Laser Sensors

A laser light source is ideally suited for BGS sensing, it is also very good for transparent object detection.
This type of sensor offers excellent repeat accuracy and performance.

D series	89
D2SA series	100
Z-L / BGS-ZL series	110

Laser Sensor

D series

BGS-DL series **Pushbutton teach type**
(Sensing distance : 40 - 100mm)
・BGS-DL10TN / TP / TCN / TCP
(Sensing distance : 100 - 250mm)
・BGS-DL25TN / TP / TCN / TCP

Manual adjust type
(Sensing distance : 40 - 100mm)
・BGS-DL10N / P / CN / CP
(Sensing distance : 100 - 700mm)
・BGS-DL70N / P / CN / CP
(Sensing distance : 100 - 300mm)
・BGS-DL30N / P / CN / CP

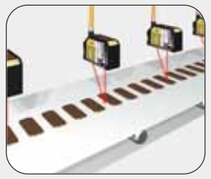
DR-Q series **Transparent detection type**
(Sensing distance : 1.5m)
・DR-Q150TN / TP / TCN / TCP
(Sensing distance : 4m)
・DR-Q400TN / TP / TCN / TCP

DT series **Thru-beam type**
(Sensing distance : 40m)
・DT-4000N / P / CN / CP

DR series **Retro-reflective type**
(Sensing distance : 5m)
・DR-500N / P / CN / CP

- ***CMOS Image Sensor + Digital Monitor for easy setting.***
- ***DR-Q series, transparent detection with AGC (Automatic Gain Control) function.***
- ***BGS-DL series, the leading edge of BGS type sensors, the ultimate in Diffuse Reflective sensing.***
- ***DT series, long distance Thru-beam sensor (max. 100 meters).***

Applications



For thin workpieces on a fluttering conveyor. (BGS-DL10T)

Any transparent object, PET / Glass / Plastic. (DR-Q150)

Positioning for ink printer (DR-500)

Stable sensing of aluminum pouch (DR-500)

Product Types

Cable / QD	Output	BGS / Accurate type	
		Laser CMOS Teach-in	Potentiometer
Distance		40 - 100mm	
Cable	NPN	BGS-DL10TN	BGS-DL10N
	PNP	BGS-DL10TP	BGS-DL10P
M8-QD	NPN	BGS-DL10TCN	BGS-DL10CN
	PNP	BGS-DL10TCP	BGS-DL10CP

Cable / QD	Output	BGS / Longer distance		
		Laser CMOS Teach-in	Potentiometer	
Distance		100 - 250mm	100 - 300mm	100 - 700mm
Cable	NPN	BGS-DL25TN	BGS-DL30N	BGS-DL70N
	PNP	BGS-DL25TP	BGS-DL30P	BGS-DL70P
M8-QD	NPN	BGS-DL25TCN	BGS-DL30CN	BGS-DL70CN
	PNP	BGS-DL25TCP	BGS-DL30CP	BGS-DL70CP

Cable / QD	Output	Transparent type (with teach-in)	
		Filled bottle	Empty bottle
Distance		1.5 meter	4.0 meter
Cable	NPN	DR-Q150TN	DR-Q400TN
	PNP	DR-Q150TP	DR-Q400TP
M8-QD	NPN	DR-Q150TCN	DR-Q400TCN
	PNP	DR-Q150TCP	DR-Q400TCP

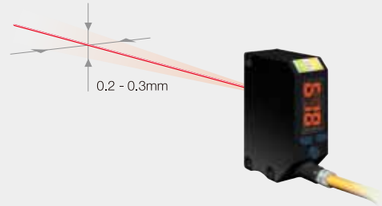
Cable / QD	Output	Thri-Beam type (with potentiometer)
Distance		40 meter
Cable	NPN	DT-4000N
	PNP	DT-4000P
M8-QD	NPN	DT-4000CN
	PNP	DT-4000CP

Cable / QD	Output	Retro-reflective type (with potentiometer)
Distance		5 meter
Cable	NPN	DR-500N
	PNP	DR-500P
M8-QD	NPN	DR-500CN
	PNP	DR-500CP

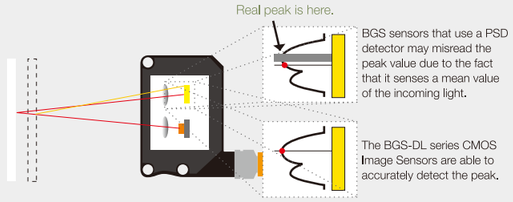
Features

Repeat Accuracy

Very tight Repeat Accuracy, 0.2 - 0.3 mm for BGS type.
Even Thru-beam and Retro types have 0.3mm Repeat Accuracy (*).
* = Tested at the middle point of sensing range.

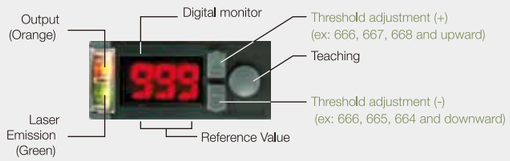


CMOS Image Sensor

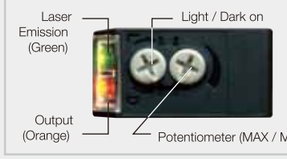


Pushbutton Teach with Fine Adjustment

In addition to a Teach button there are also two threshold adjustment buttons. Fine adjustments can be made to the threshold value after Teaching by using the adjustment buttons.

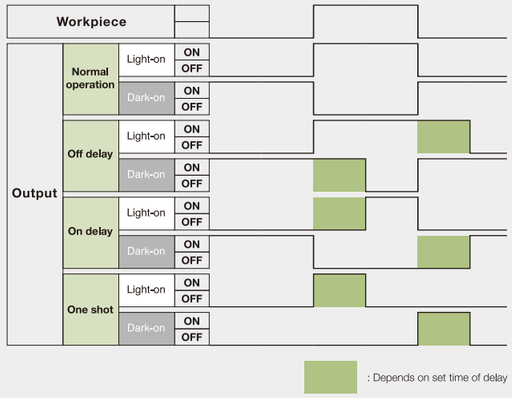


Low cost: Manual adjust type



Timer functions

The pushbutton teach models of the D series have built-in Timer functions for added flexibility.



Set time is referred as below ;

Time	ms						s			
	0	10	20	・・・	980	990	1	2	・・・	10
Display	0	1	2	・・・	98	99	01	02	・・・	10

* 1msec increment for 0-999 msec.
* Timer is not available for Manual adjust type sensors
* 1sec increment from 1sec to 10 sec.

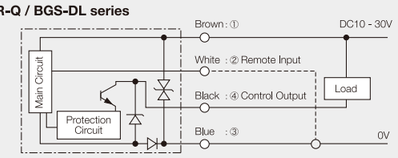
* Dispersion always happens from zero up to +5msec.
  For instance your setting at "10msec" means setting between "10msec and 15msec".

* Therefore please make sure to select Normal Operation if you are not in need of timer function.

Remote Input

The DR-Q and BGS-DL sensors have a Remote Teach input that can be used to remotely set the sensor sensitivity.

DR-Q / BGS-DL series



Class 2/Class II IEC, FDA Regulation

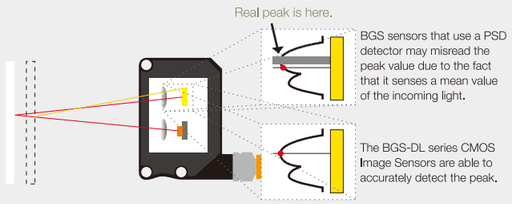
The D series conforms to Class 2 (IEC) and Class II (FDA) regulations.

The world's first Laser / BGS with CMOS Image Sensor
BGS-DL series

BGS (Background Suppression) type sensors are the most accurate method of diffuse sensing, BGS sensors are able to detect objects without being influenced by either the background or the color of the workpiece. A conventional LED - BGS sensor is accurate, but a Laser CMOS - Laser BGS sensor is able to detect black and/or highly reflective surfaces reliably.

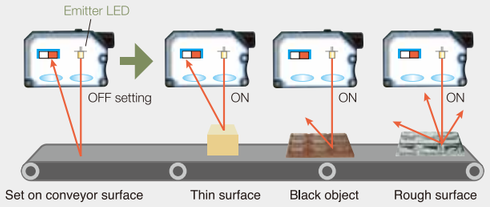
Great combination ; Laser and CMOS Image Sensor shuts out environmental influence.

CMOS Image Sensor system can detect light quantity at each CMOS pixel under well controlled shutter speed, therefore it sharply detects the peak value in the viewfield of sensor while PSD detects mean value of peaks as shown below. Actually it means CMOS Image Sensor System is the ideal way for such objects having reflecting and/or rough surface.



FGS Function, the best solution for fluttering conveyor.

The BGS-DL series BGS sensors also have a FGS function built-in. The FGS function monitors the surface of the conveyor, if the reflected light from the conveyor is interrupted by the workpiece the output is activated. The FGS sensor is similar to a retro-reflective sensor but it operates in a diffuse mode. Therefore the FGS sensor is best for detecting black, reflective, thin, or rough surfaces moving on a conveyor.



Specifications

Model	Laser CMOS BGS (Teach-in type)		Manual adjust Potentiometer type		
Type	Accurate type	Long distance type	Accurate type	Long distance type	
Cable type	BGS-DL10TN (or DL10TP)	BGS-DL25TN (or DL25TP)	BGS-DL10N (or DL10P)	BGS-DL30N (or DL30P)	BGS-DL70N (or DL70P)
M8 connector type	BGS-DL10TCN (or DL10TCP)	BGS-DL25TCN (or DL25TCP)	BGS-DL10CN (or DL10CP)	BGS-DL30CN (or DL30CP)	BGS-DL70CN (or DL70CP)
Sensing distance	40-100mm	100-250mm	40-100mm	100-300mm	100-700mm
Spot size	ϕ1mm / 80mm	ϕ2mm / 200mm	ϕ3mm / 80mm	ϕ6mm / 200mm	
Sensitivity adjustment	Push button Teach with fine adjust buttons		4-turn potentiometer		
Hysteresis	3% / 80mm	10% / 200mm	5% / 80mm	5% / 200mm	5% / 300mm
Supply voltage	DC10-30V including 10% ripple (P-P)				
Power consumption	50mA max (12V), 35mA max (24V)		35mA		
Response time	1.5msec Max(fixed sensitivity)		0.7msec		
Timer	Off delay/On delay/One shot delay (1msec increment : 0-999msec, 1sec increment for 1-10 sec)		N/A		
External input	Remote Teach / Laser OFF selectable		N/A		
Light source	Red Laser Diode 650nm, Max 1mW 300s, Class 2		Red Laser Diode 650nm, Max 2mW 6s, Class 2 (Max 3mW for BGS-DL70)		
LED Indicator	Output indicator (orange), Laser emission (green)				
Digital indicator	7 segment, 3 digit Red LED		N/A		
Control output	NPN or PNP open collector DC30V 100mA max				
Operating mode	Light/Dark On selectable				
Operating temp / humidity	−10 to 50 °C / 35-85% RH				
Insulation resistance	20M Ohm or more (at 500V DC)				
Protection category	IP67				
Conformity	IEC, CE				
Shock resistance	50G (500m/S²) , XYZ 3 directions				
Environmental illuminance	Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max				
Materials	Anti-bacterial ABS (housing), PMMA (lens)				

*1 Sensing distance with 100mm X 100mm gray 18% paper.
*2 Details of hysteresis by color/distance shall be referred in technical chart provided in this catalogue.

