOFIX mounting kit	151658
adjusting plate	101958
cap nut	101480
for details, see accessories section	

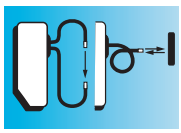
dimension drawing



connection diagrams



order reference	output circuit
FZAM 18N1155	NPN
FZAM 18P1155	PNP

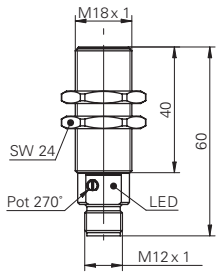


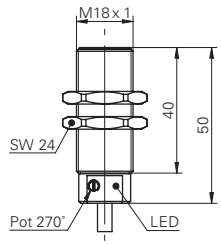
Sb = 800 mm
Tw = 150 mm

- sensitivity adjustable via potentiometer (radial)
- rugged metal housing
- infrared light source

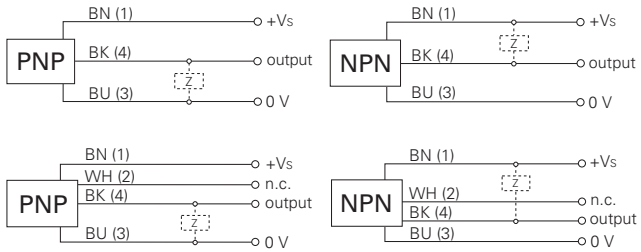
general data	
actual range Sb	800 mm
sensing distance Tw	150 mm
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	Pot 270°
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67
connectors	
ESG 34AH0200 4 pin	2 m straight
ESW 33AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	151658
adjusting plate	101958
cap nut	101480
for details, see accessories section	

dimension drawings

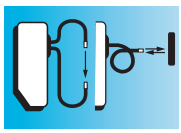




connection diagrams



order reference	height / length	output circuit	connection types
FZAM 18N1150	50 mm	NPN	cable 3 pin
FZAM 18N1150/S14	60 mm	NPN	connector M12, 4 pin
FZAM 18P1150	50 mm	PNP	cable 3 pin
FZAM 18P1150/S14	60 mm	PNP	connector M12, 4 pin

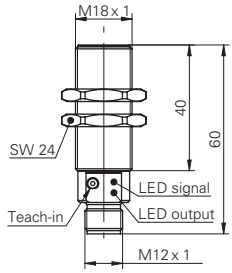


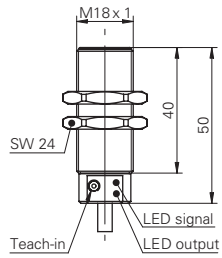
Sb = 800 mm
Tw = 150 mm

- sensitivity adjustable via Teach-in
- light / dark operation programmable
- rugged metal housing

general data	
actual range Sb	800 mm
sensing distance Tw	150 mm
light source	pulsed infrared diode
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
adjustment	Teach-in
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	55 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical
housing material	brass nickel plated / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67
connectors	
ESG 34AH0200 4 pin	2 m straight
ESW 33AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	151658
adjusting plate	101958
cap nut	101480
for details, see accessories section	

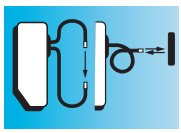
dimension drawings





connection diagrams

order reference	height / length	output circuit	connection types
FZAM 18N6460	50 mm	NPN	cable 4 pin
FZAM 18N6460/S14	60 mm	NPN	connector M12, 4 pin
FZAM 18P6460	50 mm	PNP	cable 4 pin
FZAM 18P6460/S14	60 mm	PNP	connector M12, 4 pin

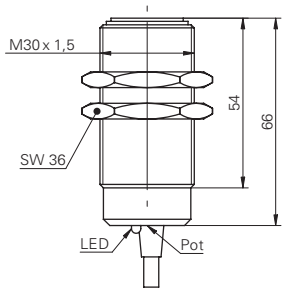


Sb = 1400 mm
Tw = 230 mm

- extended sensing distance
- fast version available
- rugged metal housing

general data	
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	Pot, 20 turn
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
voltage drop Vd	< 2,5 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	30 mm
height / length	66 mm
type	cylindrical
housing material	brass nickel plated
connection types	cable 4 pin
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 65
accessories	
adapter	102757
cap nut	102801
for details, see accessories section	

dimension drawing

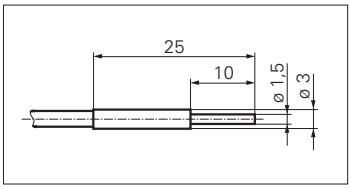
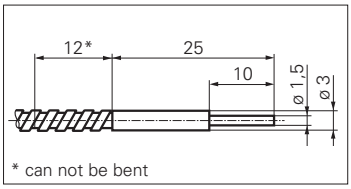
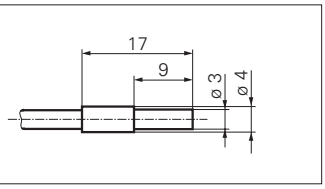
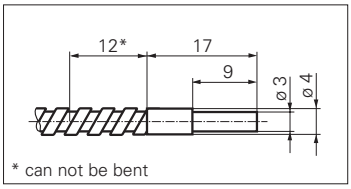
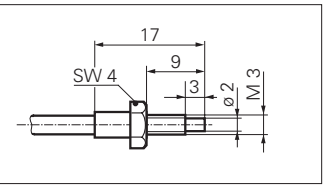
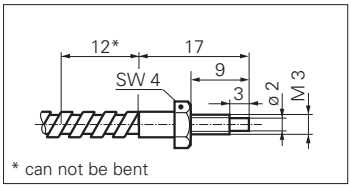
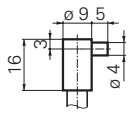
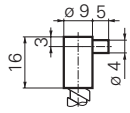


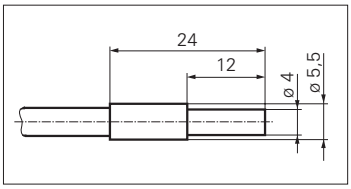
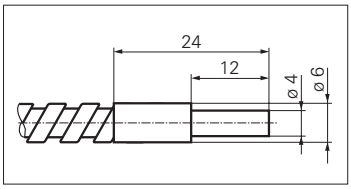
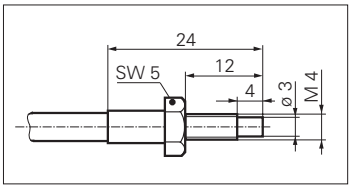
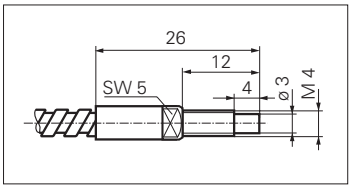
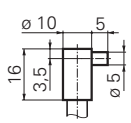
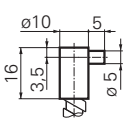
connection diagrams

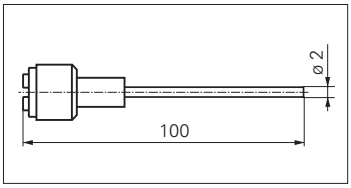
order reference	actual range Sb	sensing distance Tw	response time / release time	current consumption max.	current consumption typ.	output circuit
FZAM 30N5001	600 mm	110 mm	< 0,25 ms	40 mA	30 mA	NPN
FZAM 30N5004	1400 mm	230 mm	< 2,5 ms	50 mA	33 mA	NPN
FZAM 30P5001	600 mm	110 mm	< 0,25 ms	40 mA	30 mA	PNP
FZAM 30P5004	1400 mm	230 mm	< 2,5 ms	50 mA	33 mA	PNP

Glass fiber optics for Series 18, 30
Reflective types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Tw

Fiber diameter 2 x 0,5 mm²			Tw = sensing distance [mm]
Sheath material: PVC ø 2,5 mm (FUE ...)	Sheath material: brass chromium plated ø 4 mm (FUF ...)	Part number	
	 * can not be bent	**FUE 050A2004** **FUF 050A2004** (length 50 cm)	10 20 15 35
		FUE 100A2004 **FUF 100A2004** (length 100 cm)	5 20 15 30
	 * can not be bent	**FUE 050A2003** **FUF 050A2005** (length 50 cm)	10 20 15 35
		FUE 100A2003 **FUF 100A2005** (length 100 cm)	5 20 15 30
	 * can not be bent	**FUE 050A1003** **FUF 050A1005** (length 50 cm)	10 20 15 35
		FUE 100A1003 **FUF 100A1005** (length 100 cm)	5 20 15 30
		**FUE 050A4004** **FUF 050A4004** (length 50 cm)	10 20 15 35
		FUE 100A4004 **FUF 100A4004** (length 100 cm)	5 20 15 30

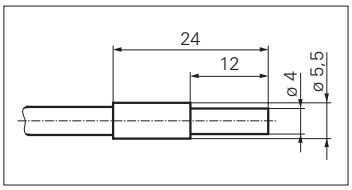
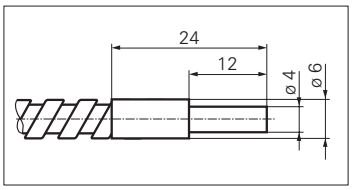
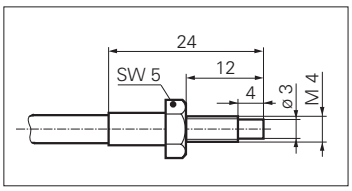
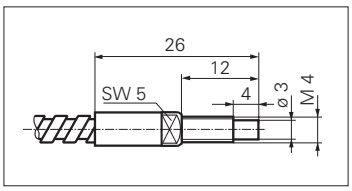
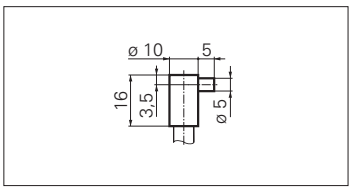
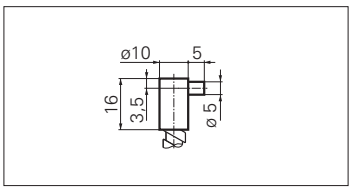
Fiber diameter 2 x 1 mm²			Tw = sensing distance [mm]
Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)	Part number	
		**FUE 050A2002** **FUF 050A2007** (length 50 cm)	15 40 30 70
		FUE 100A2002 **FUF 100A2007** (length 100 cm)	15 40 30 60
		**FUE 050A1002** **FUF 050A1007** (length 50 cm)	15 40 30 70
		FUE 100A1002 **FUF 100A1007** (length 100 cm)	15 40 30 60
		**FUE 050A4005** **FUF 050A4005** (length 50 cm)	15 40 30 70
		FUE 100A4005 **FUF 100A4005** (length 100 cm)	15 40 30 60

Fiber diameter 2 x 0,5 mm²		Part number	Tw = sensing distance [mm]
Sheath material: Chrome-nickel-steel ø 2 mm FUH 010A2002			
		**FUH 010A2002** (length 10 cm)	10 20 15 35

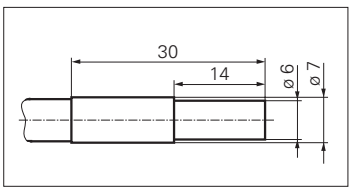
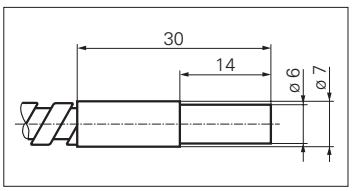
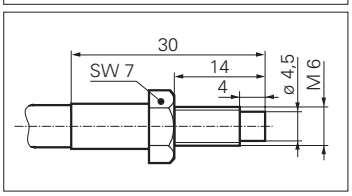
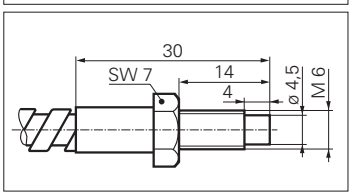
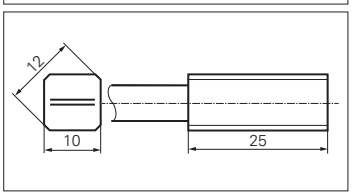
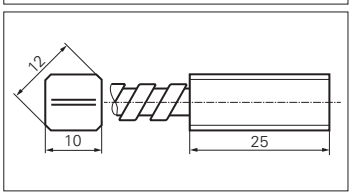
Glass fiber optics for Series 18, 30
Reflective types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Tw

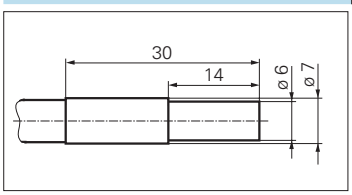
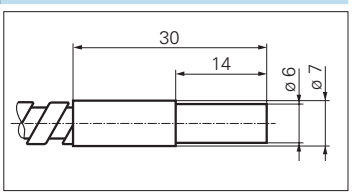
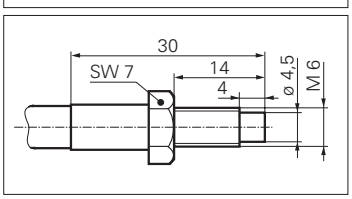
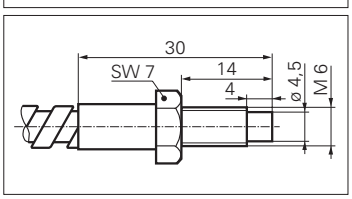
Fiber diameter 2 x 2 mm²

Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2011** **FUF 050A2011** (length 50 cm)	35 80 60 115
		FUE 100A2011 **FUF 100A2011** (length 100 cm)	35 80 60 115
		**FUE 050A1011** **FUF 050A1011** (length 50 cm)	35 80 60 115
		FUE 100A1011 **FUF 100A1011** (length 100 cm)	35 80 60 115
		**FUE 050A4003** **FUF 050A4002** (length 50 cm)	35 80 60 115
		FUE 100A4003 **FUF 100A4002** (length 100 cm)	35 80 60 115

Fiber diameter 2 x 3 mm²

Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2008** **FUF 050A2003** (length 50 cm)	60 150 100 210
		FUE 100A2008 **FUF 100A2003** (length 100 cm)	55 150 100 200
		**FUE 050A1008** **FUF 050A1003** (length 50 cm)	60 150 100 210
		FUE 100A1008 **FUF 100A1003** (length 100 cm)	55 150 100 200
		**FUE 050A3001** **FUF 050A3001** (length 50 cm)	60 150 100 210
		FUE 100A3001 **FUF 100A3001** (length 100 cm)	55 150 100 200

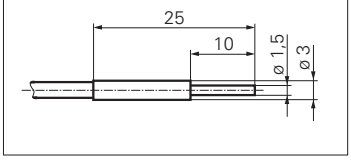
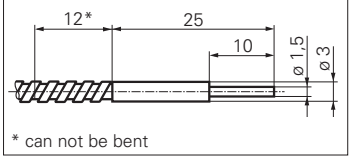
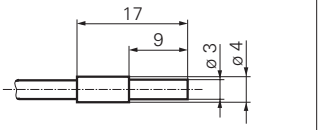
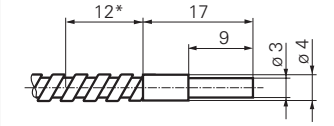
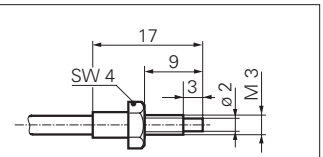
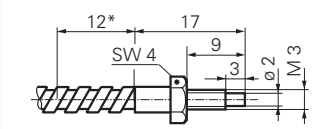
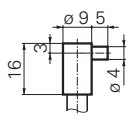
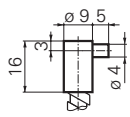
Fiber diameter 2 x 4 mm²

Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2001** **FUF 050A2001** (length 50 cm)	60 150 110 230
		FUE 100A2001 **FUF 100A2001** (length 100 cm)	60 150 100 220
		**FUE 050A1001** **FUF 050A1001** (length 50 cm)	60 150 110 230
		FUE 100A1001 **FUF 100A1001** (length 100 cm)	60 150 100 220

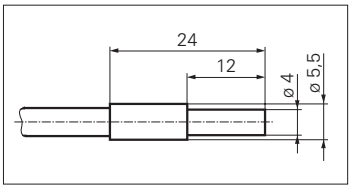
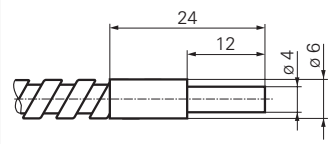
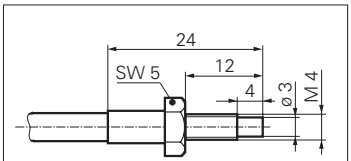
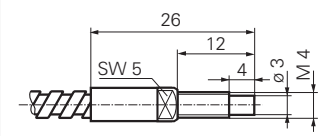
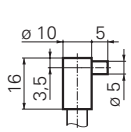
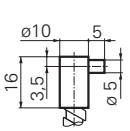
Glass fiber optics for Series 18, 30
Through beam types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Sb

Fiber diameter 2 x 1 mm²

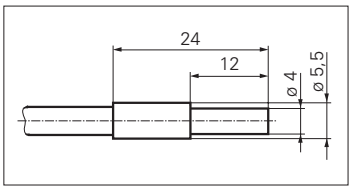
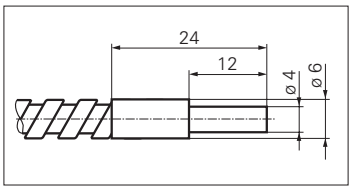
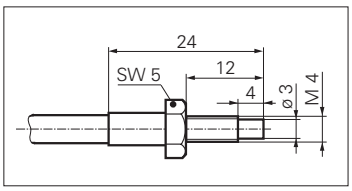
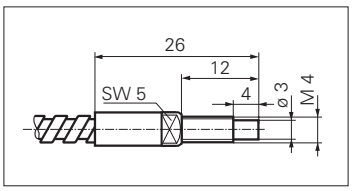
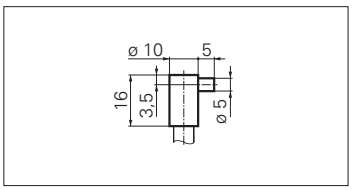
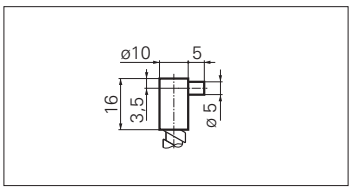
Sheath material: PVC ø 2,5 mm (FSE ...)	Sheath material: brass chromium plated ø 4 mm (FSF ...)	Part number	Sb = actual range [mm]
	 * can not be bent	**FSE 050A2002** **FSF 050A2004** (length 50 cm)	90 270 200 450
		FSE 100A2002 **FSF 100A2004** (length 100 cm)	90 250 190 500
	 * can not be bent	**FSE 050A2001** **FSF 050A2005** (length 50 cm)	90 270 200 450
		FSE 100A2001 **FSF 100A2005** (length 100 cm)	90 250 190 500
	 * can not be bent	**FSE 050A1001** **FSF 050A1005** (length 50 cm)	90 270 200 450
		FSE 100A1001 **FSF 100A1005** (length 100 cm)	90 250 190 500
		**FSE 050A4003** **FSF 050A4003** (length 50 cm)	90 270 200 450
		FSE 100A4003 **FSF 100A4003** (length 100 cm)	90 250 190 500