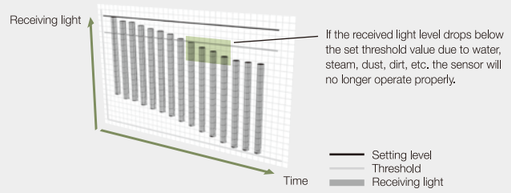
Transparent Detection with Laser Light Source is the best solution for Glass/PET
DR-Q series

The DR-Q Series offers superior performance in Transparent Object detection. With a 0.7 msec. response time it is ideal for use in high speed bottling applications.
Accurate detection is assured by the use of a Coaxial light source.
The AGC (Automatic Gain Control) circuit will automatically compensate for changes in the incoming light level (due to dust/dirt etc.) by adjusting the threshold setting.

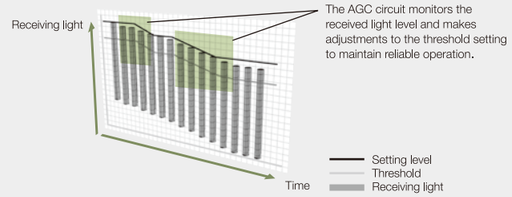
Coaxial Laser

AGC (Automatic Gain Control) circuit monitors the incoming light level to maintain reliable operation even in dusty / dirty conditions.

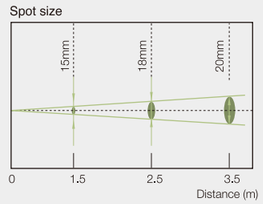
Conventional Retro Reflection sensor



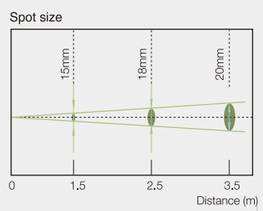
DR-Q series



DR-Q150T



DR-Q400T



Specifications

Model	Transparent type	
Type	Accurate type : For filled bottle	Long distance type
Cable type	DR-Q150TN (or Q150TP)	DR-Q400TN (or Q400TP)
M8 connector type	DR-Q150TCN (or Q150TCP)	DR-Q400TCN (or Q400TCP)
Sensing distance	1.5 meter	4 meter
Spot size	15mm / 1.5 meter	20mm / 3.5 meter
Sensitivity adjustment	Pushbutton teach with fine adjustment button	
Supply voltage	DC10-30V including 10% ripple (P-P)	
Power consumption	35mA	
Response time	0.7 msec	
Timer	Off delay/On delay/One shot delay (1msec increment : 0-999msec, 1sec increment for 1-10 sec)	
Light source	Red Laser Diode 650nm, Max 2mW 4μs, Class 2	
LED Indicator	Output indicator (orange), Laser emission (green)	
Digital indicator	7 segment, 3 digit Red LED	
Control output	NPN or PNP open collector DC30V 100mA max	
Operating mode	Light/Dark On selectable	
Operating temp / humidity	−10 to 50 °C / 35-95% RH	
Insulation resistance	20M Ohm or more (at 500V DC)	
Protection category	IP67	
Conformity	IEC, CE	
Shock resistance	50G (500m/S²) , XYZ 3 directions	
Environmental illuminance	Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max	
Materials	Anti-bacterial ABS (housing), PMMA (lens)	

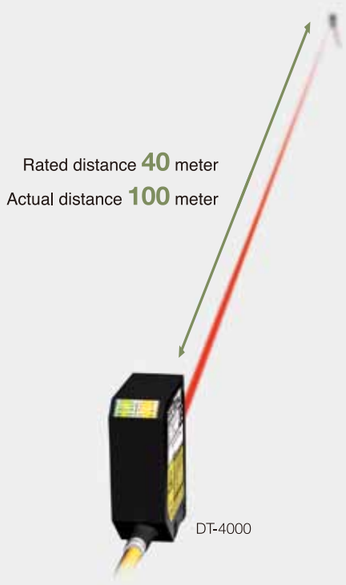
*1 Sensing distance taken with P250F reflector

The most powerful Thru-beam and Retro-reflective type sensors available with a Laser Light Source.

DT series (Laser thru-beam) / DR series (Laser retro-reflective)

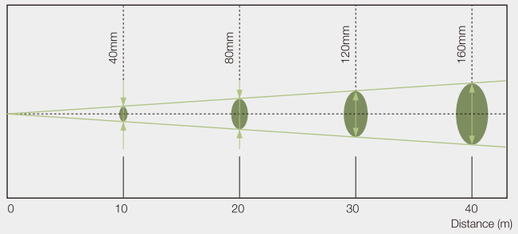
The D Series Laser Sensors offer a long sensing distance in conventional Thru-beam and Retro-reflective sensors.
The Co-axial Laser light source gives extremely tight alignment to the target.
Alignment of the sensor is easy thanks to the bright projected laser spot.
The DT Series Thru-beam detects at 100 meters distance while the actual Margin Spec is set at 40 meters.

Coaxial Laser



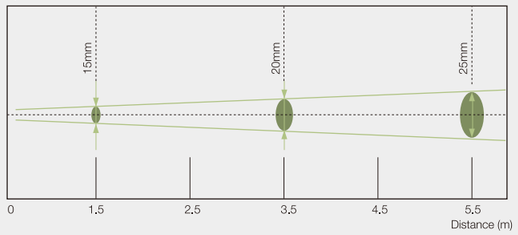
DT-4000

Spot size



DR-500

Spot size



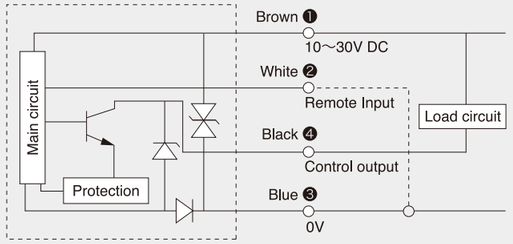
Specifications

Model	Potentiometer adjustment type	
Type	Thru-Beam	Retro reflective
Cable type	DT-4000N (or 4000P)	DR-500N (or 500P)
M8 connector type	DT-4000CN (or 4000CP)	DR-500CN (or 500CP)
Sensing distance	40 meter	5 meter
Spot size	15mm/5 meter	20mm/3.5 meter
Sensitivity adjustment	1-turn potentiometer	
Supply voltage	DC10-30V including 10% ripple (P-P)	
Power consumption	40mA	30 mA
Response time	0.5msec	
Light source	Red Laser Diode 650nm, Max 2mW 4s, Class 2	
LED Indicator	Output indicator (orange), Laser emission (green)	
Digital indicator	N/A	
Control output	NPN or PNP open collector DC30V 100mA max	
Operating mode	Light/Dark On switchable	
Operating temp / humidity	-10 to 50 °C / 35-95% RH	
Insulation resistance	20M Ohm or more (at 500V DC)	
Protection category	IP67	
Conformity	IEC, CE	
Shock resistance	50G (500m/S²) , XYZ 3 directions	
Environmental illuminance	Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max	
Materials	Anti-bacterial ABS (housing), PMMA (lens)	

*1 Sensing distance taken with P250F reflector

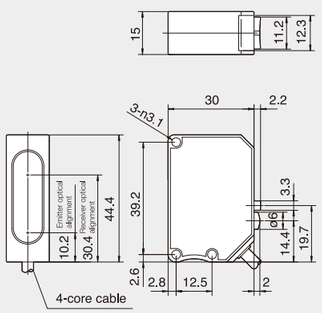
Circuit diagram

DR-Q / BGS-DL series

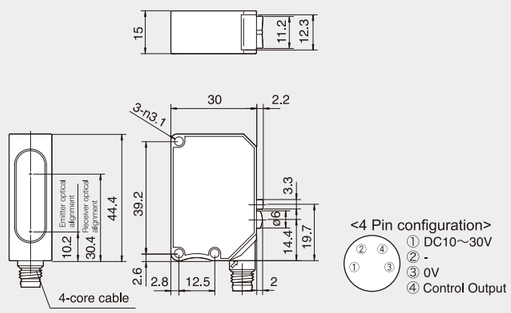


Dimensions

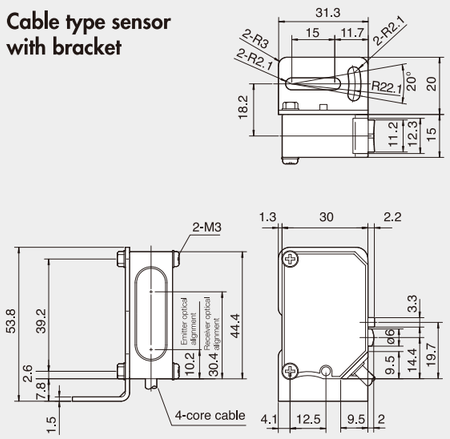
Cable type sensor



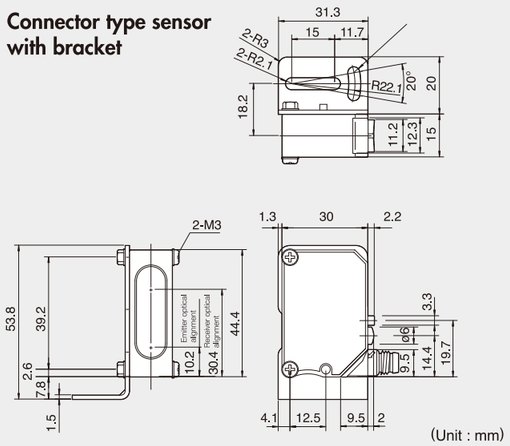
Connector type sensor



Cable type sensor with bracket

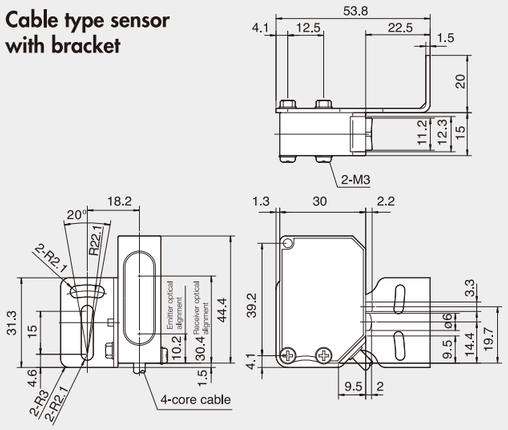


Connector type sensor with bracket

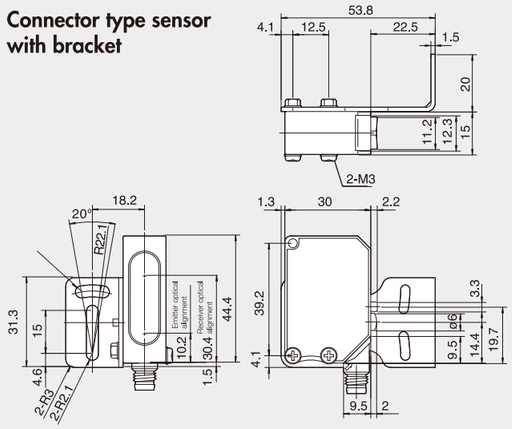


(Unit : mm)