Fiber diameter 2 x 2 mm²

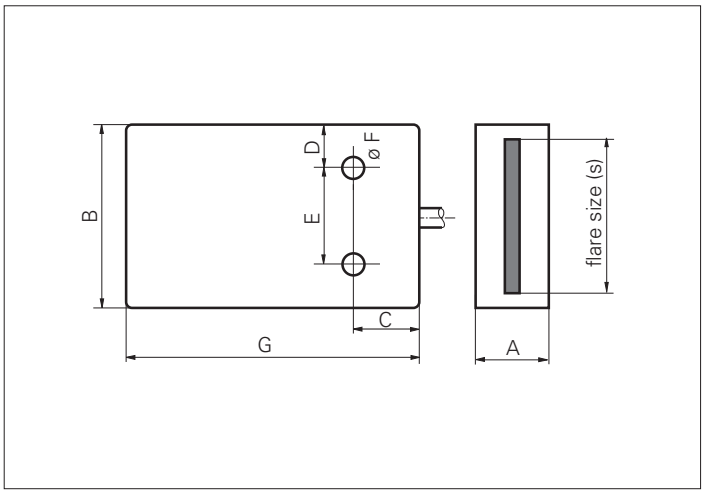
Sheath material: PUR ø 4,5 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)	Part number	Sb = actual range [mm]
		**FSE 050A2006** **FSF 050A2002** (length 50 cm)	180 450 380 450
		FSE 100A2006 **FSF 100A2002** (length 100 cm)	170 500 370 860
		**FSE 050A1006** **FSF 050A1002** (length 50 cm)	180 450 380 450
		FSE 100A1006 **FSF 100A1002** (length 100 cm)	170 500 370 860
		**FSE 050A4006** **FSF 050A4002** (length 50 cm)	180 450 380 450
		FSE 100A4006 **FSF 100A4002** (length 100 cm)	170 500 370 860

Glass fiber optics for Series 18, 30
Through beam types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Sb

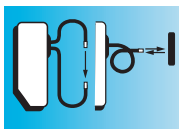
Fiber diameter 2 x 4 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 4 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 050A2003** **FSF 050A2001** (length 50 cm)	310 500 500 500
		FSE 100A2003 **FSF 100A2001** (length 100 cm)	300 800 600 1400
		**FSE 050A1003** **FSF 050A1001** (length 50 cm)	310 500 500 500
		FSE 100A1003 **FSF 100A1001** (length 100 cm)	300 800 600 1400
		**FSE 050A4004** **FSF 050A4004** (length 50 cm)	310 500 500 500
		FSE 100A4004 **FSF 100A4004** (length 100 cm)	300 800 600 1400

Arrays (for Series 18 only)



Part number	Sb = actual range [mm]
FSF 050A3020 **FSE 050A3020** (length 50 cm)	310 500
FSF 100A3020 **FSE 100A3020** (length 100 cm)	310 800
FSF 050A3021 **FSF 050A3022** (length 50 cm)	350 500
FSF 100A3021 **FSF 100A3022** (length 100 cm)	350 900

flare size	dimensions mm							part number
s	A	B	C	D	E	F	G	
8 mm	10	10	-	-	-	-	25	FSF 050A3020 FSF 100A3020
8 mm	10	10	-	-	-	-	25	FSE 050A3020 FSE 100A3020
20 mm	10	25	9	6.5	12	3,2	40	FSF 050A3021 FSF 100A3021
35 mm	12	40	12	7.5	25	4,2	50	FSF 050A3022 FSF 100A3022
metal sheath (FSF...)								length 50 cm length 100 cm
plastic sheath (FSE...) (PUR)								length 50 cm length 100 cm

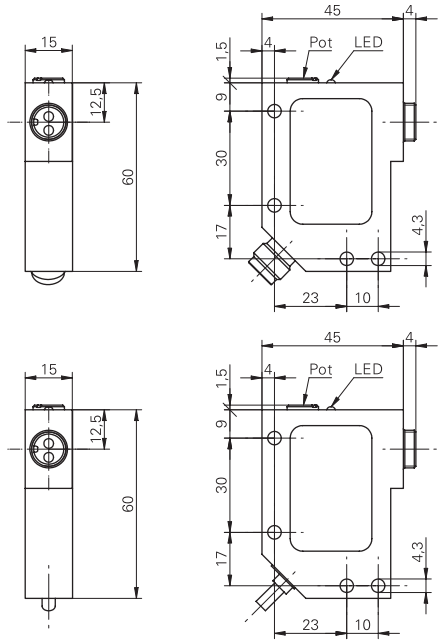


Sb = 1200 mm
Tw = 240 mm

- sensitivity adjustable via potentiometer
- fast version available
- rugged metal housing

general data		
actual range Sb		1200 mm
sensing distance Tw		240 mm
light source		pulsed infrared diode
light indicator		LED yellow
alignment / soiled lens indicator		LED, flashing
adjustment		Pot, 20 turn
wave length		880 nm
suppression of reciprocal influence		yes
electrical data		
voltage supply range +Vs		10 ... 30 VDC
voltage drop Vd		< 1,8 VDC
output function		light / dark operate
output current		< 200 mA
short circuit protection		yes
reverse polarity protection		yes
mechanical data		
width / diameter		15 mm
height / length		60 mm
depth		45 mm
type		rectangular
housing material		die-cast aluminum
ambient conditions		
operating temperature		-25 ... +65 °C
protection class		IP 65
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		
accessories		
mounting bracket		103415
for details, see accessories section		

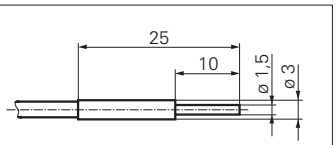
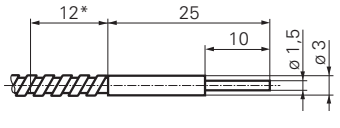
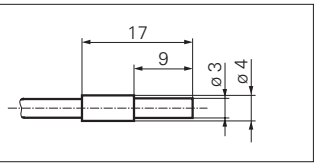
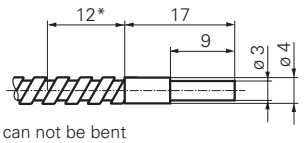
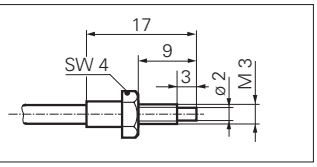
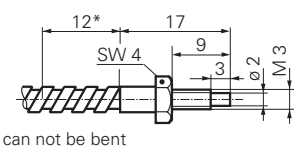
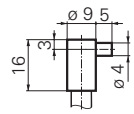
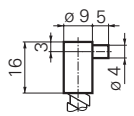
dimension drawings

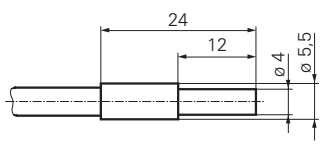
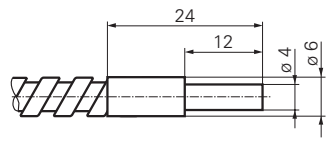
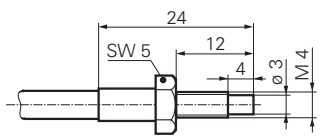
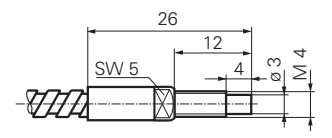
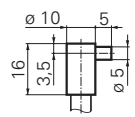
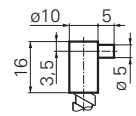


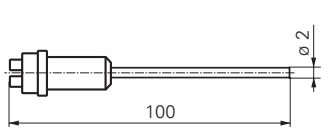
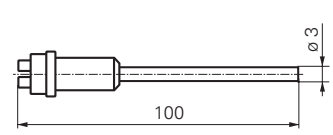
connection diagrams

order reference	response time / release time	current consumption max.	current consumption typ.	output circuit	connection types
FVDM 15N5103	< 1 ms	46 mA	30 mA	NPN	cable 4 pin
FVDM 15N5103/S14	< 1 ms	46 mA	30 mA	NPN	connector M12, 4 pin
FVDM 15P5103	< 1 ms	46 mA	30 mA	PNP	cable 4 pin
FVDM 15P5103/S14	< 1 ms	46 mA	30 mA	PNP	connector M12, 4 pin
FVDM 15P5130	< 0,1 ms	60 mA	50 mA	PNP	cable 4 pin
FVDM 15P5130/S14	< 0,1 ms	60 mA	50 mA	PNP	connector M12, 4 pin

Glass fiber optics for Series 15
Reflective types

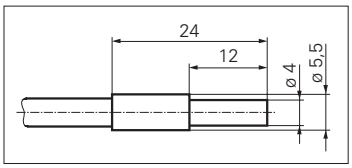
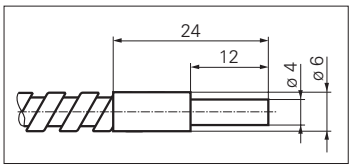
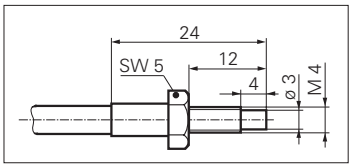
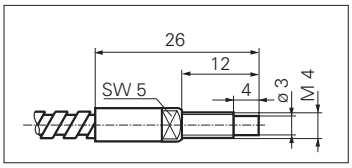
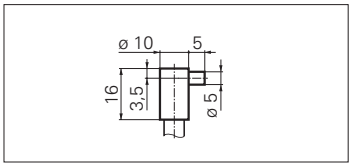
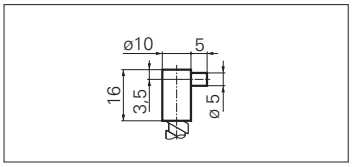
Fiber diameter 2 x 0,5 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PVC ø 2,5 mm (FUE ...)	**Sheath material: brass chromium plated ø 4 mm (FUF ...)**		
	 * can not be bent	**FUE 025B2004** **FUF 025B2004** (length 25 cm)	25
		FUE 050B2004 **FUF 050B2004** (length 50 cm)	25
	 * can not be bent	**FUE 025B2003** **FUF 025B2003** (length 25 cm)	25
		FUE 050B2003 **FUF 050B2003** (length 50 cm)	25
	 * can not be bent	**FUE 025B1003** **FUF 025B1003** (length 25 cm)	25
		FUE 050B1003 **FUF 050B1003** (length 50 cm)	25
		**FUE 025B4003** **FUF 025B4006** (length 25 cm)	25
		FUE 050B4003 **FUF 050B4006** (length 50 cm)	25

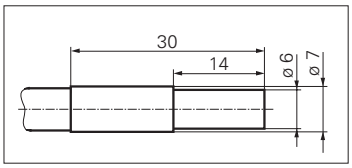
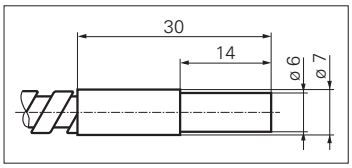
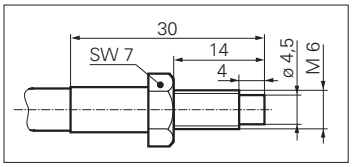
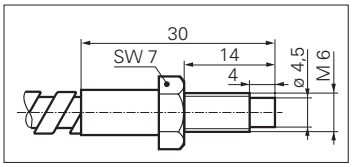
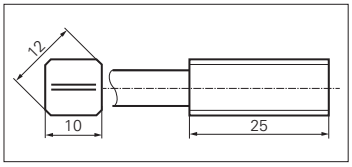
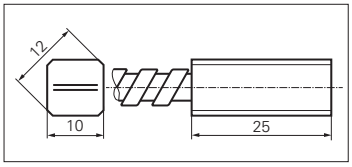
Fiber diameter 2 x 1 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PUR ø 4,5 mm (FUE ...)	**Sheath material: brass chromium plated ø 5 mm (FUF ...)**		
		**FUE 025B2002** **FUF 025B2005** (length 25 cm)	60
		FUE 050B2002 **FUF 050B2005** (length 50 cm)	60
		**FUE 025B1002** **FUF 025B1005** (length 25 cm)	60
		FUE 050B1002 **FUF 050B1005** (length 50 cm)	60
		**FUE 025B4005** **FUF 025B4008** (length 25 cm)	60
		FUE 050B4005 **FUF 050B4008** (length 50 cm)	60

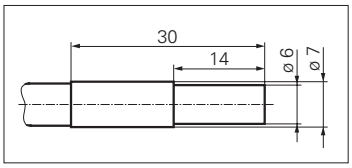
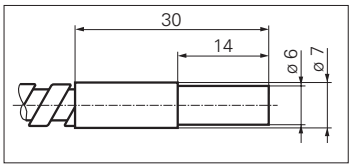
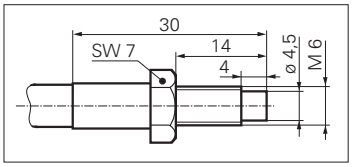
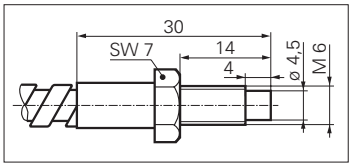
Fiber diameter 2 x 0,5 mm²	Fiber diameter 2 x 1 mm²	Part number	Tw = sensing distance [mm]
Sheath material: Chrome-nickel-steel ø 2 mm FUH 010B2002	**Sheath material: Chrome-nickel-steel ø 3 mm FUH 010B2001**		
		**FUH 010B2002** (length 10 cm)	25
		FUH 010B2001 (length 10cm)	60

Glass fiber optics for Series 15
Reflective types

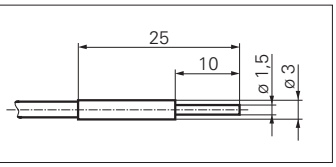
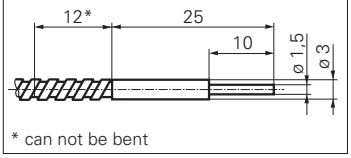
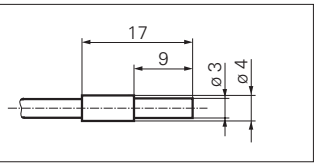
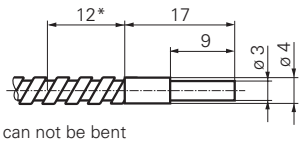
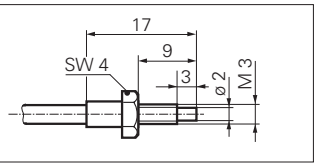
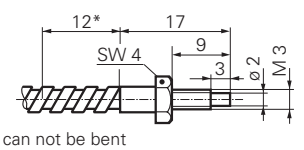
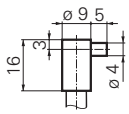
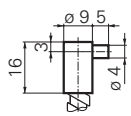
Series 15

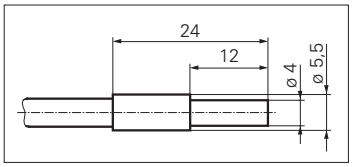
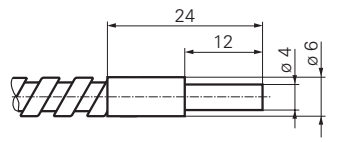
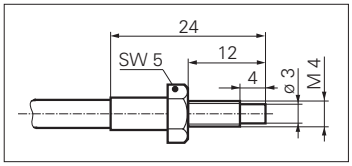
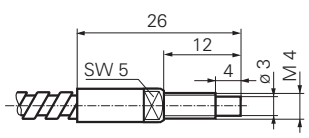
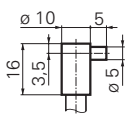
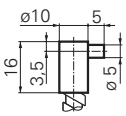
Fiber diameter 2 x 2 mm²		Part number	T_W = sensing distance [mm]
Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)		
		**FUE 025B2011** **FUF 025B2011** (length 25 cm)	110
		FUE 050B2011 **FUF 050B2011** (length 50 cm)	100
		**FUE 025B1011** **FUF 025B1011** (length 25 cm)	110
		FUE 050B1011 **FUF 050B1011** (length 50 cm)	100
		**FUE 025B4004** **FUF 025B4002** (length 25 cm)	110
		FUE 050B4004 **FUF 050B4002** (length 50 cm)	100

Fiber diameter 2 x 3 mm²		Part number	T_W = sensing distance [mm]
Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)		
		**FUE 025B2008** **FUF 025B2002** (length 25 cm)	210
		FUE 050B2008 **FUF 050B2002** (length 50 cm)	200
		**FUE 025B1008** **FUF 025B1002** (length 25 cm)	210
		FUE 050B1008 **FUF 050B1002** (length 50 cm)	200
		**FUE 025B3001** **FUF 025B3001** (length 25 cm)	210
		FUE 050B3001 **FUF 050B3001** (length 50 cm)	200

Fiber diameter 2 x 4 mm²		Part number	T_W = sensing distance [mm]
Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)		
		**FUE 025B2001** **FUF 025B2001** (length 25 cm)	240
		FUE 050B2001 **FUF 050B2001** (length 50 cm)	230
		**FUE 025B1001** **FUF 025B1001** (length 25 cm)	240
		FUE 050B1001 **FUF 050B1001** (length 50 cm)	230

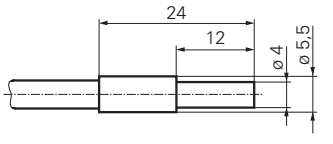
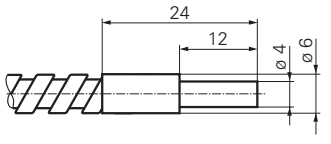
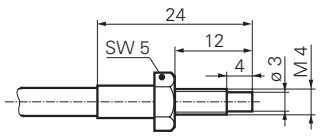
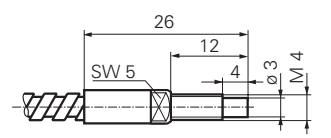
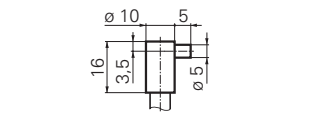
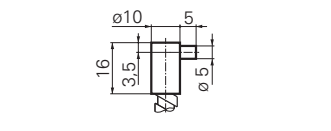
Glass fiber optics for Series 15
Through beam types

Fiber diameter 2 x 1 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 2,5 mm (FSE ...)	Sheath material: brass chromium plated ø 4 mm (FSF ...)		
	 * can not be bent	**FSE 025B2002** **FSF 025B2002** (length 25 cm)	140
		FSE 050B2002 **FSF 050B2002** (length 50 cm)	320
	 * can not be bent	**FSE 025B2001** **FSF 025B2005** (length 25 cm)	140
		FSE 050B2001 **FSF 050B2005** (length 50 cm)	320
	 * can not be bent	**FSE 025B1001** **FSF 025B1005** (length 25 cm)	140
		FSE 050B1001 **FSF 050B1005** (length 50 cm)	320
		**FSE 025B4003** **FSF 025B4003** (length 25 cm)	140
		FSE 050B4003 **FSF 050B4003** (length 50 cm)	320

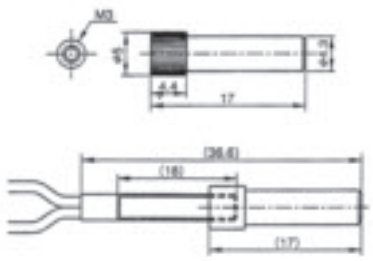
Fiber diameter 2 x 2 mm²		Part number	Sb = actual range [mm]
Sheath material: PUR ø 4,5 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 025B2006** **FSF 025B2006** (length 25 cm)	160
		FSE 050B2006 **FSF 050B2006** (length 50 cm)	450
		**FSE 025B1007** **FSF 025B1007** (length 25 cm)	160
		FSE 050B1007 **FSF 050B1007** (length 50 cm)	450
		**FSE 025B4006** **FSF 025B4002** (length 25 cm)	160
		FSE 050B4006 **FSF 050B4002** (length 50 cm)	450