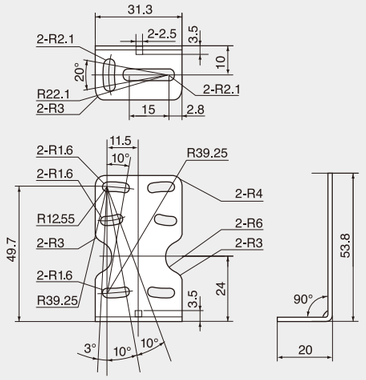
Cable type sensor with bracket



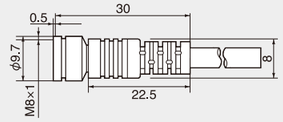
Connector type sensor with bracket



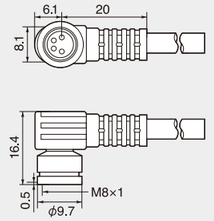
Mounting Bracket



JCN-S : M8 Straight type

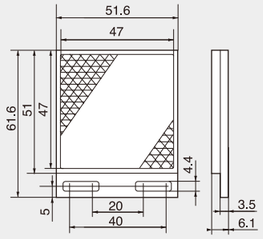


JCN-L : M8 L-shape type

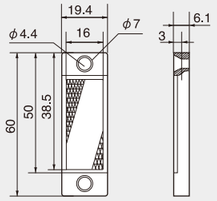


Reflectors

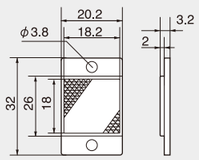
P250F



PL20F



PL10F

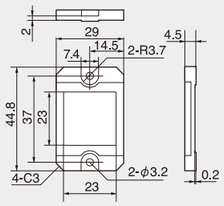


Sensing distance by reflectors

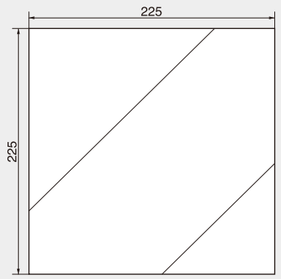
	P250F	PL20F	PL10F
DR-Q400T	4.0	2.8	1.0
DR-Q150T	1.5	1.0	0.5
DR-500	5.0	3.5	1.2

(Unit : meter)

MP45



MP225



Options

P250F : Standard reflector

61.6 × 51.6 mm
Standard accessory for any D series Retro type

PL20F : Small reflector

60 × 19.4 mm
For space saving

PL10F : Miniature reflector

32 × 20.2 mm
For limited space

MP45 : Fine Positioning reflector

44.8 × 29mm
Fine pixels of surface.
Ideal for use of fine positioning.

MP225 : Large reflector

225 × 225mm
Free-cut reflector sheet of MP45 material.

JCN-S : M8 Straight type

JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

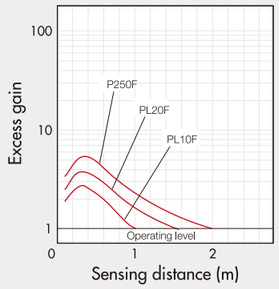
JCN-L : M8 L-shape type

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

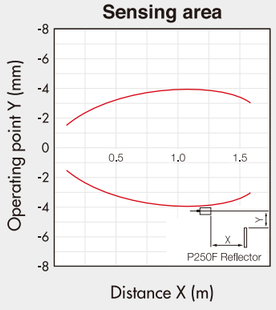
Reference (typical)

DR-Q150TN
DR-Q150TCN

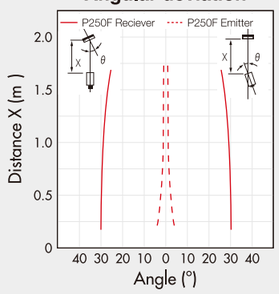
Excess gain



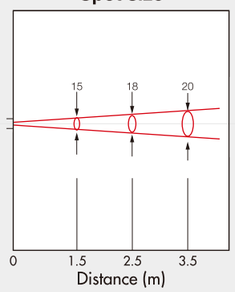
Sensing area



Angular deviation

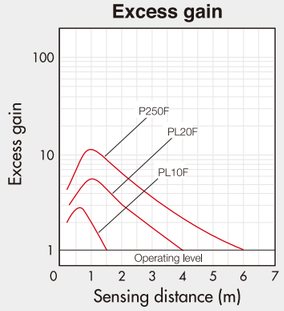


Spot size

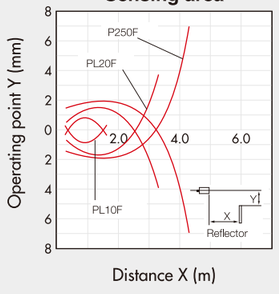


DR-Q400TN
DR-Q400TCN

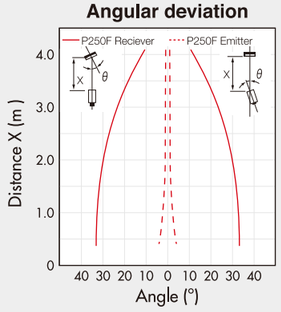
Excess gain



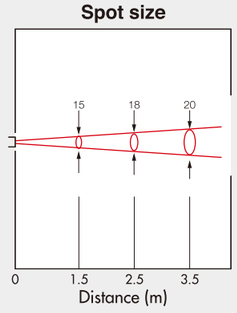
Sensing area



Angular deviation



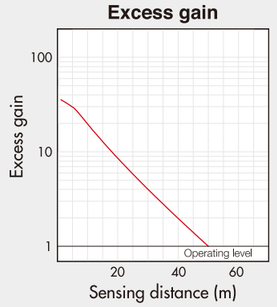
Spot size



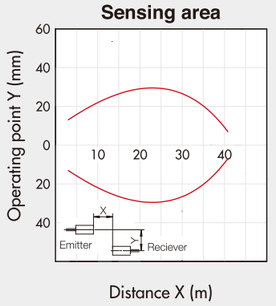
Reference (typical)

DT-4000N
DT-4000CN

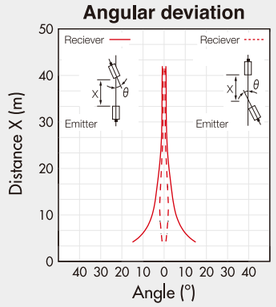
Excess gain



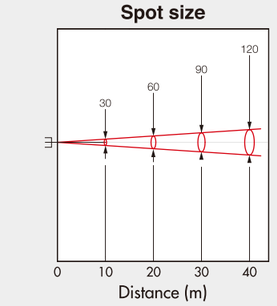
Sensing area



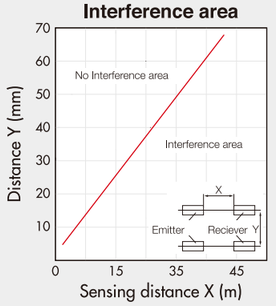
Angular deviation



Spot size

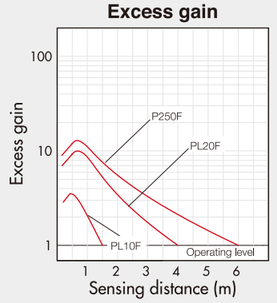


Interference area

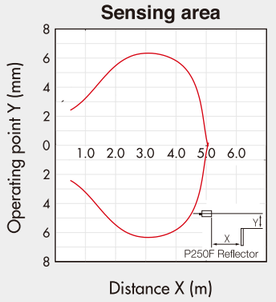


DR-500N
DR-500CN

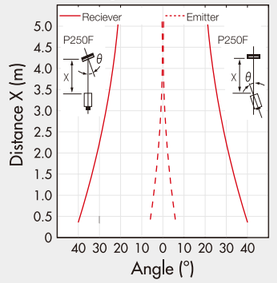
Excess gain



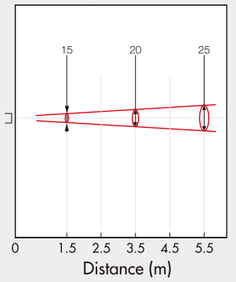
Sensing area



Angular deviation



Spot size



Laser Sensor

D2SA series

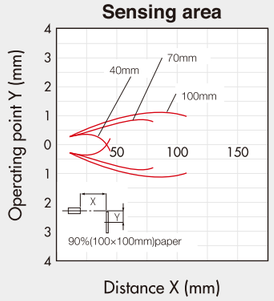
Sensor head **Retro reflective type** (Sensing distance : 2-8m) ・DSR-800 (Sensing distance : 0.1-50m) ・DSR-5000 **Diffuse reflective type** (Sensing distance : 0.25-1m) ・DSD-100

Next page

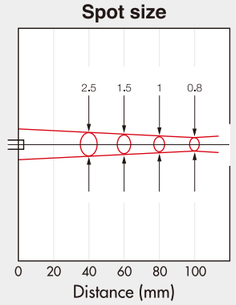
Reference (typical)

BGS-DL10TN
BGS-DL10TCN

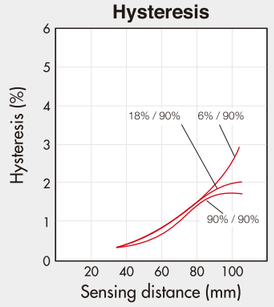
Sensing area



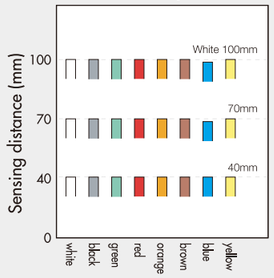
Spot size



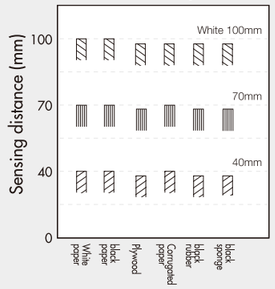
Hysteresis



Color response

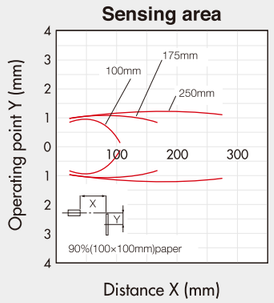


Material response

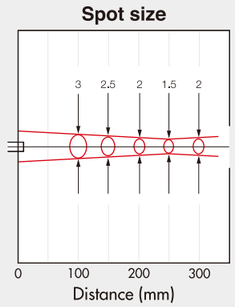


BGS-DL25TN
BGS-DL25TCN

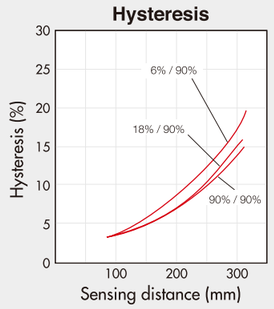
Sensing area



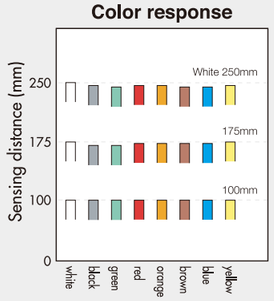
Spot size



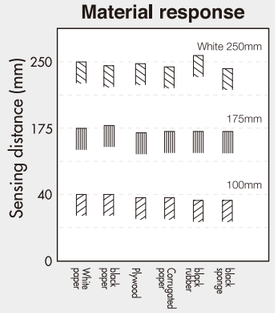
Hysteresis



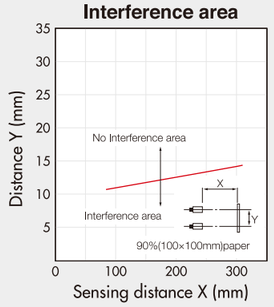
Color response



Material response



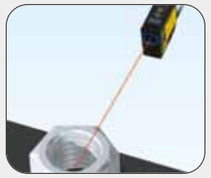
Interference area



Applications

Edge guiding of Transparent film

Sensing transparent bags



Checking for the presence of threads

Locating a small IC chip held by a vacuum pickup

- ***Digital Amplifier with Modular Laser Optics. Two independent outputs, high speed response up to 60µsec.***
- ***Max. 70 meter sensing distance with coaxial beam light source. (Retro-reflective Type)***