Glass fiber optics for Series 15
Through beam types

Series 15

Fiber diameter 2 x 4 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 4 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 025B2003** **FSF 025B2001** (length 25 cm)	160
		FSE 050B2003 **FSF 050B2001** (length 50 cm)	500
		**FSE 025B1003** **FSF 025B1001** (length 25 cm)	160
		FSE 050B1003 **FSF 050B1001** (length 50 cm)	500
		**FSE 025B4004** **FSF 025B4004** (length 25 cm)	160
		FSE 050B4004 **FSF 050B4004** (length 50 cm)	500

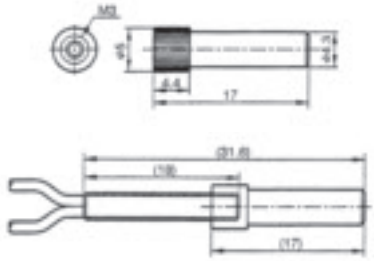
Focusing lens M3



Part number **134544**

Light spot Ø 0,1 mm at a distance of 4,6 mm
For fiber optic:
FCE 050C1Y10 (recommended)
FCE 200D1Y00 FCE 200E1Y00
FCE 200D1Y01

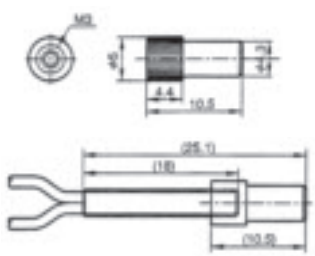
Focusing lens M3



Part number **134543**

Light spot Ø 0,4 mm at a distance of 7 mm
For fiber optic:
FCE 050C1Y10 FCE 200E1Y00
FCE 200D1Y00
FCE 200D1Y01

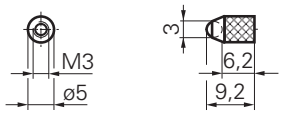
Focusing lens M3



Part number **134542**

Light spot Ø 2 mm at a distance of 19 mm
For fiber optic:
FCE 050C1Y10 FCE 200E1Y00
FCE 200D1Y00
FCE 200D1Y01

Focusing lens M3 (pair)



Part number **119910**

Increases the actual range Sb by a factor of 6
For fiber optic:
FSE 200C1004

Focusing lens M4 (pair)

Part number **119909**

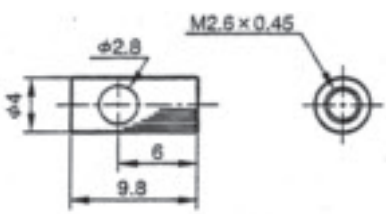
Increases the actual range Sb by a factor of 6
For fiber optic:
FSE 200C1002

Focusing lens M2.6 (pair)

Part number **134541**

Increases the actual range Sb by a factor of 6
For fiber optic:
FSE 200C1Y00 / FSE 200C2Y00
FSA 200C1Y00 FSE 200E1Y00
FSG 200C1Y00

Focusing lens M2.6 (pair)

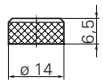


Part number **134540**

Side light exit
Increases the actual range Sb by a factor of 6
For fiber optic: FSE 200C1Y00 /
FSE 200C2Y00 FSG 200C1Y00
FSA 200C1Y00 FSE 200E1Y00

Accessories fiber optics

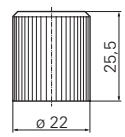
Cap nut Serie 15



Part number **103230**

- for re-orders when lost
- enclosed with every fiber optic of Series 15

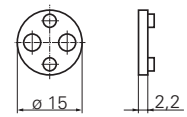
Cap nut Serie 18



Part number **101480**

- for re-orders when lost
- enclosed with every fiber optic of Series 18

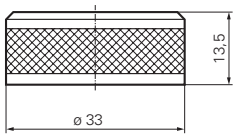
Adjusting plate Serie 18



Part number **101958**

- for re-orders when lost
- enclosed with every fiber optic of Series 18

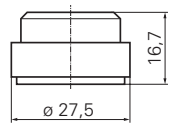
Cap nut Serie 30



Part number **102801**

- must be ordered with every fiber optic of Series 30

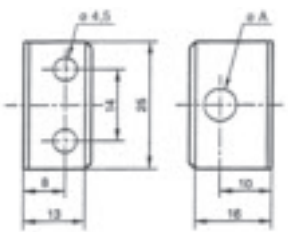
Adapter Serie 30



Part number **102757**

- must be ordered with every fiber optic of Series 30

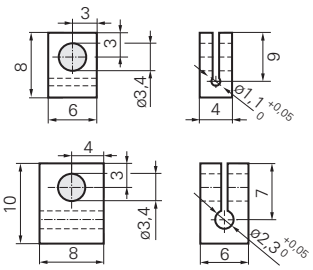
Mounting bracket



Part number

134532 for sensing head M3 øA 3,5 mm
134536 for sensing head M4 øA 4,5 mm
134538 for sensing head M6 øA 6,5 mm

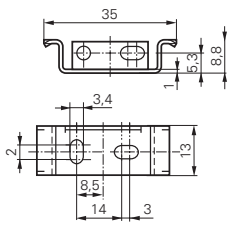
Mounting bracket



Part number

119912 For fiber optic through beam type with 1,1 mm sheath diameters
119911 For fiber optic through beam type with 2,2 mm sheath diameters

Mounting bracket

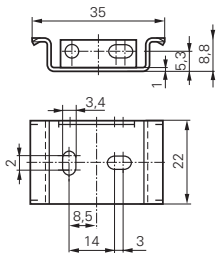


Part number **145702**

For Series 12 fiber optic sensors

Delivered with every plastic fiber optic sensor

Mounting bracket



Part number **125534**

For Series 22 fiber optic sensors

Delivered with every plastic fiber optic sensor.

Mounting bracket

Part number **159806**

Delivered with every Series 69, Series 60, Series 80 fiber optic sensor.

The mounting bracket must be ordered separately for Series 67 sensors.

Reduction tube

Part number **140260**

Set of 2

Delivered with every 1 mm diameter plastic fiber optic.

Fiber optic cable extension

Part number

145523 Länge: 5 m

Highly flexible fiber

Reduction in range due to fiber optic extension: approx. 25 %

Fiber optic extension

Part number

156738 Länge: 2 m
158142 Länge: 5 m

Reduction in range due to fiber optic extension: 2 m = approx. 25 %; 5 m = approx. 60 %

Cutting tool

Part number **114652**

Delivered with every plastic fiber optic

Vision sensors
Edge/Profile recognition

product family	VXS 1203M10	VXS 1203M16	VXS 1003M10
			
	VeriSens	*VeriSens*	*VeriSens*
picture sensor	High Sensitive Progressive Scan CCD	High Sensitive Progressive Scan CCD	High Sensitive Progressive Scan CCD
pixel quantity	656 x 494	656 x 494	656 x 494
objectiv (focal distance)	10 mm	16 mm	10 mm
min. object distance	50 mm	60 mm	50 mm
lighting LED red	■	■	■
lighting LED white	■	■	■
signal processing	processor Baumer FEX® 3.0 64 MByte	processor Baumer FEX® 3.0 64 MByte	processor Baumer FEX® 3.0 64 MByte
communication seriell	setting up USB 2.0 process interface RS485	setting up USB 2.0 process interface RS485	USB 2.0
housing material	aluminum and polycarbonat	aluminum and polycarbonat	aluminum and polycarbonat
Page	**500**	**501**	**502**

VXS 1003M16	VXS 0501M10
	
VeriSens	*VeriSens*
High Sensitive Progressive Scan CCD	CMOS
656 x 494	320 x 240
16 mm	10 mm
60 mm	50 mm
■	-
■	■
processor Baumer FEX® 3.0 64 MByte	processor Baumer FEX® 2.5 32 MByte
USB 2.0	USB 2.0
aluminum and polycarbonat	aluminum and polycarbonat
503	**504**

General information

The new image-processing vision sensors ***VeriSens®*** from Baumer close the gap between classical optical sensors and complex vision systems.
Their high-resolution image sensor permits 2-dimensional, i.e. arial inspection of objects. For this purpose, ***VeriSens®*** vision sensors offer extensive functions, thus supporting numerous inspection tasks in automation technology.

Due to the innovative Baumer FEX® processor technology, Baumer ***VeriSens®*** vision sensors are characterized by an extremely compact design. They provide process reliability and user-friendliness unachieved in this class until today.

Applications

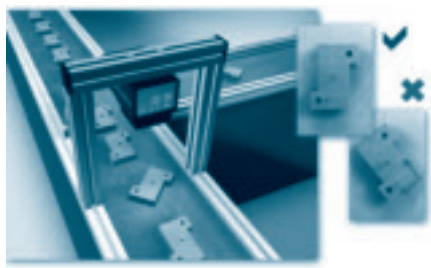
Completeness checking

Placement checking in the handling industry

Presence checking

Seal checking and inspection of labels in the packaging industry

Location and position detection



Detection of the correct position of objects in material handling

The Baumer ***VeriSens®*** is a flexible solution for many sensor applications in automated production.

The ***VeriSens®*** offers an extensive library of pre-configured functions for this purpose. You can define the job of your ***VeriSens®*** according to your requirements. The parameters are simply set with the configuration software on a PC.

Within the shortest time you can reliably implement simple presence checks up to extensive 100% inspections of several object properties simultaneously. Several jobs can be loaded into a ***VeriSens®***. The current job is selected automatically via digital inputs by a PLC or manually by the operator. This also permits the switching between different jobs when changing products subjected to inspection.

Once the parameters have been set, the ***VeriSens®*** operates completely autonomously and reliably – just like a sensor should!

Characteristics and advantages

- Pre-configured sensor functions support many inspection tasks
- Position correction functions in the x, y and rotation directions allow for reliable operation even with varying position of the inspected specimen
- Inspection tasks can be selected by digital inputs
- Compact design with integrated LED illumination, precision optics and processing electronics

Technology and operation

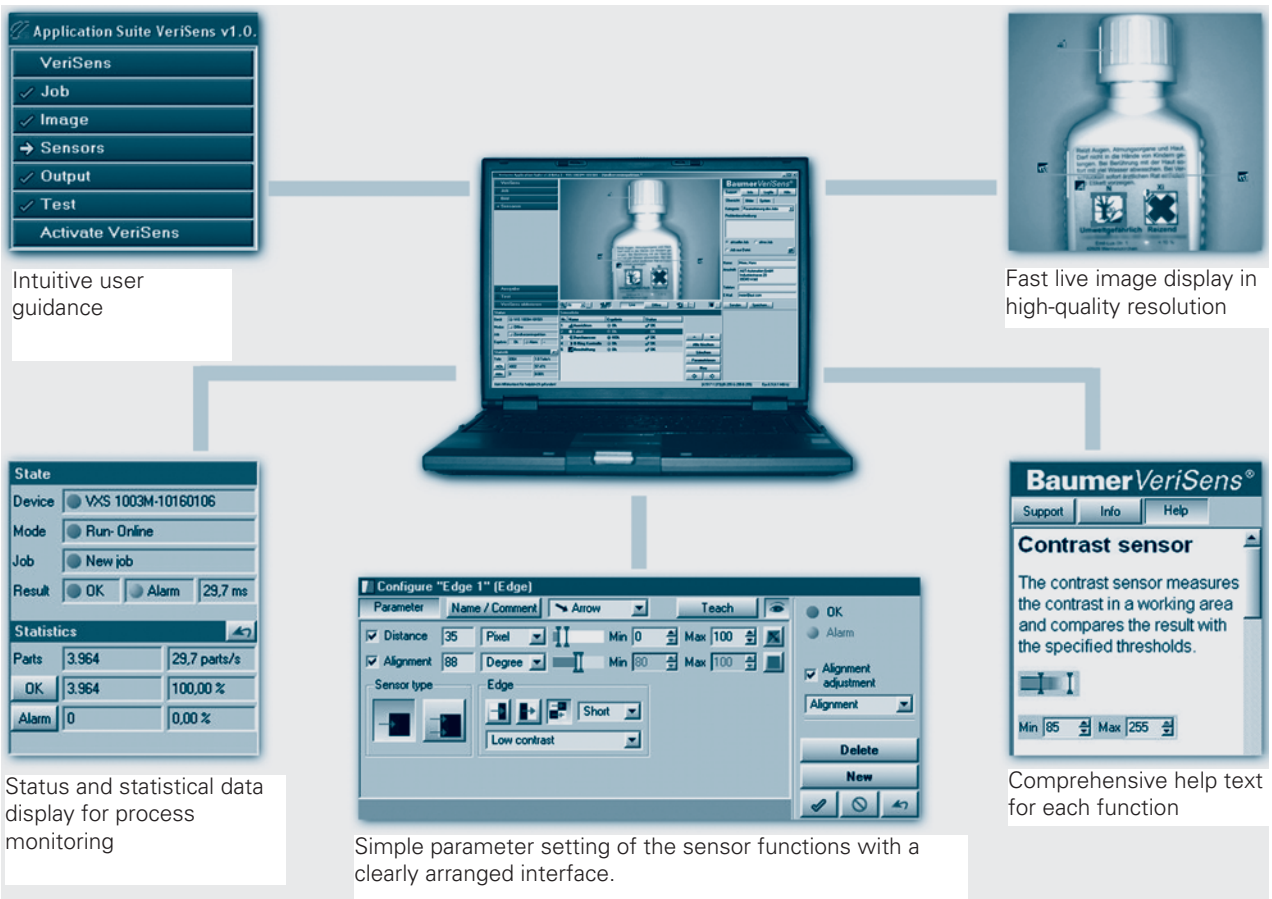
The *VeriSens*® is equipped with integrated LED illumination, precision optics, a CCD camera, processing electronics and interfaces, all contained in a very compact, rugged aluminum housing. This permits stand-alone operation without additional external modules.

The Baumer FEX® image processor calculates all object contours in a grey-value image in real-time and with subpixel accuracy, even at minimum brightness contrast.

The *VeriSens* Application Suite

Configuring a *VeriSens*® vision sensor easily takes place with the "Application Suite" control program on a PC or laptop.
The graphical user interface of the Application Suite is characterized by a straightforward user guidance. It also provides intuitive support for people not specialized in setting up an image processing application. Apart from the actual inspection function, *VeriSens*® can also be connected conveniently to a PLC.

Numerous additional functions are available to the professional, such as functions otherwise offered by expensive vision systems only. These functions include the detection of image sequences in real-time for offline parameter setting of the sensors, the convenient management of configuration data, the visualization of statistical data and the



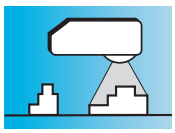
Intuitive user guidance

Fast live image display in high-quality resolution

Status and statistical data display for process monitoring

Simple parameter setting of the sensor functions with a clearly arranged interface.

Comprehensive help text for each function



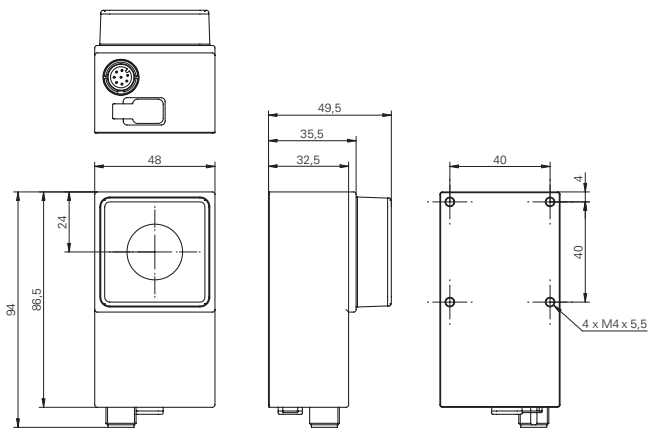
focal distance = 10 mm

- Outline function and Outline comparison
- Brightness, Contrast and Blob

general data	
picture sensor	High Sensitive Progressive Scan CCD
pixel quantity	656 x 494
version	monochromatic
speed high resolution mode: high speed mode:	 max. 30 inspections/sec max. 50 inspections/sec
objectiv (focal distance)	10 mm
min. object distance	50 mm
inspection field	
at 60 mm object distance	24 x 18 mm
at 100 mm object distance	43 x 32 mm
at 200 mm object distance	92 x 69 mm
at 300 mm object distance	140 x 106 mm
signal processing	processor Baumer FEX® 3.0 64 MByte
inputs	8 ... 30 VDC
outputs	PNP 100 mA
4x input digital	Trigger, job options 1 + 2, job option 3 / external Teach
4x output digital	Pass / Fail, Ready, Alarm, Flash sync
communication serial	setting up USB 2.0 process interface RS485
electrical data	
voltage supply range +Vs	8 ... 30 VDC
power consumption max.	typ. 6 W
mechanical data	
width / diameter	48 mm
height / length	94 mm
depth	49,5 mm
type	rectangular
housing material	aluminum and polycarbonate
weight	250 g
ambient conditions	
operating temperature	+5 ... +50 °C
humidity	0 ... 90 % (non-condensing)
protection class	IP 64
accessories	
mounting bracket straight	159905
mounting bracket angular	159906
USB cable	159907
VeriSens application suite CD	159908
for details, see accessories section	

order reference	lighting
VXS 1203M10RR	LED red (typ. 660 nm)
VXS 1203M10WR	LED white

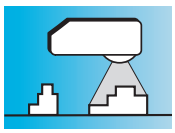
dimension drawing



SPS-Interface	Typ M12
1: IN1 (Trigger)	
2: Power +24 VDC	
3: OUT1 (Ready)	
4: OUT2 (Pass / Fail)	
5: OUT3 (Alarm)	
6: IN2 (Job)	
7: Ground	
8: IN3 (Job)	