Sensor head

Type	Model	Mode	Sensing Distance
Retro Reflective	DSR-800 (Reflector MP45)	Long	8 meter (*1)
		Standard	5 meter
		Fast	2 meter
	DSR-5000 (Reflector P250F) (*2)	Long	0.5 - 50 meter
		Standard	0.3 - 35 meter
		Fast	0.1 - 20 meter
Diffuse Reflective	DSD-100	Long	1.0 meter
		Standard	0.7 meter
		Fast	0.25 meter
Thru-beam Cable type	DSTC-200	Standard	2 meter
	DSTA-200	Standard	2 meter
		Measurement	0.5 meter
Thru-beam M8 QD type	DSTC-200-M8	Standard	2 meter
	DSTA-200-M8	Standard	2 meter
		Measurement	0.5 meter

Amplifier

Type	Mode	Specifications
Stand Alone Type	D2SA-MNS	2CH with Analogue, NPN
	D2SA-MPS	2CH with Analogue, PNP
	D2SA-MN3S	1CH, NPN
	D2SA-MP3S	1CH, PNP
	D2SA-MNS-M8	1CH, NPN, M8-QD
	D2SA-MPS-M8	1CH, PNP, M8-QD
Interconnect Type Master Units	D2SA-MN	2CH with Analogue, NPN
	D2SA-MP	2CH with Analogue, PNP
	D2SA-MN3	1CH, NPN
	D2SA-MP3	1CH, PNP
	D2SA-MN-M8	1CH, NPN, M8-QD
	D2SA-MP-M8	1CH, PNP, M8-QD
Interconnect Type Slave Units	D2SA-SN	2CH with Analogue, NPN
	D2SA-SP	2CH with Analogue, PNP
	D2SA-SN1	1CH, NPN
	D2SA-SP1	1CH, PNP
	D2SA-SN-M8	1CH, NPN, M8-QD
	D2SA-SP-M8	1CH, PNP, M8-QD

*1 Lens attachment BL-W130L-1 will change the sensing distance of DSR-800 head as follows ;
Line Beam : Long mode / 2m, Standard/1.5m, Fast / 1m
Area Beam : Long mode / 1.5m, Standard / 1m, Fast / 0.6m

*2 The MP-45 reflector is used when the sensing distance will be less than 10 meters.
MP45 : Long mode / 0.5 - 20m, Standard / 0.3 - 10m, Fast / 0.1 - 5m

*3 The sensing distance of the DSD-100 is defined with a 200 x 200 mm white paper target.

*4 Fast Mode is not available when using the "DSTA" sensing heads in Measurement Mode.
Measurement Mode is only possible when using the 2CH type amplifiers.

Thru-beam type
(Sensing distance : 2m) (Sensing distance : 0.5 - 2m)
・DSTC-200 / - M8 ・DSTA-200 / - M8

Amplifier

Stand alone type
・DSA-MNS / MN3S / MNS-M8
・DSA-MPS / MP3S / MPS-M8

Interconnect type Master units
・D2SA-MN / MN3 / MN-M8
・D2SA -MP / MP3 / MP-M8

Interconnect type Slave units
・D2SA-SN / SN1 / SN-M8
・D2SA-SP / SP1 / SP-M8

Amplifier

The Interconnect Type Amplifiers (Master: D2SA-M, Slave: D2SA-S) can be connected in parallel to provide Cross-talk prevention as well as to transfer settings.
It is possible to connect a maximum of 30 amplifiers together. (12VDC @ 40℃ ambient or less)

2 Amplifier Types (Standalone & Interconnect)

The Interconnect Type amplifiers are convenient when using multiple D2SA amplifiers in parallel.
8 amplifiers can be connected together if the ambient temperature does not exceed 50℃.
A maximum of 30 amplifiers can be connected together, the surrounding temperature must be 40℃ or less.

The Interconnect Type amplifiers automatically provide Cross-talk prevention for up to 4 amplifiers.
The D2SA series amplifiers can be connected to Optex-FA's D2RF series fiber optic amplifiers.

Stand Alone type

Interconnect type
Cross-talk prevention for up to 4 amplifiers.

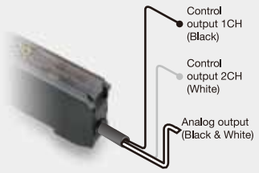
Programmable external input

The External input can be programmed to operate in one of the following modes.

・Remote teach
・Synchronizing signal input
・Laser OFF
・Counter reset

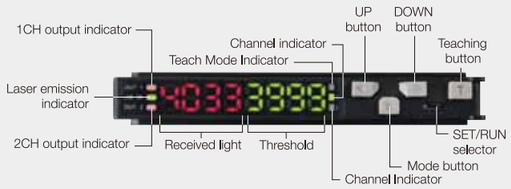
2 Independent outputs & Analog

2CH models have two digital outputs for control and/or alarm, there is also a 4~20 mA analog output. The external input can be configured to operate as needed.



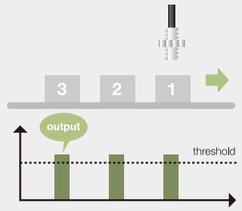
Dual Digital Display

The Threshold value and the Reflected Light level are both indicated at the same time, setting the sensitivity is easy.



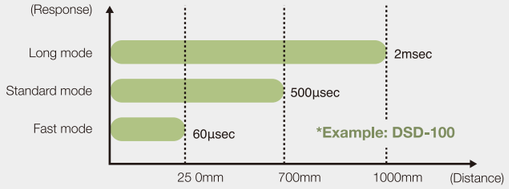
Counter Mode

The output turns ON when the count value reaches the preset number.
The preset number can be reset by remote teach.



Response Time

Select the sensing distance and response time based upon your application.



e-con, the easy connection

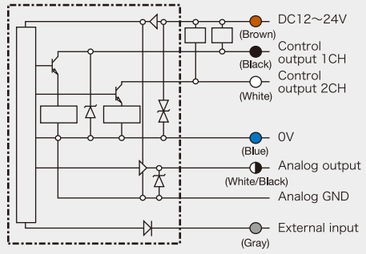
Just snap-in the e-con to connect to amplifiers. All the sensor heads are connectable to any amplifier with the preset e-con mechanics.

IP67 water tightness

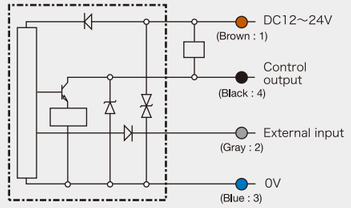
All the DS Series sensor heads secures IP67 Water tightness with its rugged housing.

Wiring Diagram : (N = NPN, P=PNP)

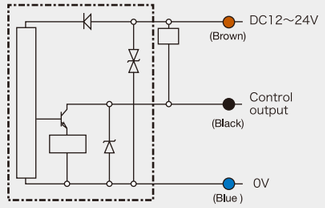
2CH output types
D2SA-MN(P)S / D2SA-MN(P) / D2SA-SN(P)



1CH, M8-QD types
D2SA-MN(P)S-M8, D2SA-MN(P)-M8



1CH types
D2SA-MN(P)3S / D2SA-MN(P)3 / D2SA-SN(P)1



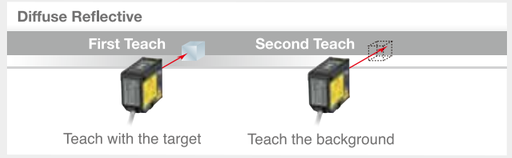
*1 Slave Unit "D2SA-S??" is powered by Master unit, so power lines are not available.

A choice of 6 convenient Teach functions to solve any application.

Single Point Teach

Use this teaching mode when no target is present.
Set the threshold so the sensor does not detect the background.

Two Point Teach



This is the basic setting method for the DSD-100 Diffuse Reflective type sensor. First teach with the target present and then teach the background. The threshold is then set between the target value and the background.

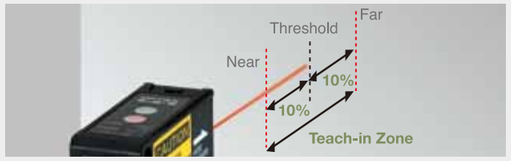
Transparent Object Teach

This mode is only for the DSR-800 Retro-Reflective sensor.
Teach without the target present so that the sensor is set to the maximum sensitivity, the DSR-800 is able to easily detect transparent film, bottles, glass, etc.

Automatic Teach

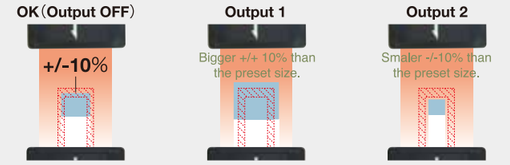
In this mode there is no reason to stop the conveyor. It is possible to teach the sensor while the product is running.

Zone Teach



Select the detection area. Use the Up / Down buttons to set the area within +/- 10%. After teaching this area can be increased or decreased by adjusting the settings.

Judgement Teach

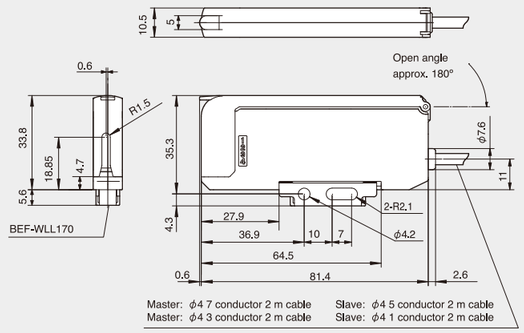


This function is exclusive to the DSTA-200 wide beam measurement sensing heads. Used to judge the size and width of a target within +/- 10% of the specified size. Even if the object position changes the sensor will detect it, so this is actually Area Teach.