SPS-Interface	Typ M12
1: OUT4 (Flash)	
2: IN4 (Job / Teach)	
3: Ground	
4: RS485+	
5: RS485-	

connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
ESG 34FP0500B	8 pin	5 m straight (shielded)
ES 34CP2B	5 pin	2 m straight (shielded)
ES 34CP5B	5 pin	5 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		



focal distance = 16 mm

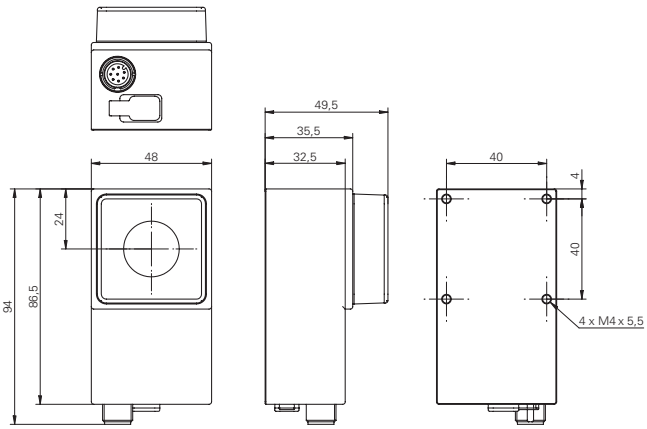
- Outline function and Outline comparison
- Brightness, Contrast and Blob

general data	
picture sensor	High Sensitive Progressive Scan CCD
pixel quantity	656 x 494
version	monochromatic
speed high resolution mode: high speed mode:	 max. 30 inspections/sec max. 50 inspections/sec
objectiv (focal distance)	16 mm
min. object distance	60 mm
inspection field	
at 60 mm object distance	13 x 10 mm
at 100 mm object distance	25 x 19 mm
at 200 mm object distance	55 x 42 mm
at 300 mm object distance	86 x 64 mm
signal processing	processor Baumer FEX® 3.0 64 MByte
inputs	8 ... 30 VDC
outputs	PNP 100 mA
3x input digital	Trigger, job options 1 + 2, job option 3 / external Teach
3x output digital	Pass / Fail, Ready, Alarm, Flash sync
communication serial	setting up USB 2.0 process interface RS485
electrical data	
voltage supply range +Vs	8 ... 30 VDC
power consumption max.	typ. 6 W
mechanical data	
width / diameter	48 mm
height / length	94 mm
depth	49,5 mm
type	rectangular
housing material	aluminum and polycarbonate
weight	250 g
ambient conditions	
operating temperature	+5 ... +50 °C
humidity	0 ... 90 % (non-condensing)
protection class	IP 64

accessories	
mounting bracket straight	159905
mounting bracket angular	159906
USB cable	159907
VeriSens application suite CD	159908
for details, see accessories section	

order reference	lighting
VXS 1203M16RR	LED red (typ. 660 nm)
VXS 1203M16WR	LED white

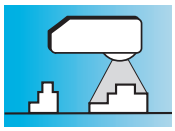
dimension drawing



SPS-Interface	Typ M12
1: IN1 (Trigger)	
2: Power +24 VDC	
3: OUT1 (Ready)	
4: OUT2 (Pass / Fail)	
5: OUT3 (Alarm)	
6: IN2 (Job)	
7: Ground	
8: IN3 (Job)	

SPS-Interface	Typ M12
1: OUT4 (Flash)	
2: IN4 (Job / Teach)	
3: Ground	
4: RS485+	
5: RS485-	

connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
ESG 34FP0500B	8 pin	5 m straight (shielded)
ES 34CP2B	5 pin	2 m straight (shielded)
ES 34CP5B	5 pin	5 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		



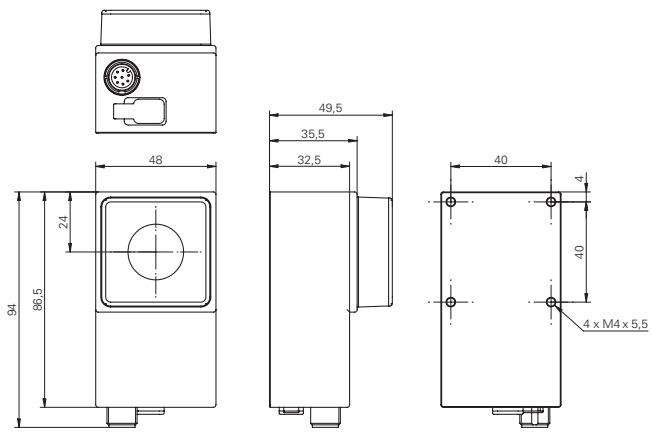
focal distance = 10 mm

- Outline function and Outline comparison
- Brightness, Contrast and Blob

general data	
picture sensor	High Sensitive Progressive Scan CCD
pixel quantity	656 x 494
version	monochromatic
speed high resolution mode: high speed mode:	 max. 30 inspections/sec max. 50 inspections/sec
objectiv (focal distance)	10 mm
min. object distance	50 mm
inspection field	
at 60 mm object distance	24 x 18 mm
at 100 mm object distance	43 x 32 mm
at 200 mm object distance	92 x 69 mm
at 300 mm object distance	140 x 106 mm
signal processing	processor Baumer FEX® 3.0 64 MByte
inputs	8 ... 30 VDC
outputs	PNP 100 mA
3x input digital	Trigger, job options 1 + 2
3x output digital	Pass / Fail, Ready Alarm / Flash sync
communication serial	USB 2.0
electrical data	
voltage supply range +Vs	8 ... 30 VDC
power consumption max.	typ. 6 W
mechanical data	
width / diameter	48 mm
height / length	94 mm
depth	49,5 mm
type	rectangular
housing material	aluminum and polycarbonate
weight	250 g
ambient conditions	
operating temperature	+5 ... +50 °C
humidity	0 ... 90 % (non-condensing)
protection class	IP 64
accessories	
mounting bracket straight	159905
mounting bracket angular	159906
USB cable	159907
VeriSens application suite CD	159908
for details, see accessories section	

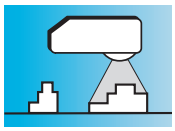
order reference	lighting
VXS 1003M10RS	LED red (typ. 660 nm)
VXS 1003M10WS	LED white

dimension drawing



SPS-Interface	Typ M12
1: IN1 (Trigger)	
2: Power +24 VDC	
3: OUT1 (Ready)	
4: OUT2 (Pass / Fail)	
5: OUT3 (Flash / Alarm)	
6: IN2 (Job)	
7: Ground	
8: IN3 (Job)	

connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
ESG 34FP0500B	8 pin	5 m straight (shielded)
ESG 34FP1000B	8 pin	10 m straight (shielded)
ESW 33FP1000B	8 pin	10 m angular (shielded)



focal distance = 16 mm

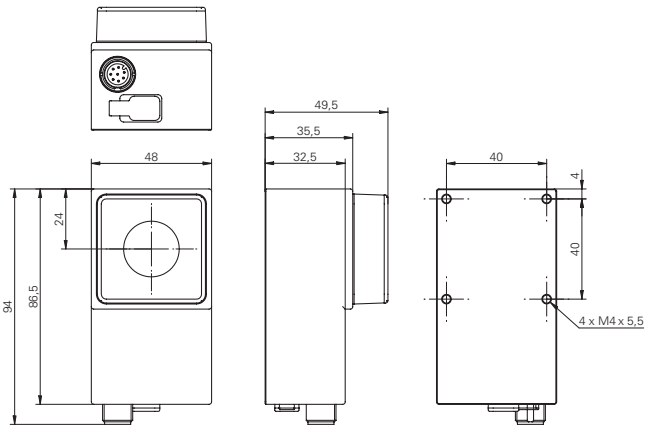
- Outline function and Outline comparison
- Brightness, Contrast and Blob

general data	
picture sensor	High Sensitive Progressive Scan CCD
pixel quantity	656 x 494
version	monochromatic
speed high resolution mode: high speed mode:	 max. 30 inspections/sec max. 50 inspections/sec
objectiv (focal distance)	16 mm
min. object distance	60 mm
inspection field	
at 60 mm object distance	13 x 10 mm
at 100 mm object distance	25 x 19 mm
at 200 mm object distance	55 x 42 mm
at 300 mm object distance	86 x 64 mm
signal processing	processor Baumer FEX® 3.0 64 MByte
inputs	8 ... 30 VDC
outputs	PNP 100 mA
3x input digital	Trigger, job options 1 + 2
3x output digital	Pass / Fail, Ready Alarm / Flash sync
communication seriell	USB 2.0
electrical data	
voltage supply range +Vs	8 ... 30 VDC
power consumption max.	typ. 6 W

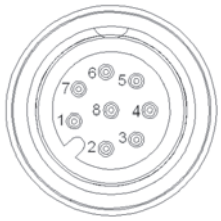
mechanical data	
width / diameter	48 mm
height / length	94 mm
depth	49,5 mm
type	rectangular
housing material	aluminum and polycarbonate
ambient conditions	
operating temperature	+5 ... +50 °C
humidity	0 ... 90 % (non-condensing)
protection class	IP 64
accessories	
mounting bracket straight	159905
mounting bracket angular	159906
USB cable	159907
VeriSens application suite CD	159908
for details, see accessories section	

order reference	lighting
VXS 1003M16RS	LED red (typ. 660 nm)
VXS 1003M16WS	LED white

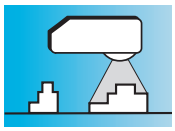
dimension drawing



SPS-Interface	Typ M12
1: IN1 (Trigger)	
2: Power +24 VDC	
3: OUT1 (Ready)	
4: OUT2 (Pass / Fail)	
5: OUT3 (Flash / Alarm)	
6: IN2 (Job)	
7: Ground	
8: IN3 (Job)	



connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
ESG 34FP0500B	8 pin	5 m straight (shielded)
ESG 34FP1000B	8 pin	10 m straight (shielded)
ESW 33FP1000B	8 pin	10 m angular (shielded)



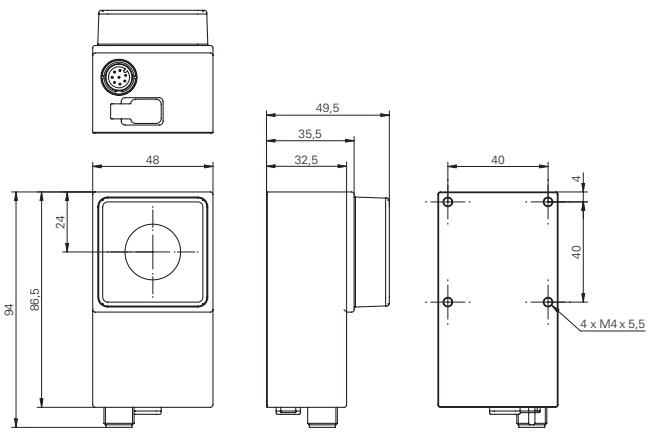
focal distance = 10 mm

- Outline function and Outline comparison
- Brightness, Contrast and Blob

general data	
picture sensor	CMOS
pixel quantity	320 x 240
version	monochromatic
speed	max. 50 inspections/sec
objectiv (focal distance)	10 mm
min. object distance	50 mm
inspection field	
at 60 mm object distance	22 x 14 mm
at 100 mm object distance	40 x 25 mm
at 200 mm object distance	85 x 55 mm
at 300 mm object distance	130 x 83 mm
signal processing	processor Baumer FEX® 2.5 32 MByte
inputs	8 ... 30 VDC
outputs	PNP 100 mA
3x input digital	Trigger, job options 1 + 2
3x output digital	Pass / Fail, Ready Alarm / Flash sync
communication seriell	USB 2.0
electrical data	
voltage supply range +Vs	8 ... 30 VDC
power consumption max.	typ. 6 W
mechanical data	
width / diameter	48 mm
height / length	94 mm
depth	49,5 mm
type	rectangular
housing material	aluminum and polycarbonate
weight	250 g
ambient conditions	
operating temperature	+5 ... +50 °C
humidity	0 ... 90 % (non-condensing)
protection class	IP 64
accessories	
mounting bracket straight	159905
mounting bracket angular	159906
USB cable	159907
VeriSens application suite CD	159908
for details, see accessories section	

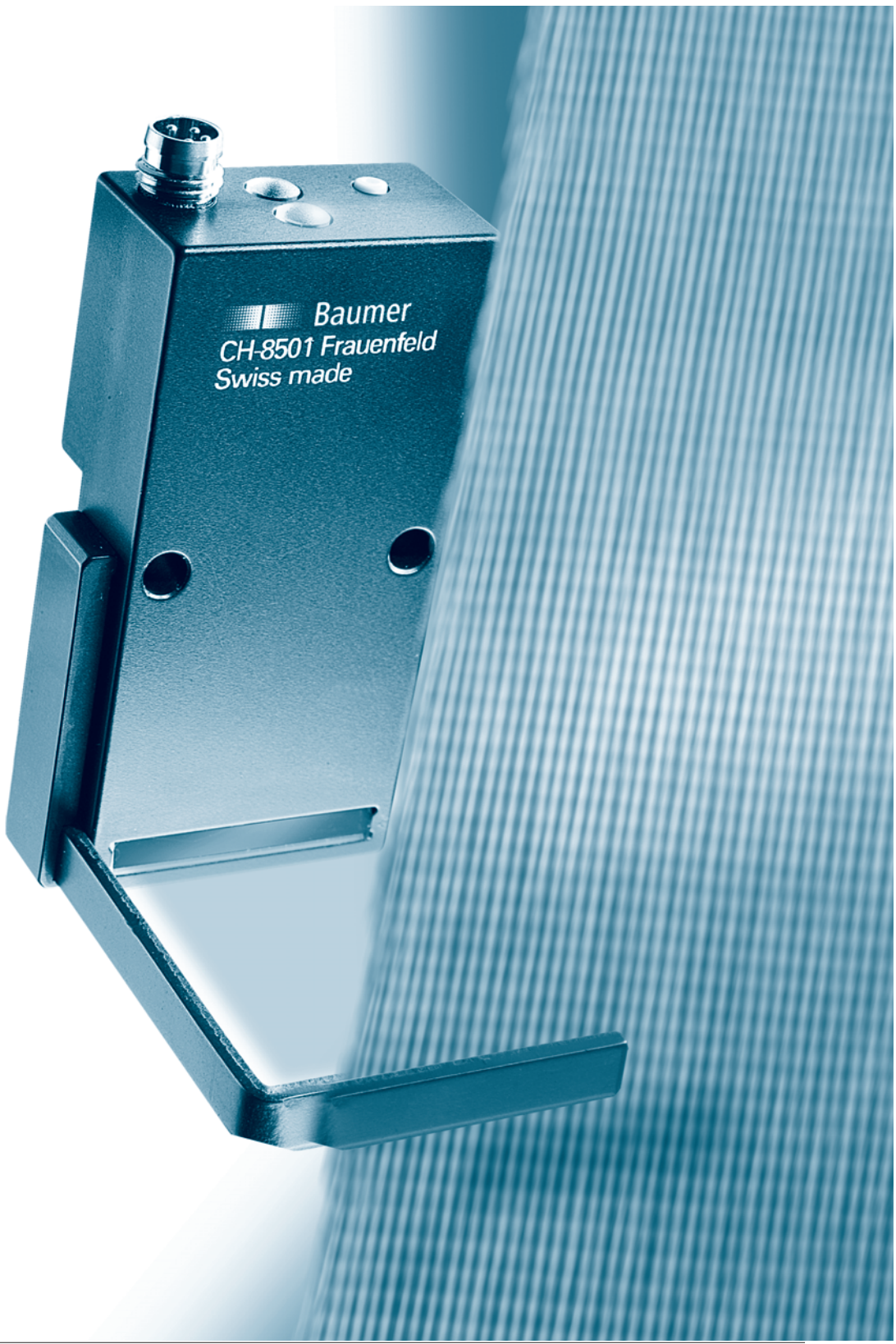
order reference	lighting
VXS 0501M10WS	LED white

dimension drawing



SPS-Interface	Typ M12
1: IN1 (Trigger)	
2: Power +24 VDC	
3: OUT1 (Ready)	
4: OUT2 (Pass / Fail)	
5: OUT3 (Flash / Alarm)	
6: IN2 (Job)	
7: Ground	
8: IN3 (Job)	

connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
ESG 34FP0500B	8 pin	5 m straight (shielded)
ESG 34FP1000B	8 pin	10 m straight (shielded)
ESW 33FP1000B	8 pin	10 m angular (shielded)


Baumer
CH-8501 Frauenfeld
Swiss made

product family	ZADM 034	ZADM 034
		
	ParCon	*ParCon*
measuring field size	24 mm	24 mm
measuring range towards object	0 ... 40 mm	0 ... 40 mm
measuring frequency	> 1000 Hz	> 4000 Hz
output signal	4 ... 20 mA	
PNP		■
analog	■	
connector	■	■
housing material	metal	metal
Page	**510**	**512**

product family	ZADM 023	ZADM 023
		
	PosCon	*PosCon*
measuring field size	30 mm 150 mm 350 mm	
measuring field size (dep. on measuring dist.)		400 ... 875 mm
measuring distance (to object)	50 mm 200 mm 500 mm	
measuring range towards object		640 ... 1400 mm
measuring frequency	> 500 Hz	> 500 Hz
analog and RS 485	■	■
output signal	4 ... 20 mA	4 ... 20 mA
connector	■	■
housing material	metal	metal
Page	**514**	**516**

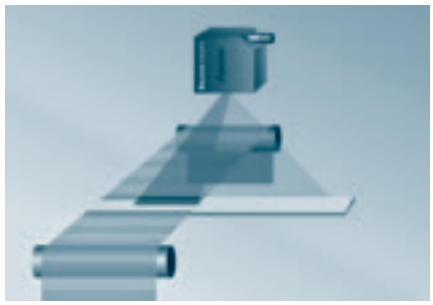
General information

Line sensors are used to detect object widths and object positions. The position / width is issued as an analog value with high accuracy proportional to the overall measuring area. Although smaller than a deck of playing cards, the sensors contain not only the complete signal conditioning, but also a long-life illumination unit.
The simple switching version of the ***ParCon*** also permits the detection of small objects within the measuring area.

Applications

Edge recognition (*PosCon*, *ParCon*)

- Control of textile, plastic or paper edges
- Positioning of objects by the edge
- Level measurement

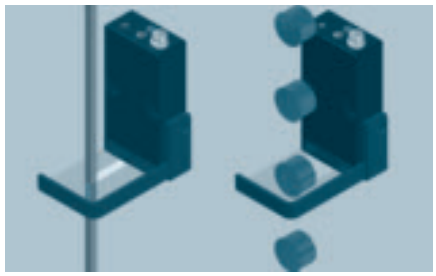


Width measurement (*PosCon*, *ParCon*)

- Width inspection during the production of fabric and rubber bands

Center position (*PosCon*)

- Position measurement by the object center, by which bands or objects of different width can be aligned centrally to each other



Counting and detecting objects (*ParCon*), switching output

- Detection and counting of small objects falling through the measurement area
- Wire and belt break monitoring

Characteristics and advantages

ParCon line sensor

- The two measuring modes (edge, center) can be set at the push of a button.
- Due to the parallel light beams, the vertical movement of fabric webs does not affect the measurement signal.
- The high measuring frequency of 1000 Hz in the analog sensor also permits rapid movements to be detected.
- Due to the high switching frequency of 4 kHz, even small, rapidly moving parts are reliably detected.

PosCon line sensor

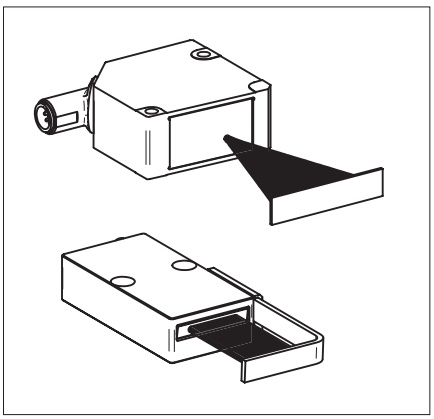
- The measuring area can be restricted by a simple Teach-in process to suppress interfering objects and areas.
- The three different measuring modes (width, edge, center) can be set simply at the push of a button.
- Two threshold values can be programmed with the Teach-in button and serve as tolerance limits for the switching output.
- All functions available with the buttons can also be operated via an RS 485 interface.
- The position and other information can be read via the interface.
- Measurement is possible on transparent objects and films.

Technology and operation

With the line sensors, the light of the integrated illumination is reflected by a reflective film (special film) installed opposite the sensor and is received by the diode line. The length of the diode line and the optics determine the measuring area. Due to the narrow diode line, the measuring area is also only a narrow band. If an object obstructs a part of the light, no light falls on the corresponding part of the diode line. The integrated microcontroller processes the shaded areas and the transitions from dark to light and calculates the corresponding analog value according to the measuring mode.

The optics of the ***PosCon*** and the ***ParCon*** are constructed differently. The ***PosCon*** has a diverging measuring field. This makes large measuring areas of up to 800 mm possible. The specified measuring area is achieved at the nominal distance. It becomes larger or smaller proportionally with the distance. This causes an object to appear larger or smaller according to the distance.

The ***ParCon*** has a parallel measuring field, making an object appear equal in size in the entire measuring area.

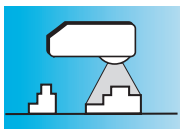


Mounting and adjustment

The reflective tape specified in the documentation must be used for the ***PosCon*** and ***ParCon***.

If the reflective tape is protected against abrasion by a Plexiglas or glass sheet, this must be tilted 7° to the sensor to ensure that the direct reflection does not reflect to the receiver. The reflective tape for the ParCon is covered by a protective film.

If highly reflective objects are measured, it is conceivable that a direct reflection will occur just as strong as the light from the reflective film. In this case, measuring errors can occur. This can be prevented by tilting the object away from the sensor.



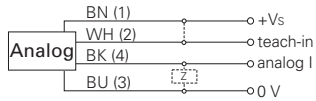
measuring range = 0 ... 40

- measuring of edge position and object width
- parallel, uniform light beam
- high measuring frequency

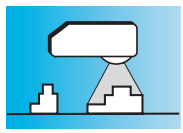
general data	
measuring field size	24 mm
measuring range towards object	0 ... 40 mm
measuring frequency	> 1000 Hz
resolution	< 0,05 mm
smallest object recognizable	1 mm
linearity error	± 0,4 mm (S = 0...40 mm) ± 0,2 mm (S = 20...40 mm)
repeatability	< 0,05 mm
power on indication	LED green
output indicator	LED yellow
light source	pulsed infrared diode
wave length	880 nm
electrical data	
response time	< 1 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	analog
output signal	4 ... 20 mA
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
housing material	aluminum
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +55 °C
protection class	IP 67

order reference	type
ZADM 034I240.0001	rectangular, side view
ZADM 034I240.0021	rectangular, front view

connection diagram

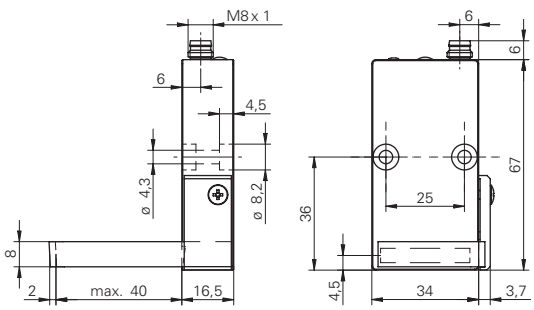


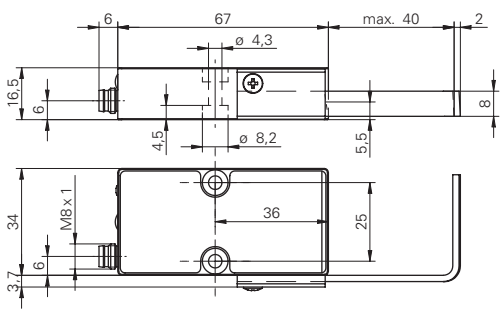
connectors		
ESG 32AP0500G	4 pin	5 m straight (shielded)
ESW 31AP0500G	4 pin	5 m angular (shielded)
additional cable connectors and field wireable connectors, see accessories		

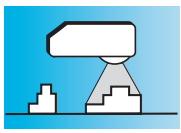


reflectors	
FTDF 012M050	tape 12 x 50 mm (included)
FTDR 008M030/01	bracket for ZADM 034x240.xx01 (included)
FTDR 008M030/21	bracket for ZADM 034x240.xx21 (included)
optional	
FTDF 050M234	tape 50 x 234 mm

dimension drawings







measuring range = 0 ... 40

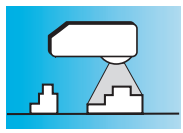
- detection of small objects
- measuring area 24 x 40 mm
- high measuring frequency

general data	
measuring field size	24 mm
measuring range towards object	0 ... 40 mm
measuring frequency	> 4000 Hz
resolution	< 0,1 mm
smallest object recognizable	0,5 mm
hysteresis	0,4 mm
power on indication	LED green
light source	pulsed infrared diode
wave length	880 nm
adjustment	Teach-in
electrical data	
response time	< 0,25 ms
output pulse length	10 ms
voltage supply range +Vs	12 ... 28 VDC
current consumption max.	120 mA
output circuit	PNP
output current	< 100 mA
voltage drop Vd	< 2,2 VDC
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
output function	light / dark operate
mechanical data	
housing material	aluminum
front (optics)	glass
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	0 ... +55 °C
protection class	IP 67

order reference	type
ZADM 034P240.6901	rectangular, side view
ZADM 034P240.6921	rectangular, front view

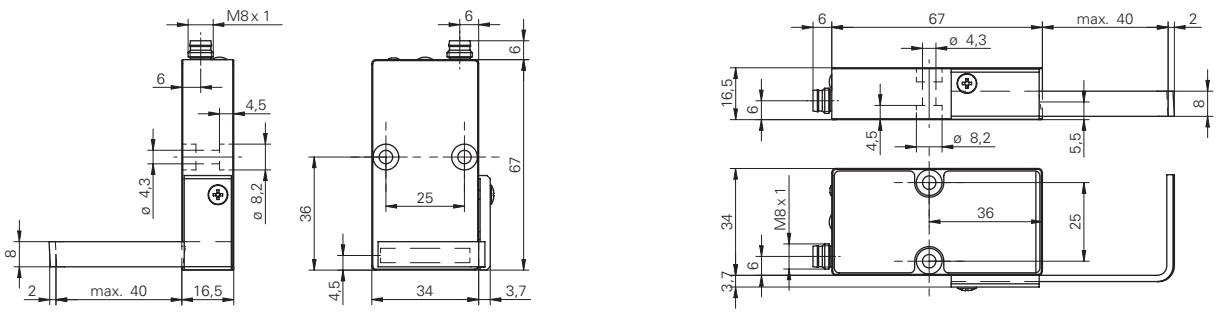
connection diagram

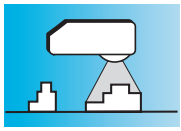
connectors		
ESG 32AP0500G	4 pin	5 m straight (shielded)
ESW 31AP0500G	4 pin	5 m angular (shielded)
additional cable connectors and field wireable connectors, see accessories		



reflectors	
FTDF 012M050	tape 12 x 50 mm (included)
FTDR 008M030/01	bracket for ZADM 034x240.xx01 (included)
FTDR 008M030/21	bracket for ZADM 034x240.xx21 (included)
optional	
FTDF 050M234	tape 50 x 234 mm

dimension drawings



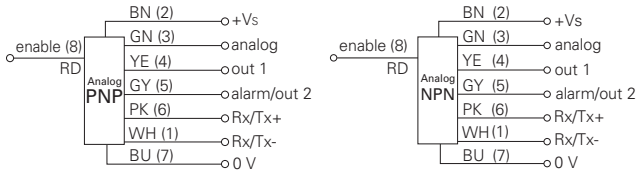


measuring field size = 350

- Teach-in measuring range
- measuring mode: edges, center, width
- RS 485 interface

general data	
version	with filter for transparent objects
measuring frequency	> 500 Hz
linearity error relative	< 0,3 %
light source	pulsed infrared diode
wave length	880 nm
adjustment	Teach-in
measuring field size = 30 mm	
measuring distance (to object)	50 mm
resolution	< 0,03 mm
smallest object recognizable	0,3 mm
measuring field size = 150 mm	
measuring distance (to object)	200 mm
resolution	< 0,15 mm
smallest object recognizable	1,2 mm
measuring field size = 350 mm	
measuring distance (to object)	500 mm
resolution	< 0,35 mm
smallest object recognizable	4 mm
electrical data	
voltage supply range +Vs	15 ... 28 VDC
current consumption max.	150 mA
output signal	4 ... 20 mA
output current	< 100 mA
interface	analog and RS 485
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
type	rectangular
housing material	die-cast zinc
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +55 °C
protection class	IP 67

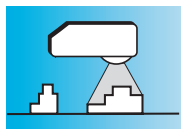
connection diagrams



connectors		
ESG 34FP0200B	8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

accessories	
mounting bracket	126220
for details, see accessories section	

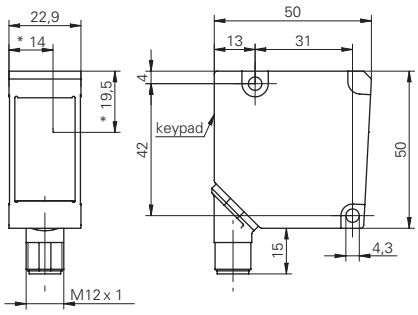
order reference	measuring field size	output function	switching output	reflector width
ZADM 023H151.0001	150 mm	Out 1 / Alarm	PNP	15 mm
ZADM 023H151.0002	150 mm	Out 1 / Alarm	NPN	15 mm
ZADM 023H151.0011	150 mm	Out 1 / Out 2	PNP	15 mm
ZADM 023H151.0012	150 mm	Out 1 / Out 2	NPN	15 mm
ZADM 023H300.0001	30 mm	Out 1 / Alarm	PNP	3 mm
ZADM 023H300.0002	30 mm	Out 1 / Alarm	NPN	3 mm
ZADM 023H300.0011	30 mm	Out 1 / Out 2	PNP	3 mm
ZADM 023H300.0012	30 mm	Out 1 / Out 2	NPN	3 mm
ZADM 023H351.0001	350 mm	Out 1 / Alarm	PNP	30 mm
ZADM 023H351.0002	350 mm	Out 1 / Alarm	NPN	30 mm
ZADM 023H351.0011	350 mm	Out 1 / Out 2	PNP	30 mm
ZADM 023H351.0012	350 mm	Out 1 / Out 2	NPN	30 mm



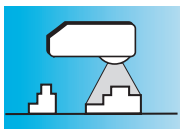
reflectors

		reflector	reflector tape on reel		reflective tape	
measuring range	30 mm	FTDR 005I040	FTDL 005I000/... m	width 5 mm	FTDF 005I040	5 x 40 mm
measuring range	150 mm	FTDR 020I175	FTDL 020I000/... m	width 20 mm	FTDF 020I175L	20 x 17,5 mm
measuring range	350 mm	FTDR 035I395	FTDL 035I000/... m	width 35 mm	FTDF 035I395	35 x 395 mm
			FTDL 610I000/... m	width 610 mm		

dimension drawing



* receiver axis

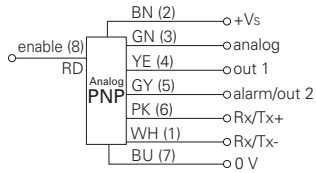


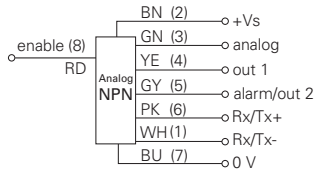
measuring field size = 875

- Teach-in measuring range
- measuring mode: edges, center, width
- RS 485 interface

general data	
version	without filter for transparent objects
measuring field size (dep. on measuring dist.)	400 ... 875 mm
measuring range towards object	640 ... 1400 mm
measuring frequency	> 500 Hz
resolution	0,5 ... 1 mm
smallest object recognizable	8,5 ... 18 mm
linearity error relative	< 0,3 %
light source	pulsed infrared diode
wave length	880 nm
adjustment	Teach-in
electrical data	
voltage supply range +Vs	15 ... 28 VDC
current consumption max.	150 mA
output signal	4 ... 20 mA
output current	< 100 mA
interface	analog and RS 485
reverse polarity protection	yes, Vs to GND
short circuit protection	yes
mechanical data	
type	rectangular
housing material	die-cast zinc
reflector width	50 mm
front (optics)	glass
connection types	connector M12, 8 pin, rotatable
ambient conditions	
operating temperature	0 ... +55 °C
protection class	IP 67

connection diagrams





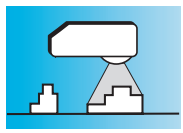
connectors

ESG 34FP0200B	8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories		

accessories

mounting bracket	126220
for details, see accessories section	

order reference	output function	switching output
ZADM 023H871.0001	Out 1 / Alarm	PNP
ZADM 023H871.0002	Out 1 / Alarm	NPN
ZADM 023H871.0011	Out 1 / Out 2	PNP
ZADM 023H871.0012	Out 1 / Out 2	NPN



reflectors

FTDL 050I000/... m	on reel, width 35 mm
FTDL 610I000/... m	on reel, width 610 mm
included	

conversion factors

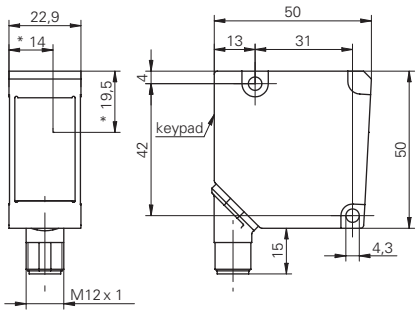
measuring distance (mm)	measuring range (mm)
640	400
1400	875
meas. distance : meas. range	**= 1,6**

measuring distance (mm)	resolution (mm)
640	0,5
1400	1
meas. distance : resolution	**= 1300**

measuring distance (mm)	smallest object (mm)
640	8,5
1400	18
meas. distance : smallest object	**= 75**

example	desired measuring range	
meas. distance	650 mm x 1,6	**= 650 mm**
resolution	1040 mm : 1300	= 1040 mm
smallest object	1040 mm : 75	= 0,8 mm

dimension drawing



* receiver axis

product family	**FLDM 170**	**FLDM 170**	**FLDK 110**	**FLDK 110**
				
	SCATEC-15	*SCATEC-10*	*SCATEC-2*	*SCATEC-J*
measuring distance Sd	0 ... 120 mm	0 ... 90 mm	0 ... 60 mm	0 ... 55 mm
optimum operating distance	100 mm	70 mm	40 mm	40 mm
counting rate	< 3'000'000 copies/h	< 3'000'000 copies/h	< 600'000 copies/h	< 280'000 copies/h
output pulse length	0,3 ... 500 ms selectable	0,3 ... 500 ms selectable	5 / 10 / 15 / 20 ms selectable	10 ms
sensitivity	single sheet/edge thickness 0,15 mm	single sheet/edge thickness 0,1 mm	single sheet/edge thickness 0,2 mm	single sheet/edge thickness 1,5 mm
false pulse suppression	4 program options	4 program options	on/off switchable	
sensitivity adjustment	4 preset levels or level set by customer	4 preset levels or level set by customer	high/low switchable	no
direct gap detection	yes	yes		
interface	CAN and serial	serial		
push-pull	■	■	■	■
opto isolated	■	■	■	
housing material	metal	metal	plastic	plastic
Page	**522**	**524**	**526**	**528**

General information

The sensors in the ***SCATEC*** range were developed specifically for non-contact counting of overlapped paper sheets and newspapers. Other flat objects conveyed in a lap stream or individually can also be counted. If such an object moves through the laser beam, the sensor replies with an electrical impulse with a fixed time period. The patented optical principle permits objects to be detected regardless of their color and surface; matte black objects are counted just as accurately as white glossy ones.

Characteristics and advantages

- Counts regardless of the direction of product motion
  The copies are counted when an edge facing the laser beam moves through the beam, whether the direction of product motion is forwards or backwards.
- Visible laser beam
  The red laser line is easily visible on the object and permits simple alignment.
- Color insensitivity
  The integrated laser controller makes the ***SCATEC*** extremely insensitive to different surfaces of the object.
- No blind region
  Large counted objects can even touch the sensor without causing counting errors.
- Sensitivity adjustment
  Depending on the model, the sensitivity can be adjusted with a DIP switch, on the control panel or via the interface.
- Edge indicator
  Yellow LED: this lights as long as an edge is in the laser beam.

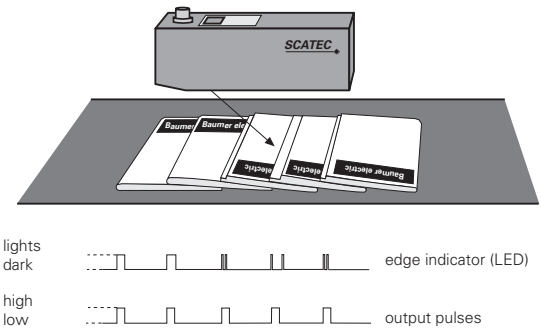
Characteristics and advantages

Multiple pulse suppression
Particularly with thick copies (newspapers, folded cardboard boxes etc.) or with a small prefold, multiple pulses which can occur at the edge can be suppressed by this function. Error pulse suppression operates by preventing further pulses from being emitted when an output pulse is active or during an idle time. The following programs guarantee optimum adjustment to all counting problems:

Fixed idle time: adjustable in milliseconds

Dynamic dead time: the microcontroller constantly monitors the pulse sequence and eliminates multiple pulses even if the conveying speed varies by dynamically adjusting the dead time to the pulse sequence.

Synchronization to the machine cycle: the ***SCATEC*** can be synchronized to the machine cycle (e.g. by an encoder) via a synchronization input. The dead time then corresponds to a defined distance which is absolutely independent of the conveying speed.



- No counting errors when the lap stream is interrupted
  The ***SCATEC*** detects only the leading edge of an object. It does not detect trailing edges which become visible when the lap stream is interrupted. Projecting trailing edges can be suppressed by direct gap detection or by delaying the output pulse (***SCATEC-10*** or ***SCATEC-15***). An integrated retro-reflective sensor permits accurate detection of gaps in the lap stream. This can additionally increase the counting accuracy.
- Programming and diagnostic software
  With the programming software ***ScaDiag***, all functions and parameters can be simply adjusted on a PC. Furthermore, measurement sequences can be recorded and stored for diagnosis and troubleshooting.
- CAN interface
  The ***SCATEC-15*** can be automatically programmed via the CAN interface (e.g. if the format is changed).

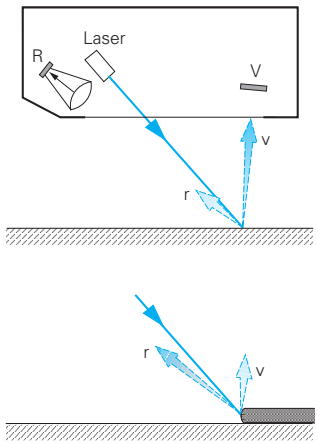
Technology and operation

Stated simply, the *SCATEC* consists of a laser light source and two photodetectors. The beam is aimed diagonally at the objects to be detected.

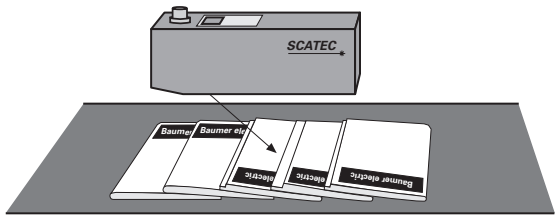
The photodetector **R** is located close to the laser light source and photodetector **V** is a little further away. The sensor determines the ratio between signal **v** (light diffused forwards) and signal **r** (light diffused backwards).