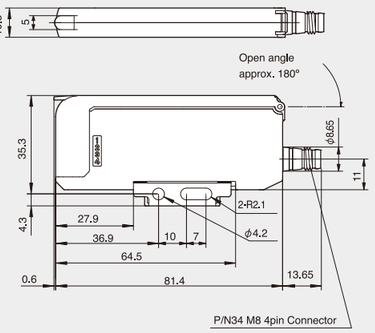
Amplifier Dimensions

Stand-alone type

Cable type



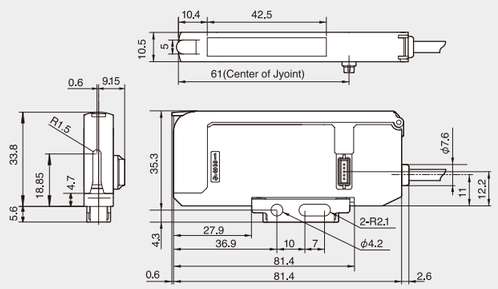
M8-QD type



<4 Pin configuration>
① DC12～24V
② External input
③ 0V
④ Control Output

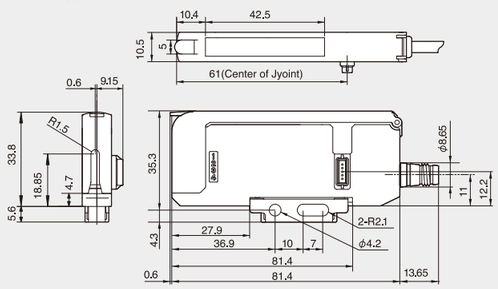
Interconnection type

Cable type



Slave unit

M8-QD type



<4 Pin configuration>
① DC12～24V
② External input
③ 0V
④ Control Output

(Unit : mm)

Specifications

1CH Output Type Specifications

Model		Stand-alone type	Interconnect type	
			Master Unit	Slave Unit
Cable type	NPN	D2SA-MN3S	D2SA-MN3	D2SA-SN1
	PNP	D2SA-MP3S	D2SA-MP3	D2SA-SP1
M8 Connector type	NPN	D2SA-MNS-M8	D2SA-MN-M8	D2SA-SN-M8
	PNP	D2SA-MPS-M8	D2SA-MP-M8	D2SA-SP-M8
Response time		60μ /500μ /2msec (Fast/Standard/Long) selectable		
External input		External Input (*1) : Select one among (1) teach (2) Synchronizing (3) Laser OFF, or (4) Reset Counter (This functrion is available only with M8-QD type except Slave unit of M8-DQ Type)		
Control output		NPN or PNP Open collector, 100mA Max, residual voltage 1.8V Max		
Analogue output		N/A		
Timer		On delay / Off delay / One Shot / No delay, 1msec to 9s (1ms increment)		
Operating mode		Light ON / Dark ON selectable		
Crosstalk prevention		4pcs Max.		
Sensivity adjustment		Teach-in (manual adjustment is possible)		
LED Indicator		Green (laser power), Orange (output), Red (teaching), Green (active CH)		
Digital display		8 digits (7 segments)		
Power consumption		45mA Max, 24V DC		
Supply voltage		12 - 24V DC +/- 10%, ripple 10%		
Operating temp / humidity (*3)		–25 to 55 °C (–13 to 131 °F) / 35 to 85% RH (no freezing)		
Storage temp / humidity		–40 to 70 °C (–40 to 158 °F) / 35 to 85% RH (no condensation)		
Shock resistance		50G (500m/s²) , XYZ 3-ways		
Protection category		IEC IP50		
Materials		PC		

2CH Output Type Specifications

Model		Stand-alone type	Interconnect type	
			Master Unit	Slave Unit
Cable type	NPN	D2SA-MNS	D2SA-MN	D2SA-SN
	PNP	D2SA-MPS	D2SA-MP	D2SA-SP
M8 Connector type	NPN	-	-	-
	PNP	-	-	-
Response time		60μ /500μ /2msec (Fast/Standard/Long) selectable		
External input		External Input (*1) : Select one among (1) teach (2) Synchronizing (3) Laser OFF, or (4) Reset Counter Control Output : 2CH, used as Control Output or Alarm output		
Control output		NPN or PNP Open collector, 100mA Max, residual voltage 1.8V Max		
Analogue output		4-20mA (*2)		
Timer		On delay / Off delay / One Shot / No delay, 1msec to 9s (1ms increment)		
Operating mode		Light ON / Dark ON selectable		
Crosstalk prevention		4pcs Max.		
Sensivity adjustment		Teach-in (manual adjustment is possible)		
LED Indicator		Green (laser power), Orange (output), Red (teaching), Green (active CH)		
Digital display		8 digits (7 segments)		
Power consumption		45mA Max, 24V DC		
Supply voltage		12 - 24V DC +/- 10%, ripple 10%		
Operating temp / humidity (*3)		–25 to 55 °C (–13 to 131 °F) / 35 to 85% RH (no freezing)		
Storage temp / humidity		–40 to 70 °C (–40 to 158 °F) / 35 to 85% RH (no condensation)		
Shock resistance		50G (500m/s²) , XYZ 3-ways		
Protection category		IEC IP50		
Materials		PC		

* 1 The teach mode preset at amplifer will be done with External Teach
* 2 Load impedence 300Ω Max
* 3 Up to 3pcs of interconnection. Up to 30 pcs with 40 ℃ (104 °F) surroundings operated in 12V DC.

Options

JCN-S : M8 Straight type

JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

JCN-L : M8 L-shape type

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

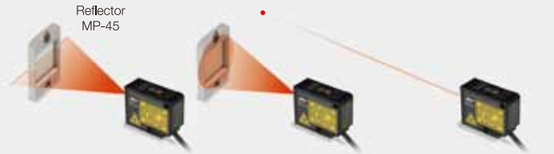
BEF-EB01-W190 : Fixture terminal

Laser Head Lineup (IP67 protection. Visible red laser for easy alignment)

Retro Reflective Type

The DSR-800 projects a very small Spot beam that is only 2 mm in diameter. There is an optional lens attachment (BL-W130L-1) that can be used to change the projected beam into a 40 mm wide line or a large circular beam.

The DSR-5000 has a maximum sensing distance of 70 meters in the Long Distance mode. The sensing distance is determined by the Response time that has been selected. The DSR-800 is able to detect Glass and/or PET bottles up to a maximum distance of 8 meters. Both types will project a 2 mm diameter Spot beam at 2 meters.



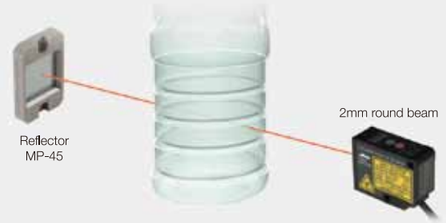
DSR-800 with Line Beam of 40 X 1mm (at 300mm distance) When using the BL-W130L-1 lens attachment

DSR-800 with Area Beam of 35 X 35mm (at 300mm distance) When using the BL-W130L-1 lens attachment

DSR-800 (8 meter) and DSR-5000 (70 meter) with 2mm round spot (at 2 meter distance).

DSR-800 : Three types of projected beams are possible.

The DSR-800 will reliably detect clear glass and/or PET bottles.
The 2 mm diameter projected beam combined with the "Glass Teach" function insure that the detection of clear materials is easy to setup.



The projected beam of the DSR-800 can be changed to a Wide Line beam (40 x 1 mm), or Circular Area beam (35 x 35 mm) by using the optional lens attachment BL-W130L-1.

BL-W130L-1 lens attachment

DSR-5000 : Max 70 meter of sensing distance
(Long Mode with Sensitivity Compensation ON)

When used with the P250F reflector a 70 meter distance is possible.

Diffuse Reflective Type

The DSD-100 has a maximum sensing distance of 1.5 meters in the Long mode. The co-axial beam provides accurate sensing regardless of the orientation of the workpiece.

With a 1 mm projected beam at 1 meter distance, it is possible to detect the target through a small opening.

DSD-100, 1 mm coaxial spot beam.

DSD-100 : Diffuse Reflective sensor with1.5 meter sensing distance.

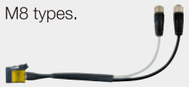
In the Long mode with Sensitivity Compensation ON, a 1.5 meter sensing distance is possible. Ideal for positioning applications due to the coaxial optics and 1 mm projected beam.

Coaxial beam

Thru-beam type

There are two models, the DSTC-200 (2 mm spot) or the DSTA-200 (30 x 2.5 mm line array). The DSTA-200 is a Measurement type sensor with a 30 mm wide beam. The 4 to 20 mA analog output can be used for measuring the size of objects. M8 QD connector models are available for easy maintenance.

The DSL-8L04-2-130 connecting cable is required for use with the M8 types.



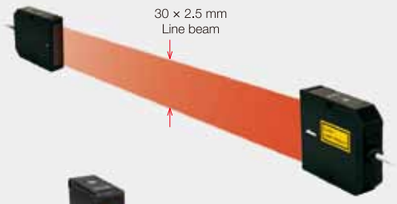
DSL-8L04-2-130, M8 QD cable for sensor head DSTA(C)-200-M8

DSTA-200, Line beam, 30 x 2.5 mm width at 50 cm distance.

DSTC-200, Standard Thru-beam, 2 mm spot size at 2 meter distance.

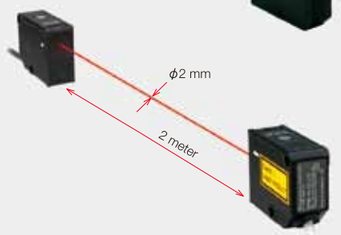
DSTA-200 : 30mm width Line Beam for sorting application with 4-20mA output.

Ideal for sorting by width and size of objects. Measurement Mode will give analogue signal for use in the range of 0.5 meter.



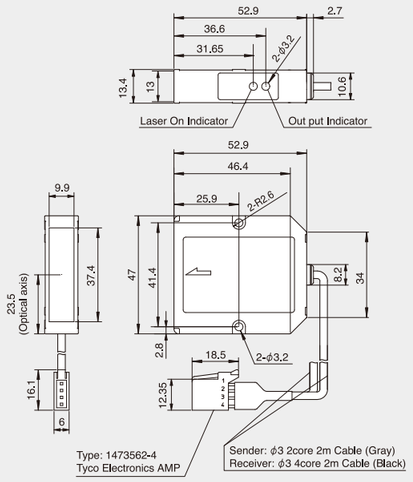
DSTC-200 : 2mm sharp and small spot

At the rated distance of 2 meters the projected beam is only 2 mm in diameter.