The ration **v/r** differs widely depending on whether the beam strikes a flat surface or an edge. If an edge moves into the laser beam, the direct view from detector **V** to the laser strike point is obstructed, reducing signal **v**, and also the edge increases the backwards diffusion, which causes signal **r** to rise. Both effects make the ratio **v/r** much smaller at an edge than on a flat surface. If the ratio **v/r** falls below a specific threshold, this is interpreted by the sensor as an edge.

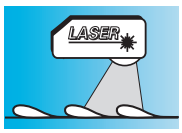
Due to the well-focused laser beam, the *SCATEC* detects even the smallest edges. There is no blind region directly beneath the sensor. Large counted objects may even touch the sensor without causing counting errors.



Mounting and adjustment



- The objects to be counted must have an edge facing the beam.
- The sensor must be installed parallel above the working plane.
- The laser beam should be blocked by a beam stop mounted parallel and just below the working plane. We recommend a light, matte object for this purpose (white paper, light and matte metal surface).



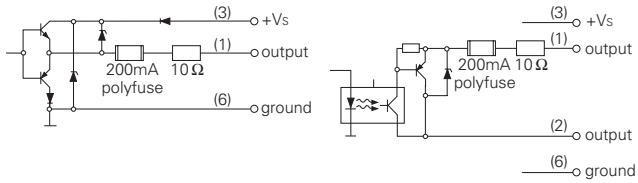
Sd = 0 ... 120 mm

- counting of up to 3 million copies/hour
- integrated copy counter
- CAN interface

general data	
measuring distance Sd	0 ... 120 mm
optimum operating distance	100 mm
counting rate	< 3'000'000 copies/h
object speed	< 5 m/sec
object cycle distance	> 1 mm
sensitivity	single sheet/edge thickness 0,15 mm
sync. input	yes
measuring point	visible red laser line 8 mm
light source	pulsed red laser diode
wave length	670 nm
laser class	2
edge indicator	LED yellow
power on indication	LED green
direct gap detection	yes
false pulse suppression	4 program options
sensitivity adjustment	4 preset levels or level set by customer
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	230 mA
output pulse length	0,3 ... 500 ms selectable
short circuit protection	yes
reverse polarity protection	yes
interface	CAN and serial
mechanical data	
type	rectangular
housing material	die-cast zinc
connector base (main connector)	DIN 45322, 6 pin
connector base (interface)	DIN 45326, 8 pin
front (optics)	glass
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 54

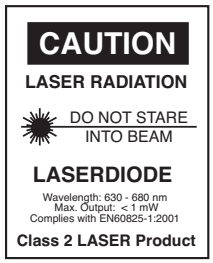
order reference	output circuit
FLDM 170C1030/S42	opto isolated
FLDM 170G1030/S42	push-pull

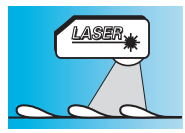
connection diagrams



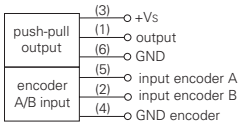
accessories	
ScaDiag kit diagnostic program includes interface converter and manual	156491
mounting plate for mounting on rails	157472
for details, see accessories section	

laser warning

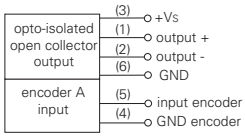




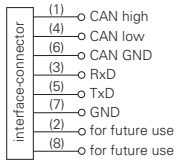
pin assignments



main connector push-pull

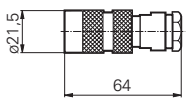


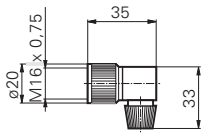
main connector open collector



interface-connector

connectors





104236	6 pin	(included)
153202	8 pin	(optional)

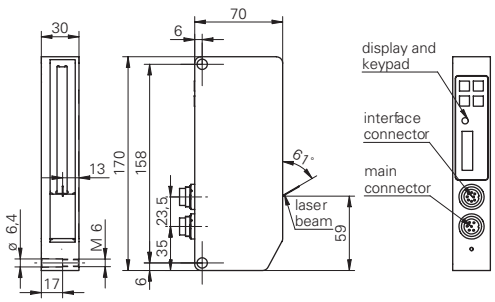
153094	6 pin	(optional)
153095	8 pin	(optional)

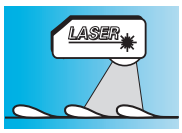
connector	
ESG 16FP1000G	CAN cable, length = 10 m

reflectors

FTDF 025F025	tape 25 x 25 mm
(included)	

dimension drawing





Sd = 0 ... 90 mm

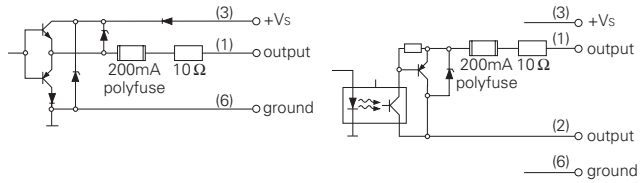
- counting of up to 3 million copies/hour
- integrated copy counter

general data	
measuring distance Sd	0 ... 90 mm
optimum operating distance	70 mm
counting rate	< 3'000'000 copies/h
object speed	< 5 m/sec
object cycle distance	> 1 mm
sensitivity	single sheet/edge thickness 0,1 mm
sync. input	yes
measuring point	visible red laser line 6 mm
light source	pulsed red laser diode
wave length	670 nm
laser class	2
edge indicator	LED yellow
power on indication	LED green
direct gap detection	yes
false pulse suppression	4 program options

electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	230 mA
output pulse length	0,3 ... 500 ms selectable
short circuit protection	yes
reverse polarity protection	yes
interface	serial
mechanical data	
type	rectangular
housing material	die-cast zinc
connector base (main connector)	DIN 45322, 6 pin
connector base (interface)	DIN 45326, 8 pin
front (optics)	glass
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 54

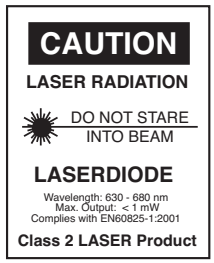
order reference	output circuit
FLDM 170C1011/S42	opto isolated
FLDM 170G1011/S42	push-pull

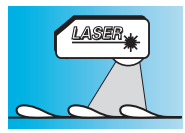
connection diagrams



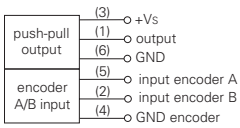
accessories	
ScaDiag kit diagnostic program includes interface converter and manual	156490
mounting plate for mounting on rails	157472
for details, see accessories section	

laser warning

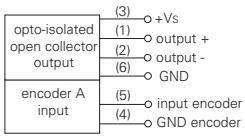




pin assignments

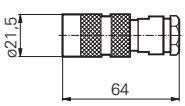


main connector push-pull

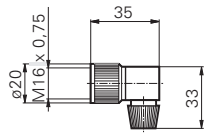


main connector open collector

connectors



104236	6 pin	(included)

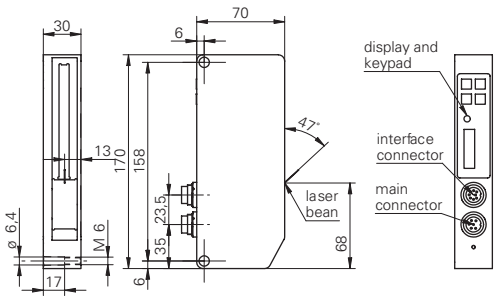


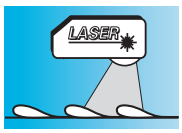
153094	6 pin	(optional)

reflectors

FTDF 025F025	tape 25 x 25 mm
(included)	

dimension drawing





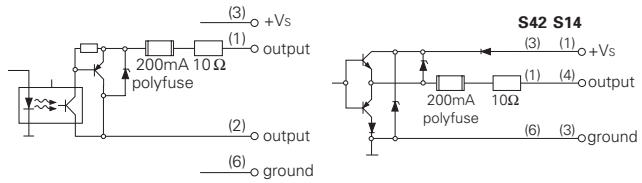
Sd = 0 ... 60 mm

- counting of up to 600'000 copies/hour
- standard connector M12x1
- compact design

general data	
measuring distance Sd	0 ... 60 mm
optimum operating distance	40 mm
counting rate	< 600'000 copies/h
object speed	< 5 m/sec
object cycle distance	> 1 mm
sensitivity	single sheet/edge thickness 0,2 mm
sync. input	no
measuring point	visible red laser line 2 mm
light source	pulsed red laser diode
wave length	670 nm
laser class	2
edge indicator	LED yellow
power on indication	LED green
false pulse suppression	on/off switchable

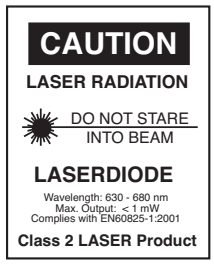
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	180 mA
output pulse length	5 / 10 / 15 / 20 ms selectable
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
type	rectangular
housing material	PA 6
front (optics)	glass
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 54

connection diagrams

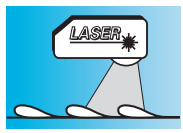


accessories	
ScaDiag kit (M12 x 1) diagnostic program includes interface converter and manual	156479
ScaDiag kit (DIN 45322) diagnostic program includes interface converter and manual	156489
for details, see accessories section	

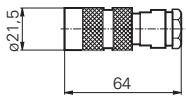
laser warning



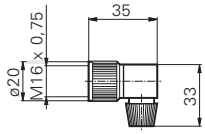
order reference	output circuit	connector base (main connector)
FLDK 110C1003/S42	opto isolated	DIN 45322, 6 pin
FLDK 110G1003/S14	push-pull	M12 x 1, 4 pin
FLDK 110G1003/S42	push-pull	DIN 45322, 6 pin



connectors



104236	6 pin	DIN 45322
(included)		

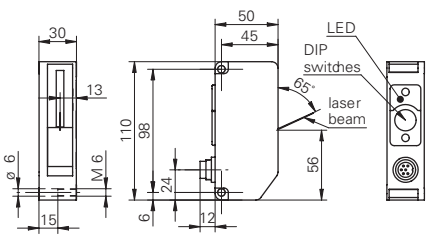


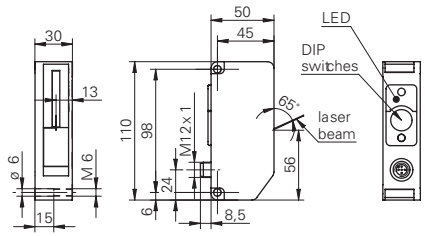
153094	6 pin	DIN 45322
(optional)		

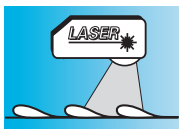
connectors M12 x 1		
ESG 34AH0200	4 pin	2 m, straight
ESG 34AH0500	4 pin	5 m, straight
ESG 34AH1000	4 pin	10 m, straight

connectors M12 x 1		
ESW 34AH0200	4 pin	2 m, angular
ESW 34AH0500	4 pin	5 m, angular
ESW 34AH1000	4 pin	10 m, angular

dimension drawings





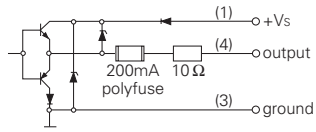


Sd = 0 ... 55 mm

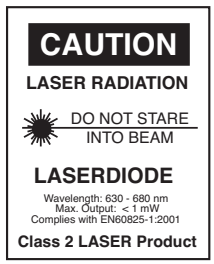
- Plug & Play
- counting of up to 280'000 copies/hour
- compact design

general data	
measuring distance Sd	0 ... 55 mm
optimum operating distance	40 mm
counting rate	< 280'000 copies/h
object speed	< 2 m/sec
object cycle distance	> 13 mm
sensitivity	single sheet/edge thickness 1,5 mm
sync. input	no
measuring point	visible red point
light source	pulsed red laser diode
wave length	670 nm
laser class	2
edge indicator	LED yellow
power on indication	LED green
sensitivity adjustment	no
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	180 mA
output circuit	push-pull
output pulse length	10 ms
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
type	rectangular
housing material	PA 6
connector base (main connector)	M12 x 1, 4 pin
front (optics)	glass
ambient conditions	
operating temperature	0 ... +50 °C
protection class	IP 54

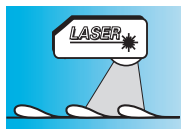
connection diagram



laser warning



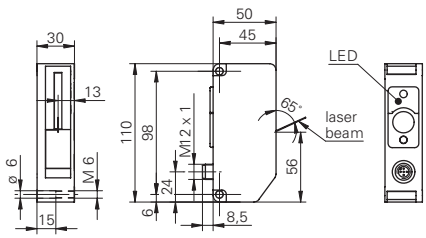
order reference
FLDK 110G1010/S14



connectors

connectors M12 x 1			connectors M12 x 1		
ESG 34AH0200	4 pin	2 m, straight	ESW 34AH0200	4 pin	2 m, angular
ESG 34AH0500	4 pin	5 m, straight	ESW 34AH0500	4 pin	5 m, angular
ESG 34AH1000	4 pin	10 m, straight	ESW 34AH1000	4 pin	10 m, angular

dimension drawing



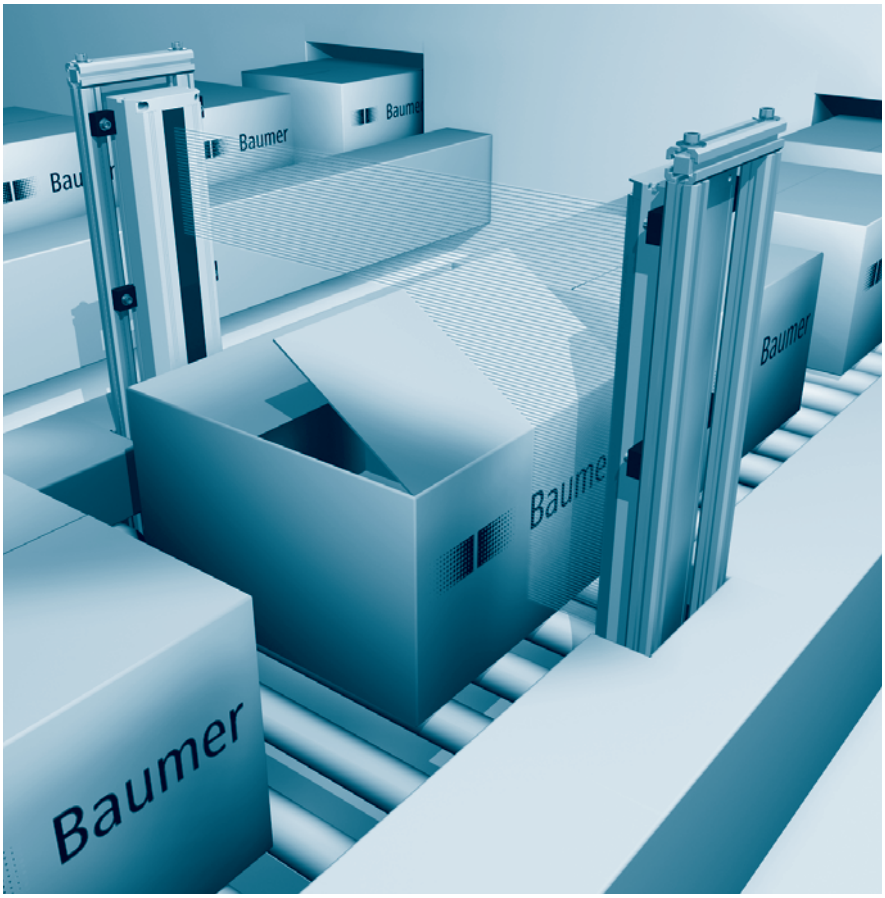
product family	**FCDM 012**	**FCDM 082**
		
	SpiderScan	*SpiderScan*
width	12 mm	82 mm
actual range Sb	< 4 m	< 6,5 m
measuring field size	150 mm	< 1677,5 mm
beam distance	50 mm	2,5 mm
resolution	50 mm	2,5 mm
switching output	■	-
switching output + RS 422	■	-
RS 422	-	■
SSI + RS 422	-	■
parallel 10 Bit + RS 422	-	■
Page	**534**	**536**

General information

The light barriers are electronic infrared light curtains to detect objects or for continuous measuring purposes. Light barriers are available with a measuring field of up to 1,6 m, a measuring distance of up to 6,5 m and a resolution of 1,25 mm to 50 mm.

Applications

- Automatic measurement of large objects such as parcels or crates on a conveyor belt.
- Use as area/object size/object position monitor, e.g. in front of the compartment door of automatic spray painting machines
- Ejection monitoring of punching machines



Characteristics and advantages

- High cycle rate
  Due to the high clock frequency of the system (100 kHz), very fast measurements are achieved, which ensures the highest measuring accuracy even with quickly moving objects.
  Example: a light barrier with 96 beams requires less than 1.2 ms for a measuring cycle, or the measuring cycle is < 0.1 ms with a light barrier with 4 beams.

- Reliable measuring principle
  As the individual light beams are aligned parallel to each other, it is irrelevant to the measurement results whether the measured object is closer to the receiver or closer to the emitter.

- Simple installation
  As only the receiver associated with each emitter diode is activated, a wide-angled beam from the emitter is possible. This light beam ensures that the light barrier operates faultlessly even under heavy vibrations. An LED integrated in the receiver unit which immediately indicates all interruptions of the beam channel is a valuable aid for adjusting the light barrier.

- Integrated processing
  Due to the compact construction, it is possible to integrate the processing and interface electronics in the light barrier, making an external processing unit unnecessary. This substantially simplifies installation and wiring.

- Rugged housing
  Both the emitter and the receiver are installed in an aluminum housing. The design of this housing takes account not only of ruggedness, but also a means of simple installation.

- Multi-system operation
  The light barrier FCDM 082 is equipped to make it possible to synchronize several measuring systems with each other. This prevents several systems operating on one measurement from interfering with each other.

- Parameter setting software
  With the ***SpiderView*** software, the parameters of the light barriers can be set via an RS 422 interface. The software is written for Windows 95/98/2000/XP.

Technology and operation

Each measuring system consists of an emitter and a receiver unit, each containing a microcontroller to control the light pulses. During a measuring cycle, the individual emitting diodes are activated in sequence and the corresponding receiver unit is simultaneously scanned. This means that the first sensor is interrupted at the precise time when the imaginary line from the first emitter to the first receiver is interrupted. This applies equivalently to the next beams, forming a "light barrier" of parallel light beams.
During each measuring cycle, the number of interrupted beams is determined. The value is issued as "DATA" and the position of the first interrupted beam is available as the "POSITION" value.

Output formats:

DATA/POSITION "normal"
The system issues the number of interrupted beams as "DATA" and the position of the first interrupted beam as "POSITION".

DATA/POSITION „largest blocked area"
The system issues the largest blocked area as "DATA" and the number of the beam at which this area begins as "POSITION".

Technology and operation

DATA/POSITION „over all“
The system issues the number of beams between the first and last interrupted beam as “DATA” and the position of the first interrupted beam as “POSITION”.

Double scanning:
For various applications, higher measuring accuracy and improved object detection are required. The double scanning function is available for this purpose. An additional diagonal beam is inserted between the parallel beams. This produces twice the resolution at the middle of the measuring distance.

Smoothing:
With the “smoothing” function, the number of interrupted beams from which a measurement is made is determined. Measuring beams are thereby only regarded as interrupted if the number of immediately adjacent interrupted measuring beams is at least equal to the “smoothing” value. In units with RS 422 interfaces, this value can be adjusted. Otherwise, this function is inactive and unavailable.

Interfaces:
Parallel
Parallel output of the number of interrupted beams as a 10-bit binary value. Whether DATA or POSITION is issued as the value can be chosen via a control line.

Example: in a light barrier with 32 measuring beams, an object interrupts the first 15 measuring beams. The first four of the six PNP switch elements are therefore closed (0000001111).

RS 422
The RS 422 interface permits the connection of the light barrier to a supersidiary controller. Apart from reading the measured data, numerous adjustments can be made to the system via the interface.

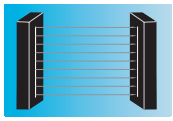
Transistor switching output
If a beam (or a number of beams determined by the smoothing value) is interrupted, the output switches.

SSI (synchronous serial interface)
With the SSI interface, the data is transmitted in Gray code with a clock frequency of 100 kHz.

Mounting and adjustment

The emitter and receiver should be as parallel as possible to each other and be installed at the same height to ensure the optimum function and receiver excess gain.

Due to the diverging angle of radiation of the IR diodes (which has advantages for installation), reflective surfaces in close proximity with the light barrier can deflect the light sufficiently to result in incorrect information.



Sb = 4 m

- very small housing 12 mm
- 100 kHz high clock frequency
- aluminum housing material rugged

general data	
measuring field	150 mm
actual range Sb	< 4 m
beam distance	50 mm
resolution	50 mm
number of beams	4
alignment aid	LED green
light source	infrared diode
wave length	950 nm
clock frequency	91 kHz
clock speed per beam	11 µs
analysis time	150 µs
electrical data	
voltage supply range +Vs	24 VDC ± 10%
residual ripple	< 200 mV
current consumption max.	500 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12 mm
height / length	252 mm
depth	40 mm
type	rectangular
housing material	aluminum
ambient conditions	
operating temperature	-25 ... +55 °C
humidity	0 ... 90 % (non condensed)
protection class	IP 65

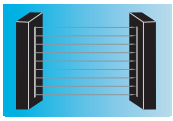
cable

included in delivery:
power/data cable — length 3 m
synchronization cable — length 5 m
specify other lengths when ordering

accessory

remote access kit:
software "SpiderView",
interface cable with converter,
manual

order reference	output circuit	output current	interface
FCDM 012P0150/50.0	PNP	< 100 mA	-
FCDM 012J0150/50.0	-	-	RS 422

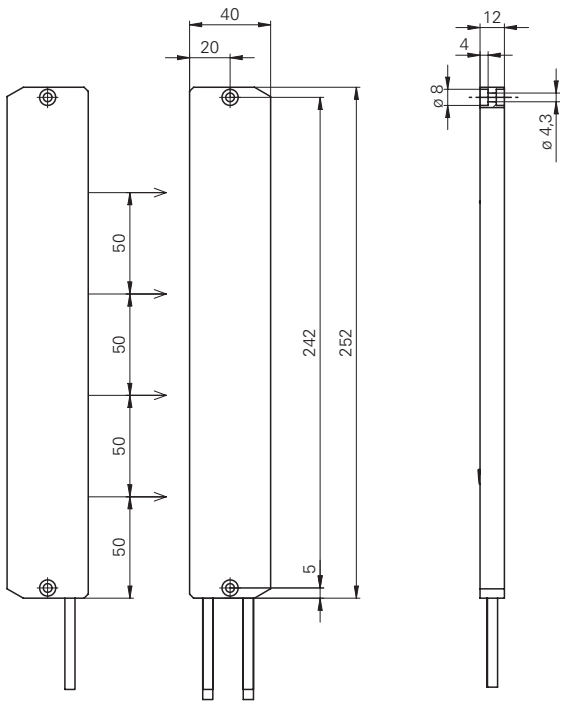


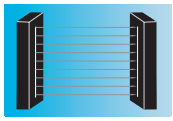
configuration

If a configuration different from the factory setting is desired, this must be specified in the order. Other settings can also be made with the programming kit. In this case, it is essential that a version with RS 422 interface is ordered.

	factory setup	optional
data format	normal	"largest blocked area" oder "over all"
actual range	1,2 ... 2 m	... m (min. 0,5 m/max. 4 m)
double scanning	no	yes
smoothing data	1 beam	number of beams

dimension drawing





Sb = 6,5 m

- high resolution
- 100 kHz high clock frequency
- rugged aluminum housing material

general data	
measuring field	237,5 ... 1677,5 mm
actual range Sb	< 6,5 m
beam distance	2,5 mm
resolution	2,5 mm
number of beams	96 ... 672
alignment aid	LED green
light source	infrared diode
wave length	950 nm
clock frequency	100 kHz
clock speed per beam	10 µs
analysis time	200 µs
electrical data	
voltage supply range +Vs	24 VDC ± 10%
residual ripple	< 200 mV
current consumption max.	1,2 A
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	82 mm
depth	40 mm
type	rectangular
housing material	aluminum

ambient conditions	
operating temperature	-25 ... +55 °C
humidity	0 ... 90 % (non condensed)
protection class	IP 65

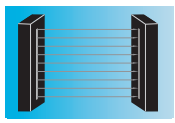
cable	
included in delivery:	
synchronization cable	length 5 m
connector 7 pin	
connector RS-422	
other connectors, interfaces and cable lengths on request	

accessory	
remote access kit: software "SpiderView", interface cable with converter, manual	163150

order reference	number of beams	measuring field Lm	height/length L	L1
FCDM 082x0237/02.5	96	237,5 mm	390 mm	128,5 mm
FCDM 082x0477/02.5	192	477,5 mm	630 mm	128,5 mm
FCDM 082x0717/02.5	288	717,5 mm	870 mm	128,5 mm
FCDM 082x0957/02.5	384	957,5 mm	1110 mm	128,5 mm
FCDM 082x1197/02.5	480	1197,5 mm	1350 mm	128,5 mm
FCDM 082x1437/02.5	576	1437,5 mm	1590 mm	128,5 mm
FCDM 082x1677/02.5	672	1677,5 mm	1830 mm	128,5 mm

interface

J	RS 422
I	SSI + RS 422
B	Parallel 10 Bit + RS 422

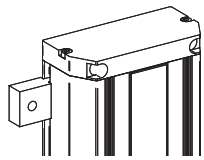


configuration

If a configuration different from the factory setting is desired, this must be specified in the order. Other settings can also be made with the programming kit.

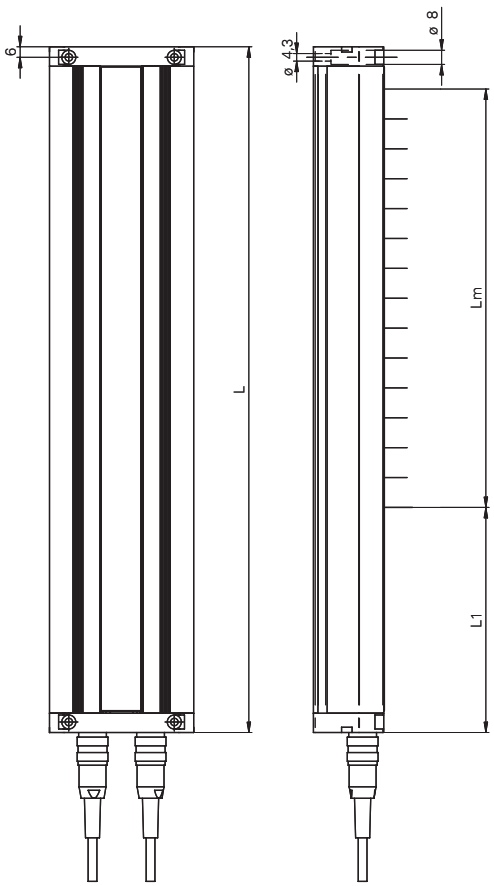
	factory setup	optional
data format	normal	"largest blocked area" or "over all"
actual range	0,6 ... 1 m	... m (min. 0,2 m / max. 6,5 m)
output mode	number of beams	mm
coding	binary	«Gray» or «BCD»
double scanning	no	yes
smoothing data	1 beam	... beams

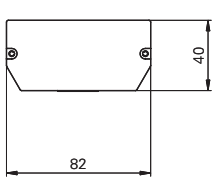
mounting

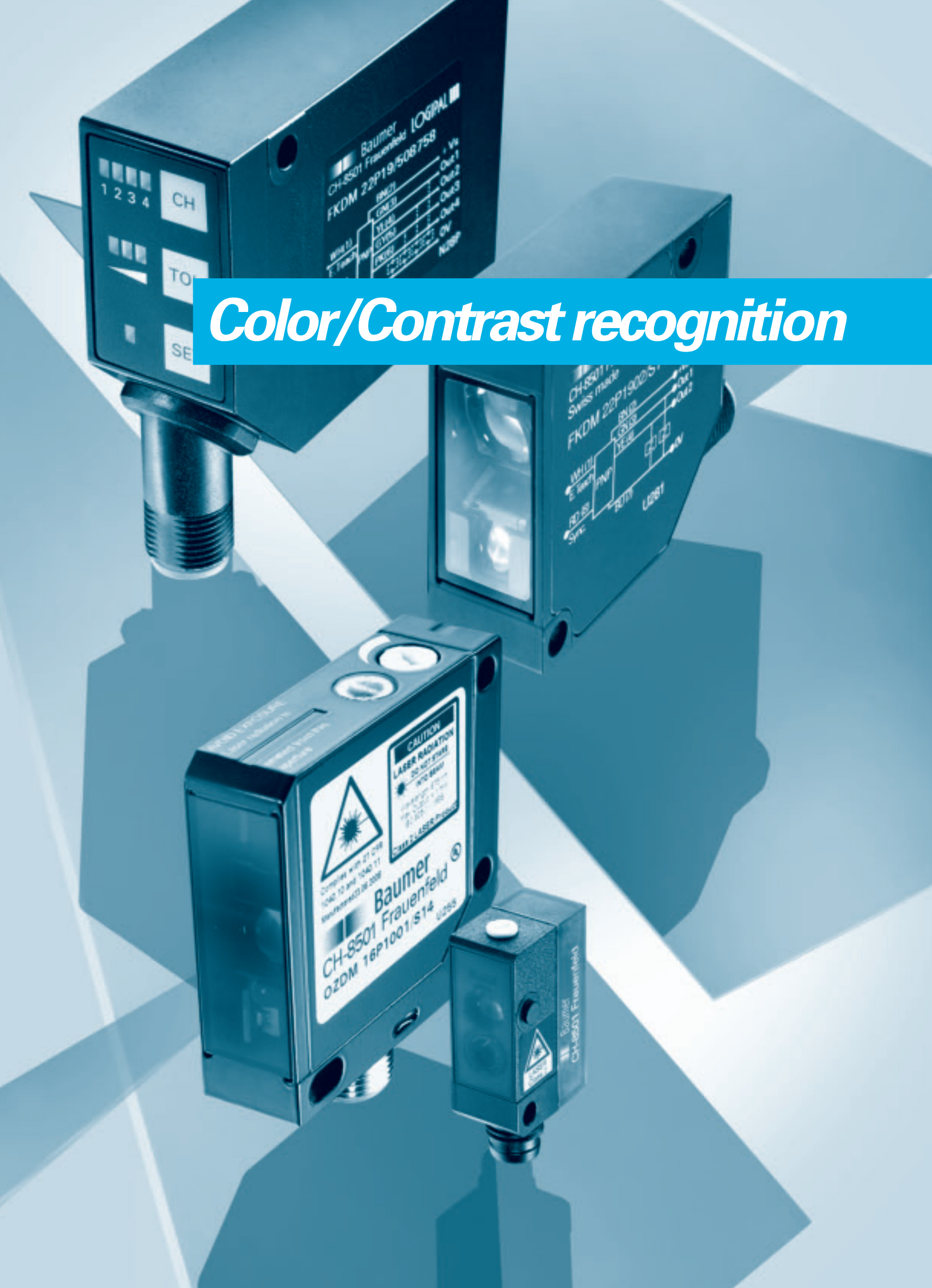


groove plate part nr. 161963

dimension drawing






Color/Contrast recognition
Baumer
CH-8501 Frauenfeld
FKDM 22P19/S0B758
LOGIPAL
1 2 3 4
CH
CAUTION
LASER RADIATION
Baumer
CH-8501 Frauenfeld
OZDM 16P1001/S14

product family	**FKDM 22**	**FKDM 22**	**FKDM 22**
			
	LOGIPAL	*LOGIPAL*	*LOGIPAL*
sensing distance Tw	40 mm	40 mm	25 mm
sensor channels	4 (teachable)	2 (teachable)	4 (teachable)
size of measuring spot	3 mm x 5 mm	3 mm x 5 mm	0,7 mm x 1,3 mm
response time / release time	< 0,34 ms	< 0,34 ms	< 0,34 ms
NPN	■	■	■
PNP	■	■	■
device plug	rotatable by 180°	rotatable by 180°	rotatable by 180°
housing material	metal	metal	metal
Page	**542**	**543**	**544**

General information

With the ***LOGIPAL*** color detection sensor, you can now use the color as a solution for sorting, quality monitoring and automation in your processes.

Applications

- Products marked with colored marks can be monitored and sorted.
- The correct color of objects can be inspected or the objects can be sorted by their color.

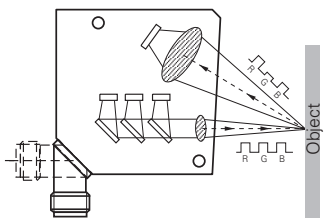
Characteristics and advantages

- Simple operation:
  Four different colors can be programmed with just three buttons.
- Finest color graduation:
  One of five tolerance stages can be chosen for each color.
- Short response time:
  With a response time of only 0,34 ms, high detection rates can be achieved.
- Synchronization input:
  Permits controlled measurement of the color.
- External Teach-in input:
  Permits complete remote control of all teach-in functions by serial data transfer. An RS 232 interface transducer with galvanic isolation is available as an accessory.

Technology and operation

The sensor operates by the three-stage principle, meaning that it emits the three colors red, green and blue and then measures the color proportions of the three colors reflected by the object.

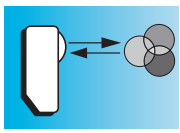
The color of an object is programmed in the teach-in procedure. If the sensor recognizes this color again during operation, it activates the corresponding output. Optional tolerances permit it to detect large or small differences in color.



Mounting and adjustment

The use of the color sensor is as simple as for a diffuse sensor. Only the points below must be observed.

- For glossy objects, tilt the sensor to the side by approx. 15 °.
- If you wish to detect very fine differences in color, the sensing distance of 40 mm must be complied with as closely as possible.

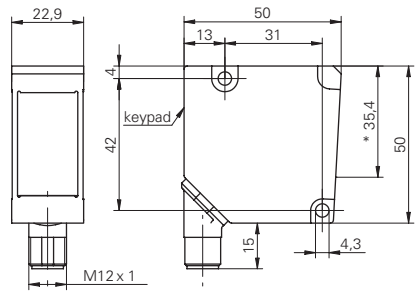


Tw = 40 mm

- up to 4 colors can be distinguished properly
- spot size 3 x 5 mm
- rugged metal housing

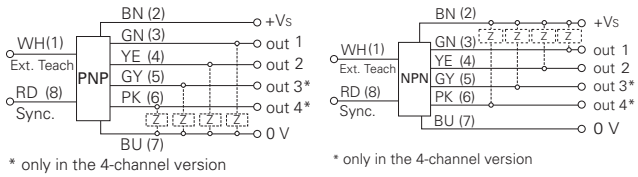
general data	
sensing distance Tw	40 mm
sensor channels	4 (teachable)
tolerance ranges	5-step teachable (LEDs)
size of measuring spot	3 mm x 5 mm
light source	LED red / green / blue
signal display (Teach)	LED orange
channel status display	LED yellow per channel
power on indication	LED green
electrical data	
response time / release time	< 0,34 ms
voltage supply range +Vs	10 ... 30 VDC
power consumption	< 2 W
voltage drop Vd	< 1,8 VDC
output current (per channel)	< 100 mA
remote Teach-In input	protocol with return signal through channel 1-output
level (sync., teach)	high: 2/3 Vs...Vs low: 0 V...1/3 Vs
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
type	rectangular
housing material	die-cast zinc
front (optics)	glass
device plug	rotatable by 180°
ambient conditions	
operating temperature	-10 ... +55 °C
protection class	IP 67
connectors	
ESG 34FP0200B 8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket	126220
for details, see accessories section	

dimension drawing



* emitter axis

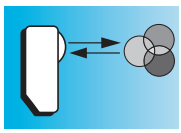
connection diagrams



* only in the 4-channel version

* only in the 4-channel version

order reference	output circuit	output function	sync. input
FKDM 22N1901/S14F	NPN	light operate	high active
FKDM 22P1901/S14F	PNP	light operate	low active
FKDM 22P3901/S14F	PNP	dark operate	low active

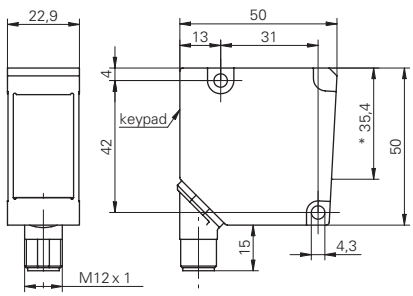


Tw = 40 mm

- up to 2 colors can be distinguished properly
- spot size 3 x 5 mm
- rugged metal housing

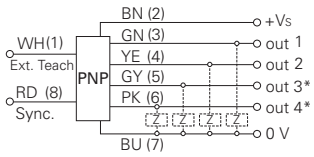
general data	
sensing distance Tw	40 mm
sensor channels	2 (teachable)
tolerance ranges	5-step teachable (LEDs)
size of measuring spot	3 mm x 5 mm
light source	LED red / green / blue
signal display (Teach)	LED orange
channel status display	LED yellow per channel
power on indication	LED green
electrical data	
response time / release time	< 0,34 ms
voltage supply range +Vs	10 ... 30 VDC
power consumption	< 2 W
voltage drop Vd	< 1,8 VDC
output current (per channel)	< 100 mA
remote Teach-In input	protocol with return signal through channel 1-output
level (sync., teach)	high: 2/3 Vs...Vs low: 0 V...1/3 Vs
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
type	rectangular
housing material	die-cast zinc
front (optics)	glass
device plug	rotatable by 180°
ambient conditions	
operating temperature	-10 ... +55 °C
protection class	IP 67
connectors	
ESG 34FP0200B 8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket	126220
for details, see accessories section	

dimension drawing

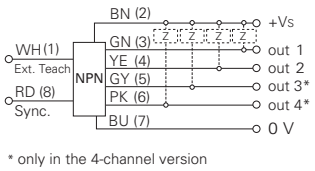


* emitter axis

connection diagrams

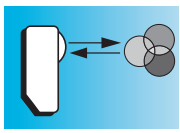


* only in the 4-channel version



* only in the 4-channel version

order reference	output circuit	output function	sync. input
FKDM 22N1902/S14F	NPN	light operate	high active
FKDM 22P1902/S14F	PNP	light operate	low active
FKDM 22P3902/S14F	PNP	dark operate	low active