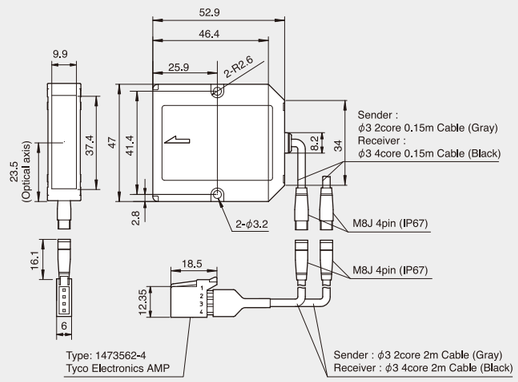


Laser Head Dimensions

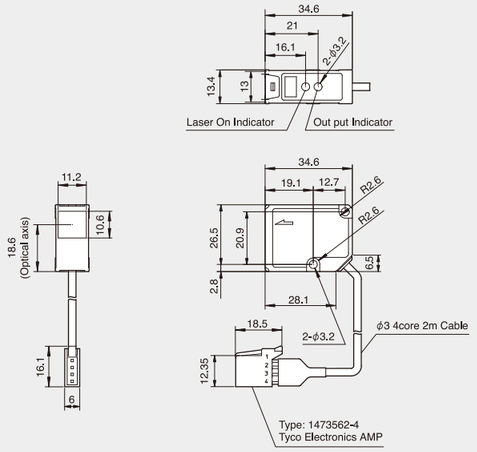
DSTA-200



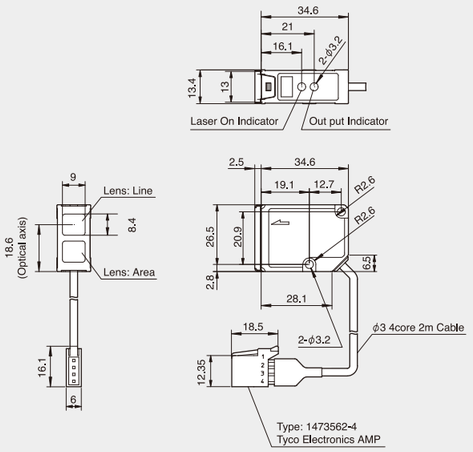
DSTA-200-M8



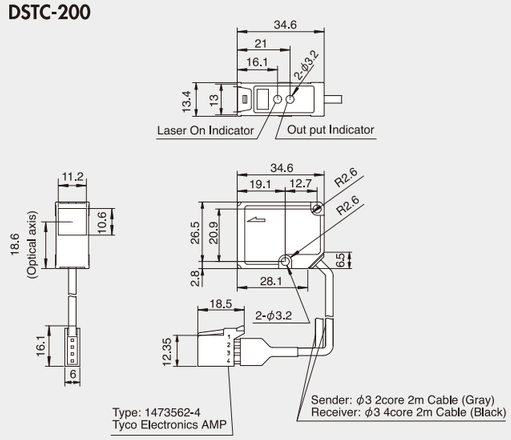
DSR-800 / DSR-5000 / DSD-100



DSR-800 + Lens Attachment

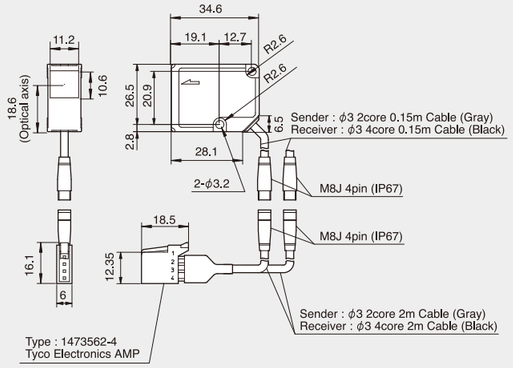


DSTC-200

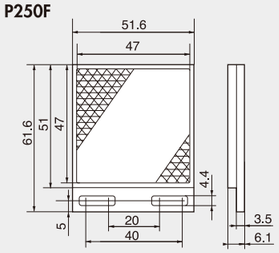


The sensing head dimensions for the DSR-5000,DSR-800 and DSD-100 are the same as the DSTC-200 with the exception of the cable.

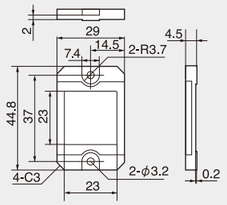
DSTC-200-M8



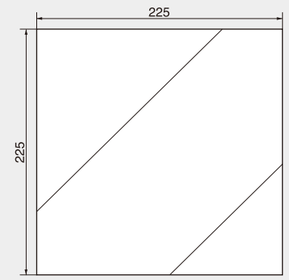
P250F



MP45



MP-225



(Unit : mm)

Z-L / BGS-ZL series

Thru-beam type
(Sensing distance : 30m)
・ZT-L3000N / P / CN / CP

Polarized Retro-reflective
(Sensing distance : 10m)
・ZR-L1000N / P / CN / CP

Diffuse-reflective
(Sensing distance : 400mm)
・ZD-L40N / P / CN / CP

Next page

Specifications

Model		Retro-reflective type		Diffuse reflective type	Thru-beam type	Thru-beam / Measurement type
	Cable	DSR-5000	DSR-800	DSD-100	DSTC-200 Emitter: DSTC-D Receiver: DSTC-200	DSTA-200 Emitter: DSTA-D Receiver: DSTA-200
	M8 QD-type	-	-	-	DSTC-200-M8	DSTA-200-M8
	Emitter M8	-	-	-	DSTC-S	DSTA-S
	Detector M8	-	-	-	DSTC-R	DSTA-R
Amplifier unit		D2SA-M□□ /D2SA-M□ -M8 / D2SA-S□□				
Light source		Visible light semiconductor laser 650mm				
Output		max. 3mW			max. 390W	
IEC / JIS CLASS		CLASS 2			CLASS 1	
FDA CLASS		Class Ⅱ				
Sensing distance (*1)	**Long**	0.5 - 50 m	8 m	1 m	2 m	2 m
	Standard	0.3 - 35 m	5 m	0.7 m		Length measurement mode: 0.5 m
	Fast	0.1 - 20 m	2 m	0.25 m		(Only Long and Standard)
Spot size (*2)		Selectable		Approx. 1 mmϕ (Distance: 1 m)	Approx. 2 mmϕ (Distance: 2 m)	Approx. 30 x 2.5 mm (Distance: 2 m)
Repeat accuracy (*3)		0.2 mm		0.2 mm	0.2 mm	0.3 mm
LED Indicator		Laser radiation indictor light: Green Output indicator light: Orange				
Operating temp / humidity		-10 to +55°C/35 to 85 %RH (No condensation or freezing)				
Storage temp / humidity		-25 to +70°C/35 to 85 %RH (No condensation or freezing)				
Environmental illuminance		3,000 lx (Incandescent light) 10,000 lx (Sunlight)				
Shock resistance		10 to 55 Hz Double-amplitude 1.5 mm 2 hours at each direction of X, Y and Z				
Protection category		IP67				
Material		PC (Case, Cover) PMMA / Glass (Front glass)				
Weight (including the codes) (*4)		45g			90g	115g

* 1 DSD-100 : With white paper (90 %) of 200 x 200 mm
DSR-800 : With the reflector MP-45 (accessory)
* 2 Defined with center strength $1/e^2$ (13.5%).
There may be leak light other than the specified spot size. The sensor may be influenced when there is a highly reflective object around the target.
* 3 Right angle to sensing axis.
* 4 The weights of DSTC-200 and DSTA-200 include the emitter and the reciever.
* For the model M8-QD type, replacement is available only for the emitter and the detector.

Class II , FDA Regulation

The D2SA series conforms to FDA Class II .

Options

MP-45 : Standard reflector for DSR-800

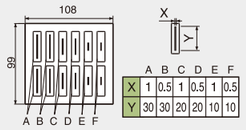
P250F : Long distance reflector for DSR-5000

MP225 : Large reflector

225 x 225mm
Free-cut reflector
sheet of MP45 material.

BL-W130L-1 : Beam Selector

BL-W130-2 : Slit Mask for DSTA-200 sensor head



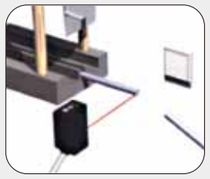
	A	B	C	D	E	F
X	1	0.5	1	0.5	1	0.5
Y	30	30	20	20	10	10

DSL-8L04-2-130 : M8-QD cable

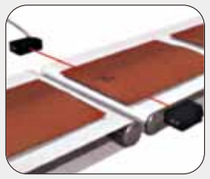
Applications

Edge control (BGS-ZL30)

Height control of multi-colored object (BGS-ZL30)



Counting metal parts (ZR-L1000)

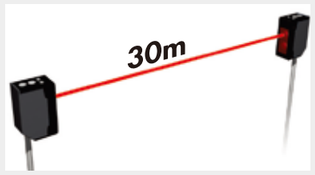


Thin plates counting (ZT-L3000)

- ***The Laser light source projects a 2 mm spot at 400 mm distance (Diffuse mode).***
- ***BGS (Background Suppression) sensing is also available in the BGS-ZL series.***

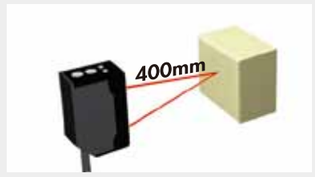
Features

Thru-Beam type



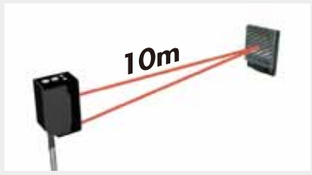
ZT-L3000

Diffuse type



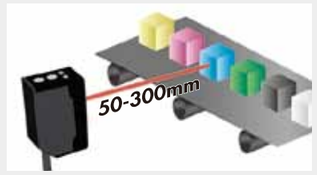
ZD-L40

Retro Reflective type



ZR-L1000

BGS type



BGS-ZL30
BGS-ZL10

Class 2/Class II IEC, FDA Regulation

Conforms to Class 2 (IEC) and Class II (FDA) regulations.
(Class 1 for Thru-beam type)

Long distance
(Sensing distance : 50-300mm)
・BGS-ZL30N / P / CN / CP

Short distance
(Sensing distance : 20-100mm)
・BGS-Z10N / P / CN / CP

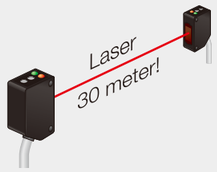
Laser Thru-beam / RetroType

- ***30 meter sensing distance (Thru-beam type), fast 250μsec. response time.***
- ***Compact size with Laser source, small 2 mm diameter projected beam.***
- ***IP67 rating***
- ***M8 QD types are available***

Features

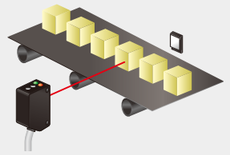
Thru-beam type, ZT-L series

30mm spot size at 30 meter sensing distance



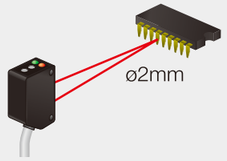
250μsec response

Good for fast moving objects.



Diffuse Reflective, ZD-L type

Fine 2mm spot at 400mm sensing distance

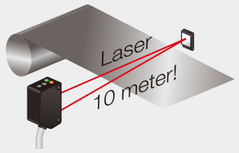


Cross-talk prevention

2 sensors can be mounted side-by-side.

Retro Reflective, ZR-L type

10mm spot size at 10 meter sensing distance



IP67 rating

Hose it down!
Water-tightness is tested to IP67.