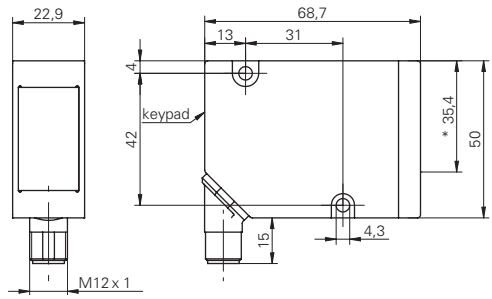


Tw = 25 mm

- up to 4 colors can be distinguished properly
- spot size 0,7 x 1,3 mm
- rugged metal housing

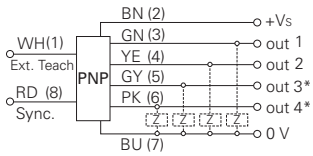
general data	
sensing distance Tw	25 mm
sensor channels	4 (teachable)
tolerance ranges	5-step teachable (LEDs)
size of measuring spot	0,7 mm x 1,3 mm
light source	LED red / green / blue
signal display (Teach)	LED orange
channel status display	LED yellow per channel
power on indication	LED green
electrical data	
response time / release time	< 0,34 ms
voltage supply range +Vs	10 ... 30 VDC
power consumption	< 2 W
output function	light operate
voltage drop Vd	< 1,8 VDC
output current (per channel)	< 100 mA
remote Teach-In input	protocol with return signal through channel 1-output
level (sync., teach)	high: 2/3 Vs...Vs low: 0 V...1/3 Vs
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
type	rectangular
housing material	aluminum anodized
front (optics)	glass
device plug	rotatable by 180°
ambient conditions	
operating temperature	-10 ... +55 °C
protection class	IP 67
connectors	
ESG 34FP0200B 8 pin	2 m straight (shielded)
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket	126220
for details, see accessories section	

dimension drawing

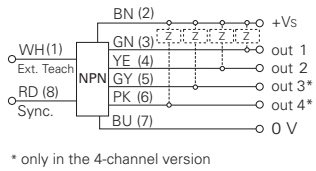


* emitter axis

connection diagrams



* only in the 4-channel version



* only in the 4-channel version

order reference	output circuit	sync. input
FKDM 22N1911/S14F	NPN	high active
FKDM 22P1911/S14F	PNP	low active

product family	OZDK 10	OZDK 10	OZDK 14	OZDM 16	OZDM 16
					
width / diameter	10,4 mm	10,4 mm	14,8 mm	15,4 mm	15,4 mm
sensing distance Tw	3 ... 150 mm	3 ... 150 mm	20 ... 300 mm	0 ... 250 mm	0 ... 250 mm
response time / release time	< 0,05 ms	< 0,05 ms	< 0,15 ms	< 0,05 ms	< 0,1 ms
sensitivity adjustment	Pot, 5 turn	Pot, 5 turn	teach-in	Pot, 14 turn	Pot, 14 turn
NPN	■	■	■	■	
PNP	■	■	■	■	■
cable	■	■		■	■
connector	■	■	■	■	■
housing material	plastic	plastic	plastic	metal	metal
Page	**548**	**550**	**552**	**554**	**556**

Contrast sensors

General information

This diffuse laser sensor permits the finest differences in contrast to be detected. Due to the very small light spot, the sensor can precisely detect such states down to a size of 0,1 mm.

Applications

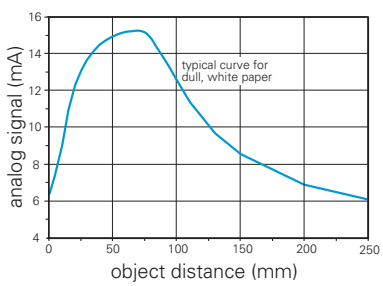
- Registration:
  Printed marks on objects used to align the printing mechanism or trigger an event.
- Indentations, grooves, edges:
  If a surface is observed from an oblique angle, the reflection behavior changes at an indentation, which is equivalent to a change in contrast for the sensor.
- Analog output:
  This makes it possible to read the desired nominal values and to detect deviations from these.

Characteristics and advantages

- Red laser light:
  Easily visible measuring spot.
- Adjustable laser spot size:
  Very small diameter due to focused laser beam.
- Fast reaction time:
  Reaction times of down to 0,1 ms.
- Low laser class:
  No problems in use.
- Switching output:
  For simpler sensing problems.
- Switching output:
  With high linearity with regard to brightness.

Technology and operation

This sensor is based on the intensity difference principle with a clearly defined, small light spot (laser). At the ideal working distance, it is optimized so that contrasts are detected almost independently of small changes in the distance ("plateau" in the signal curve). The sensor issues a signal proportional to the brightness with good linearity for all matt objects (= linear range) at the analog output. Glossy objects up to reflective sheet metal are also detected. This is due to a deliberate non-linearity with regard to the brightness with a strong receiving signal.



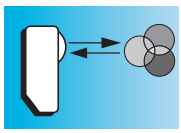
Mounting and adjustment

The sensor should normally be installed tilted by 5° to 20° to the object surface, particularly if glossy materials are scanned.

If edges, grooves or indentations are scanned, the sensor must be aimed so that the direct reflection is detected when the indentation, groove or edge enters the light beam.

The working distance must be adjusted according to the measuring task:

- Scanning at the laser focus permits positioning with high accuracy.
- With a light spot approx. 1 mm in size, small differences in contrast are detected even with slight surface roughness and non-homogenous colors.



Tw = 3 ... 150 mm

- subminiature housing
- high repeatability
- very short response time

general data	
type	diffuse contrast sensor
light source	pulsed red laser diode
sensing distance Tw	3 ... 150 mm
optimum operating distance	20 ... 40 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Pot, 5 turn
laser class	2
distance to laser focus	40 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	16,3 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C

connection diagrams

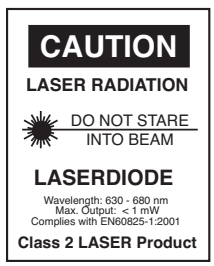
connectors

ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

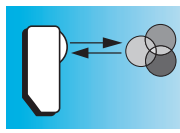
accessories

SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

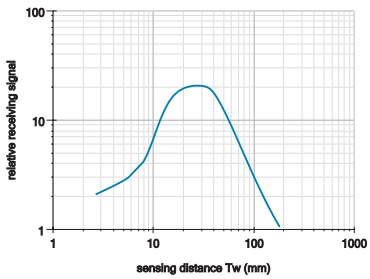
laser warning



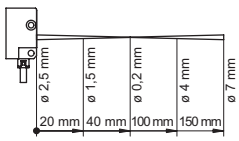
order reference	connection types	output circuit	protection class
OZDK 10N5101	cable 4 pin	NPN	IP 65
OZDK 10N5101/S35A	connector M8, 4 pin	NPN	IP 67
OZDK 10P5101	cable 4 pin	PNP	IP 65
OZDK 10P5101/S35A	connector M8, 4 pin	PNP	IP 67



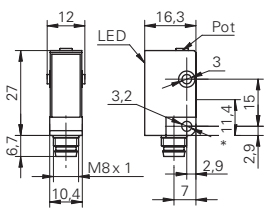
relative receiving signal



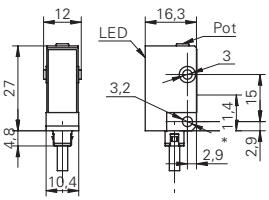
beam characteristic



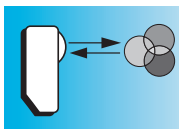
dimension drawings



* emitter axis



* emitter axis



Tw = 3 ... 150 mm

- subminiature housing
- high repeatability
- very short response time

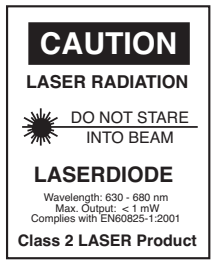
general data	
type	diffuse contrast sensor
version	line beam
light source	pulsed red laser diode
sensing distance Tw	3 ... 150 mm
optimum operating distance	35 ... 45 mm
repeatability	< 0,2 mm at laser focus
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Pot, 5 turn
laser class	2
distance to laser focus	40 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	50 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	16,3 mm
type	rectangular
housing material	plastic (ASA)
front (optics)	PMMA
ambient conditions	
operating temperature	-10 ... +50 °C

connection diagrams

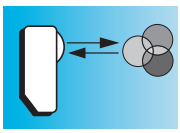
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	150326
mounting bracket (cable type)	114501
mounting bracket (connector type)	133792
for details, see accessories section	

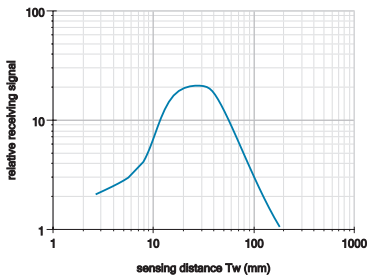
laser warning



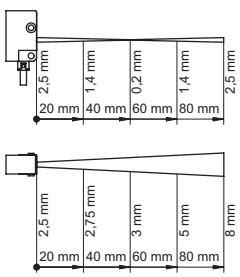
order reference	connection types	output circuit	protection class
OZDK 10N5150	cable 4 pin	NPN	IP 65
OZDK 10N5150/S35A	connector M8, 4 pin	NPN	IP 67
OZDK 10P5150	cable 4 pin	PNP	IP 65
OZDK 10P5150/S35A	connector M8, 4 pin	PNP	IP 67



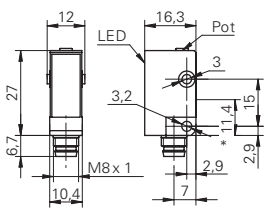
relative receiving signal



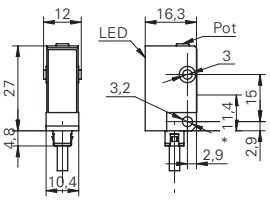
beam characteristic



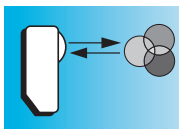
dimension drawings



* emitter axis



* emitter axis



Tw = 20 ... 300 mm

- very short response time
- high repeatability
- sensing distance adjustable via Teach-in

general data	
type	diffuse contrast sensor
light source	pulsed red laser diode
sensing distance Tw	20 ... 300 mm
repeatability	< 0,2 mm at laser focus
alignment / soiled lens indicator	flashing light indicator
light indicator	LED yellow
power on indication	LED green
sensitivity adjustment	Teach-in
laser class	2
distance to laser focus	115 mm
wave length	650 nm
electrical data	
response time / release time	< 0,15 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max.	35 mA
current consumption typ.	25 mA
voltage drop Vd	< 2,2 VDC
output function	light operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	14,8 mm
height / length	43 mm
depth	31 mm
type	rectangular
housing material	plastic (PA12)
front (optics)	PMMA
connection types	connector M8, 4 pin
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

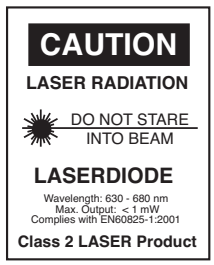
order reference	output circuit
OZDK 14N1901/S35A	NPN
OZDK 14P1901/S35A	PNP

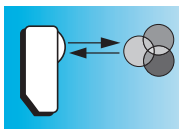
connection diagrams

connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

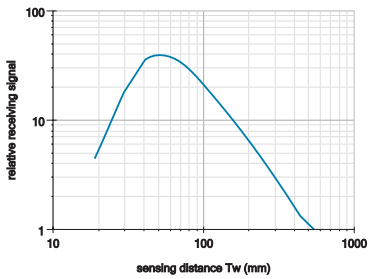
accessories	
SENSOFIX mounting kit	149011
mounting bracket	134964
for details, see accessories section	

laser warning

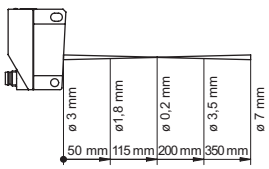




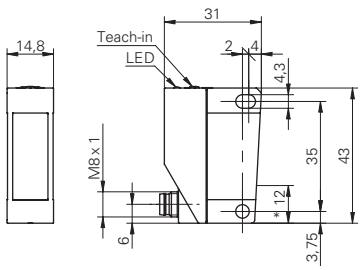
relative receiving signal



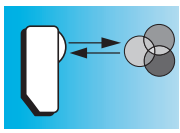
beam characteristic



dimension drawing



* emitter axis

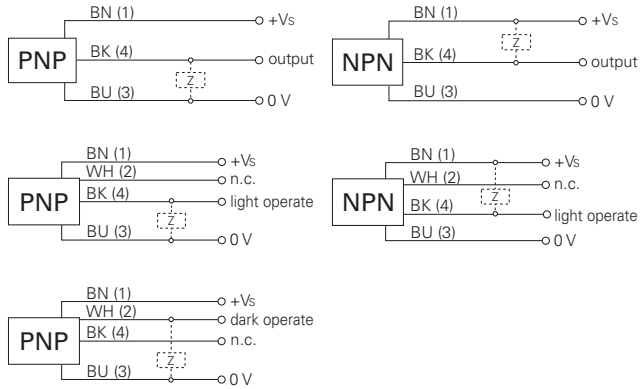


Tw = 0 ... 250 mm

- rugged metal housing
- high repeatability
- very short response time

general data	
type	diffuse contrast sensor
light source	pulsed red laser diode
sensing distance Tw	0 ... 250 mm
optimum operating distance	40 ... 80 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
sensitivity adjustment	Pot, 14 turn
laser class	2
distance to laser focus	80 mm
wave length	675 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	12 ... 30 VDC
current consumption max.	65 mA
current consumption typ.	60 mA
voltage drop Vd	< 1,8 VDC
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

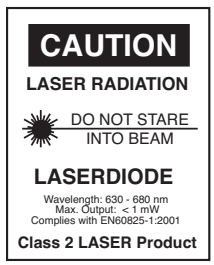
connection diagrams



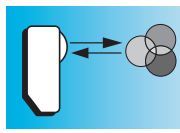
connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
for details, see accessories section	

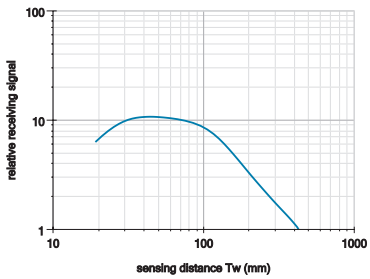
laser warning



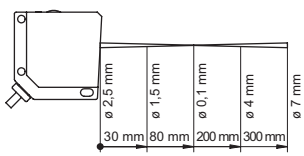
order reference	connection types	output circuit	output function
OZDM 16N1001	cable 3 pin	NPN	light operate
OZDM 16N1001/S14	connector M12, 4 pin	NPN	light operate
OZDM 16P1001	cable 3 pin	PNP	light operate
OZDM 16P1001/S14	connector M12, 4 pin	PNP	light operate
OZDM 16P3001	cable 3 pin	PNP	dark operate
OZDM 16P3001/S14	connector M12, 4 pin	PNP	dark operate



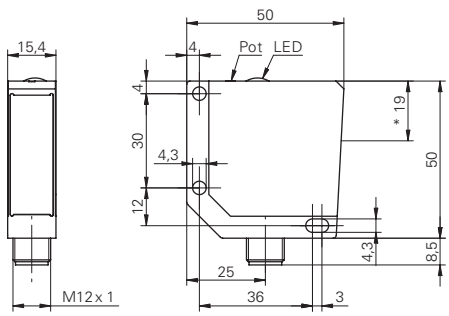
relative receiving signal



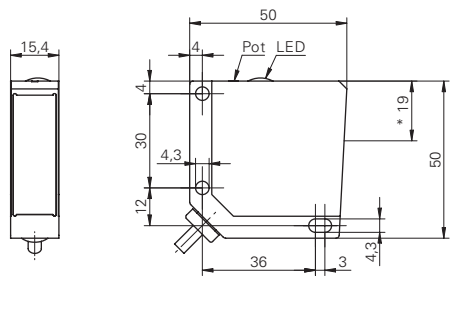
beam characteristic



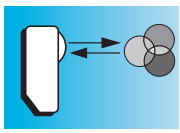
dimension drawings



* emitter axis



* emitter axis



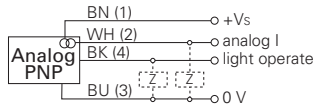
Tw = 0 ... 250 mm

- with analog output
- high repeatability
- very short response time

general data	
type	diffuse contrast sensor
light source	pulsed red laser diode
sensing distance Tw	0 ... 250 mm
optimum operating distance	40 ... 80 mm
detectable remission difference (on grey)	> 8 %
repeatability	< 0,1 mm at laser focus
output indicator	LED yellow
sensitivity adjustment	Pot, 14 turn
laser class	2
distance to laser focus	80 mm
wave length	675 nm
electrical data	
response time / release time	< 0,1 ms
voltage supply range +Vs	12 ... 30 VDC
current consumption max.	65 mA
current consumption typ.	60 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output circuit	PNP / analog 4 ... 20 mA
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15,4 mm
height / length	50 mm
depth	50 mm
type	rectangular
housing material	die-cast zinc
front (optics)	glass
ambient conditions	
operating temperature	-10 ... +50 °C
protection class	IP 67

order reference	connection types
OZDM 16P1901	cable 4 pin
OZDM 16P1901/S14	connector M12, 4 pin

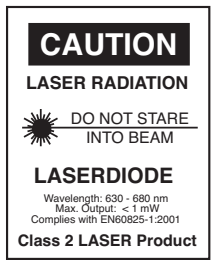
connection diagram

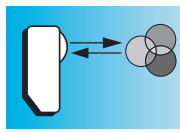


connectors		
ESG 34AH0200	4 pin	2 m straight
ESW 33AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

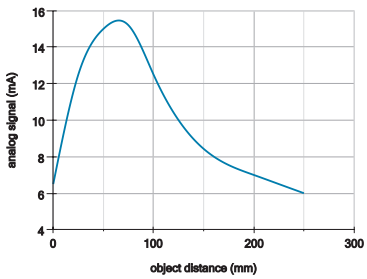
accessories	
SENSOFIX mounting kit	151721
mounting bracket	113917
for details, see accessories section	

laser warning

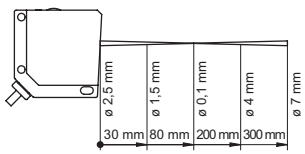




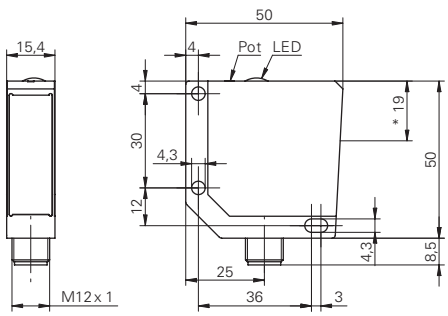
signal progression



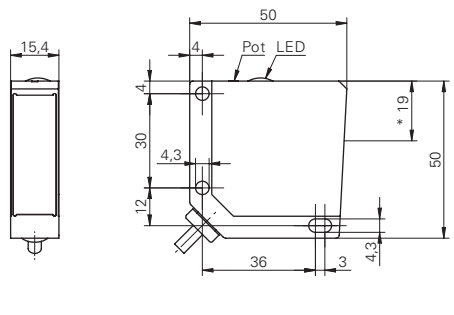
beam characteristic



dimension drawings



* emitter axis



* emitter axis