Specifications

Model		Thru-beam	Polarized Retro-reflective	Diffuse-reflective
Cable type	NPN	ZT-L3000N	ZR-L1000N	ZD-L40N
	PNP	ZT-L3000P	ZR-L1000P	ZD-L40P
M8 connector type	NPN	ZT-L3000CN	ZR-L1000CN	ZD-L40CN
	PNP	ZT-L3000CP	ZR-L1000CP	ZD-L40CP
Supply voltage		DC10～30V Inc. 10% ripple		
Power consumption		30mA max.	20mA max.	
Sensing distance		30meter	10meter (Reflector : P250F)	400mm
Spot size		30mm/30m	10mm/8m	2mm/400mm
Response time		250μsec		
Hysteresis		–		20% Max
Operating temp		–10 to +50°C		
Operating humidity		35 to 85%		
Storage temp / humidity		–25 to +70°C/35 to 95%		
Vibration resistance		10 to 55Hz width 1.5mm		
Shock resistance		50 G (500 m/s²)		
Protection category		IP67		
Light source		Laser(650nm)		
Laser class (IEC)		class 1	class 2	
Laser class (FDA)		class Ⅰ	class Ⅱ	
Output indicator		Orange(Yellow) LED		
Laser power indicator		Green LED		
Sensitivity adjustment		Single turn potentiometer		
Operating mode		Light On / Dark On selectable (switch)		
Connection		2m cable / M8 connector		

BGS - Laser Type

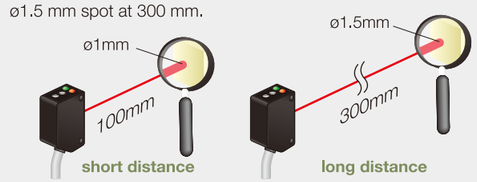
Fine spot / high speed applications

- ***BGS (Background Suppression Type) Sensors are not influenced by the background, available with conventional Laser light source.***
- ***250 μsec fast response (Laser light source models)***
- ***1 mm projected spot size with BGS optical system (BGS-ZL Laser types)***

Features

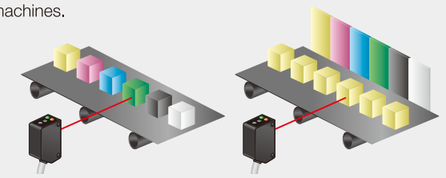
1 mm projected spot size

The Short distance BGS Laser sensor projects a very small ø1 mm spot at 100 mm distance.
Ideal for the detection of small targets at long distance without being influenced by the background. The Long distance type projects a ø1.5 mm spot at 300 mm.



BGS optical system designed with Laser light source

Extremely small BGS type sensors are only 17 x 10 x 20mm. Ideal for use in OEM equipment such as Printed Circit Board processing machines.



External control of Laser Beam

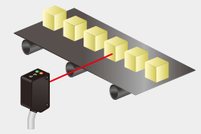
External control of laser OFF is possible by connecting gray wire to GND (NPN type) or DC10-30V (PNP type).
(This function is not available in 3 pin types)

4 Turn adjustment pot.

A four turn adjustment pot. is built-in for precise adjustment of the sensing distance.
The potentiometer has a slip clutch that protects it from damage when it is turned past the end.

250μsec response

Good for fast moving objects.



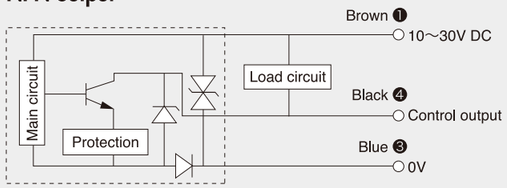
Specifications

Model		long distance		short distance	
		2m Cable	M8QD 4pin	2m Cable	M8QD 4pin
Type	NPN	BGS-ZL30N	BGS-ZL30CN	BGS-ZL10N	BGS-ZL10CN
	PNP	BGS-ZL30P	BGS-ZL30CP	BGS-ZL10P	BGS-ZL10CP
Adjustable distance		50 - 300 mm (*1)		20 -100 mm (*1)	
Sensing distance		10 - 300 mm (*1)		5 -100 mm (*1)	
Response time		250μs			
Spot size		ϕ1.5mm/300mm		ϕ1mm/100mm	
Hysteresis (white to white)		5%		3%	
Operating mode		Light On / Dark On selectable			
Output indicator		Output : orange, Laser Power : green			
Sensitivity adjustment		4-turn, endless pot.			
Control output		NPN or PNP open collector, 100mA max / DC30V			
Supply voltage		DC 10 - 30V, including 10% ripple			
Power consumption		30mA max			
Protection category		IP 67			
Shock resistance		50G			
Operating temp / humidity		–10 to 55°C / 35 to 85% RH			
Materials		Housing : ABS with glass, Lens : PMMA			

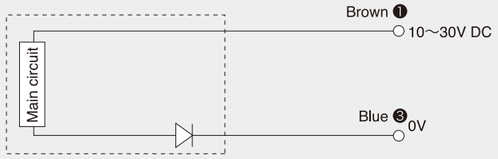
*1 white paper 100 X 100mm "M8-QD in 3 pins for European machines " are available with extention code of -CN(P)3, for instance, "BGS-ZL30CN3".

Circuit diagram

NPN output

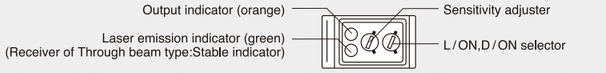


Emitter of Thru-beam type

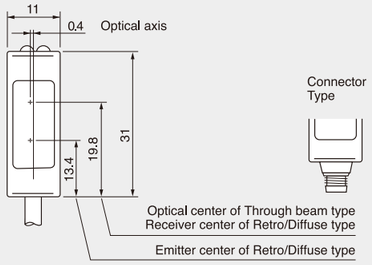


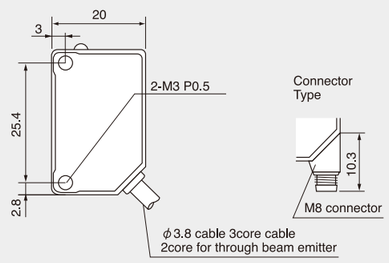
Dimensions

General Use Type except BGS

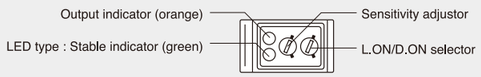


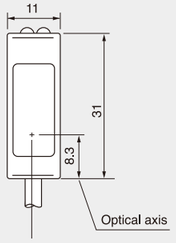
Remark : ZR-QX type (coaxial beam for transparent detection) has single LED (orange for output indicator).

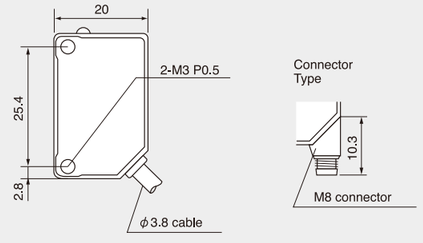




BGS Type







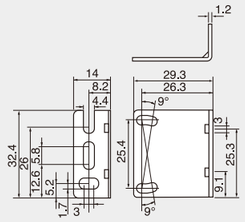
<Cable>
Brown : DC10～30V
Blue : GND
Black : Control Output
Gray : Laser OFF (Laser type only)
(NPN connect to GND / PNP connect to DC10～30V)

<3 Pin configuration>
① DC10～30V
② GND
③ Control Output

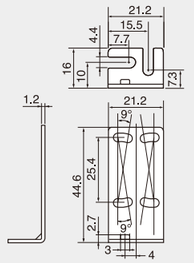
<4 Pin configuration>
① DC10～30V
② Laser OFF (Laser type only)
(NPN connect to GND / PNP connect to DC10～30V)
③ GND
④ Control Output

(Unit : mm)

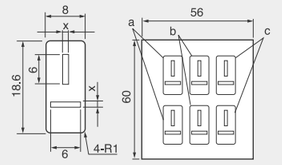
Standard bracket BEF-W-100-A
For M8 QD type sensors



Standard bracket BEF-W-100-B
For cabled type sensors

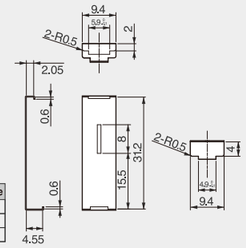


Slit mask BL-160-SK
(for Thru-beam type)



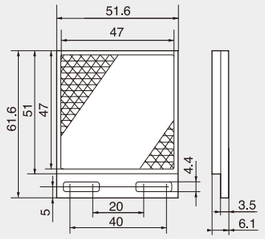
Type	Size	Attached to	Object size (Min)	Scanning range
Slit a	0.5mm	Receiver,Emitter	0.4mm	0.8mm
Slit B	1mm	Receiver,Emitter	0.6mm	2.5mm
Slit C	2mm	Receiver,Emitter	1.5mm	5mm

Slit mask BL-100-M1

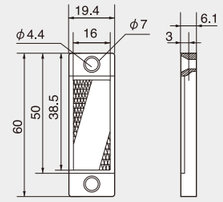


Reflectors for Laser Type

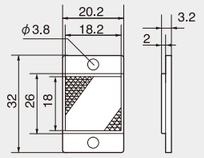
P250F
(Standard, 0.2-10m)



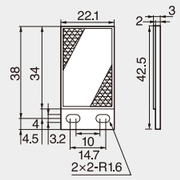
PL20F
(Optional, 0.2-8m)



PL10F
(Optional, 0.2-7m)



V-42F
(Optional, 0.1-5m)



JCN-S：**M8 Straight type**

JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

JCN-L：**L-shape M8 type**

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

Protective mounting brackets
LK-S01

LK-S02

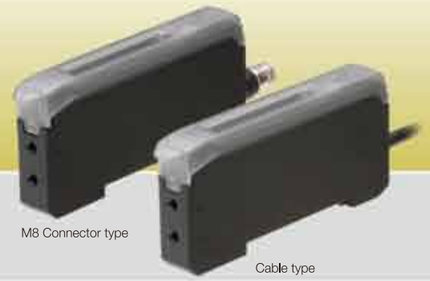
Sensor stand
PLN-1

Fixture of Reflector
PLN-1M

Fiber Sensors

All Optex-FA fiber optic sensors are designed for high performance and ease of use.
From models with digital display and pushbutton teach to manual adjust there is an amplifier to solve your application.
All amplifiers are available in Cabled or M8 QD versions and are offered with a choice of NPN or PNP outputs.

D2RF series	117
BRF series	125
BIF series	129
NF series	132
NF02 / NF25 series	154



Digital Fiber Sensor

D2RF series

Standard Type : Stand-alone use

(IP50 protection)
・D2RF-TN / TP / TCN4 / TCP4

(IP66 protection)
・D2RF-2TN / 2TP / 2TCN3 / 2TCP3 / 2TCN4 / 2TCP4

Standard Type : Interconnection use

(IP50 protection)
・D2RF-TMN / TMP / TMCN4 / TMCP4 / TSN / TSP / TSCN4 / TSCP4

Mark Sensor Type : Stand-alone use

(IP50 protection)
・D2GF-TN / TP / TCN4 / TCP4

(IP66 protection)
・D2GF-2TN / 2TP / 2TCN3 / 2TCP3 / 2TCN4 / 2TCP4

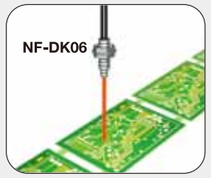
Next page

- ***Digital Fiber Amplifier with Two Independent Outputs.***
- ***High speed 60 micro second response.***
- ***SAM Circuit - The ASC function (Auto Sensitivity Control)***

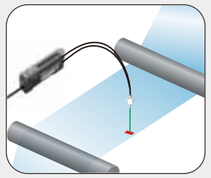
Applications

Bottle sensing in chemical environment (Full power teaching)

Counting electric components (One point teaching)



Sensing PC Board (Two point teaching)



Detection of mark on sheet

Product Types

Standard Type : Stand-alone use		
IP50 protection	**D2RF-TN/TP**	2 meter cable
	D2RF-TCN4/TCP4	M8 QD, 4 pin
IP66 protection	**D2RF-2TN/2TP**	2 meter cable
	D2RF-2TCN3/2TCP3	M8 QD, 3 pin
	D2RF-2TCN4/2TCP4	M8 QD, 4 pin

Standard Type : Interconnection use		
IP50 protection	**D2RF-TMN/TMP**	Master Unit
	D2RF-TSN/TSP	Slave Unit
	D2RF-TMCN4/TMCP4	Master Unit, M8 QD
	D2RF-TSCN4/TSCP4	Slave Unit, M8 QD

Mark Sensor Type : Stand-alone use		
IP50 protection	**D2GF-TN/TP**	2 meter cable
	D2GF-TCN4/TCP4	M8 QD, 4 pin
IP66 protection	**D2GF-2TN/2TP**	2 meter cable
	D2GF-2TCN3/2TCP3	M8 QD, 3 pin
	D2GF-2TCN4/2TCP4	M8 QD, 4 pin

Analogue Type : Stand-alone use		
IP50 protection	**D2RF-TAN/TAP**	4-20mA Analog Transistor output
IP66 protection	**D2RF-2TAN/2TAP**	4-20mA Analog Transistor output

Features

Two four digit display's.

Received Light Level and Threshold Setting

6 teach method for individual applications.

Full Power Teaching
Standard detection mode for Thru-beam type sensing but applicable for retro-reflective sensing also.

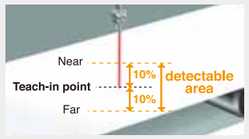
Full automatic Teaching
Set while the equipment is operating.

Single point Teaching
Set without a target present.

Transparent / Glass Teaching
Ideal for the detection of glass, film, plastic or any transparent material.

Two points Teaching
Standard detection mode for Diffuse type sensing.
It is possible to make fine adjustments.

Zone Teaching
Similar to Area Teach Mode.
This is useful if the conveyor moves closer to and farther from the sensor. An area +/- 10% of the teach point can be detected.



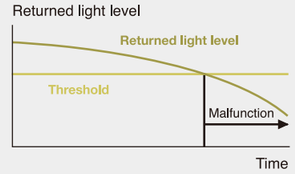
SAM Circuit - The ASC function (Auto Sensitivity Control)

Our engineer "SAM" designed this function. The lens and/or reflector may be contaminated over time. The D2RF amplifier monitors the change in light level and automatically resets the threshold value.

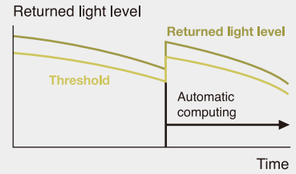
After cleaning off the lens / reflector it used to be necessary to reset the threshold setting. The D2RF does not require this step. Simply clean off the lens and wait three seconds without a target present. The sensor will automatically reset the threshold level for the change. This is how the SAM circuit works.

After cleaning the incoming light level will increase suddenly. The SAM circuit computes the preset threshold based on the increase in light intensity.
This function is available only in Transparent Detection Mode.

Conventional Sensor
Contamination on the lens will eventually cause the sensor to malfunction.

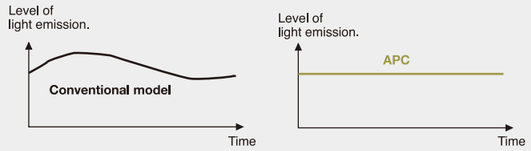


D2RF series SAM Circuit
The threshold will auto-matically return to the preset level after the lens is cleaned off.



APC Function (Auto Power Control)

The APC function ensures precise sensing even when there are changes in the temperature or environmental conditions.
APC maintains a constant power level of light emission by regulating the current flow into the light emission element. The APC function can be turned On and Off.



Mark Sensor Type : Interconnection use

(IP50 protection)
・D2GF-TMN / TMP / TMCN4 / TMCP4 / TSN / TSP / TSCN4 / TSCP4

Analogue Type : Stand-alone use

(IP50 protection)
・D2RF-TAN / TAP

(IP66 protection)
・D2RF-2TAN / 2TAP

IP66 and IP50, two types.

If your application is around water or high humidity.
There is a model of the D2RF-T series with an IP66 rating.

60 micro second high speed response.

Both outputs can be set to operate at this speed.
This response time is available in 5 of the teach modes

Long Term Stable Detection.

A conventional 3 element LED will lose brightness over time. This results in a decrease in sensitivity in the sensor. Optex FA's new D2RF uses a 4 element LED to provide long service life. The Green LED type D2GF uses a "Glan N2" LED, which offers the best performance for Mark Detection with a Green LED light source.

Cross Talk Prevention

The amplifier frequencies are automatically set between the Master and Slave units. Cross talk prevention is possible for up to 4 amplifiers.

LED Power adjustment - 3 step adjustment of LED emitting power.

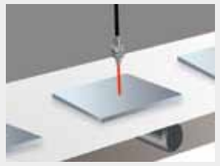
A highly reflective target will cause the amplifier to saturate making adjustment difficult. This can also happen if the fiber cable is mounted too close to the target.
In situations where the amplifier is saturated due to excessive reflected light, the power level of the emitting LED can be decreased to 50 or 25 percent.

Power setting

100%

50%

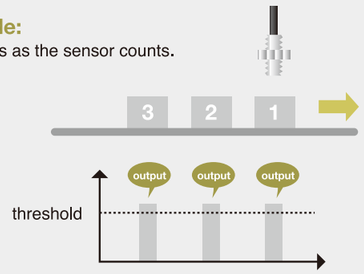
25%



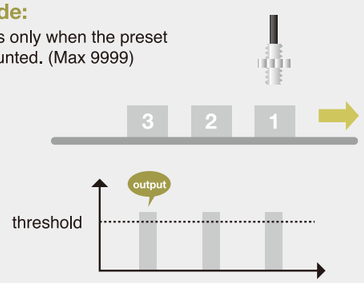
Counter Mode

The D2RF amplifier features a built-in counter. This makes it convenient to count parts, for example 10 pcs. in a bag. The output turns on once the sensor has counted the desired quantity. Simply program in the number of parts to count.

Normal Mode:
An output comes as the sensor counts.



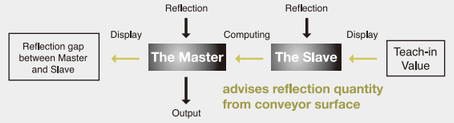
Counter Mode:
An output comes only when the preset numbers are counted. (Max 9999)



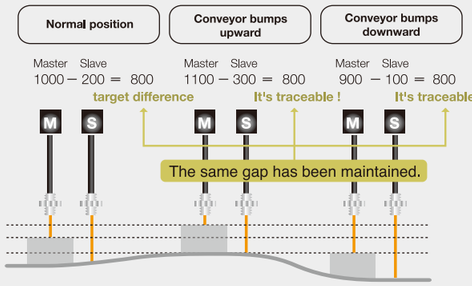
Differential Sensing Mode

A bumpy conveyor always makes stable detection difficult. The D2RF-T solves this problem with the Differential Sensing Mode. The Master and Slave amplifiers will calculate the difference between the reflection from the background and the target (see picture below). No matter how much the surface of the conveyor moves up and down the D2RF-T can follow the change and reliably detect the target.

Operation Flow:



How to follow the changing condition!



Automatic Tuning

This provides a way to boost or dampen the excess gain level of the amplifier in poor sensing conditions (low light level, low sensitivity or saturating condition).
Automatic Tuning is ideal when you need a little bit better excess gain level, or when detecting a dark object with diffuse reflective fiber cables.

Edge Sensing

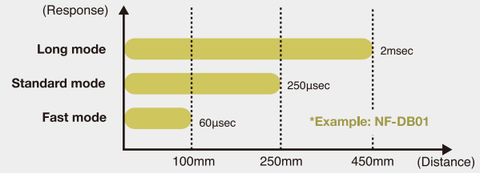
The sensor output triggers when there is a sudden increase or decrease in the light level. This is ideal for sensing objects without being influenced by a dusty environment.

Rising Edge Sensing Mode

Falling Edge Sensing Mode

Selectable Response Time

The Response time will affect the sensing distance.
The D2RF-T has three choices (Long, Standard, and Fast), select the response time based on the required sensing distance.
Long Mode boosts the power for the maximum sensing distance with a 2 msec. response time.
The Fast Mode has a reduced sensing distance but provides high speed 60μsec. response.



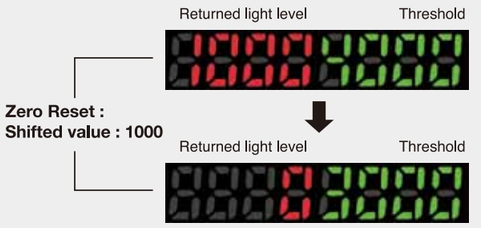
Long mode

Standard mode

Fast mode

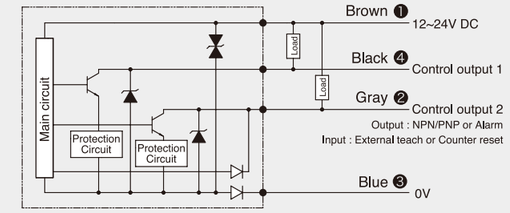
Zero Reset

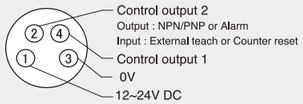
The sensor display can be reset to zero. This is useful for adjusting the display's of the Master and Slave units to read the same. It is also good to set the value to zero when the light is interrupted.



Two Independent Outputs. Each output can be set separately.

The 2nd output can be configured as an external Teach input.





The operation of each output can be set to Light-On / Dark-On. Also, the Threshold level, Timer settings, etc. of each output can be set independently. The Analog output type (D2RF-TAN/P) provides a 4 ~ 20 mA (gray wire) analog output and a NPN (or PNP) digital output (black wire).

The second output can be configured as an Alarm output (self-diagnostic). It can also be set to operate as an External Teach Input or Counter Reset Input if the Counter function is being used.

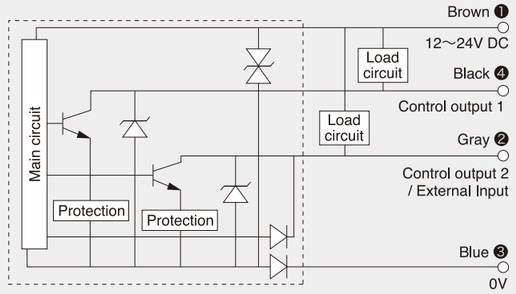
External Teach Input (CH2)

It is possible to have a Remote Teach Input if the CH2 output is re-assigned as an input.
When using the Remote Teach with Interconnected amplifiers all units will perform the Teach function simultaneously.
(This function is not available for Analogue Type)

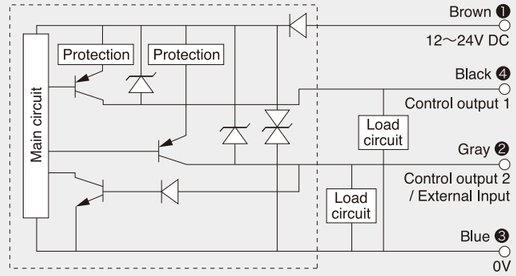
Circuit diagram

Stand-alone model

NPN output

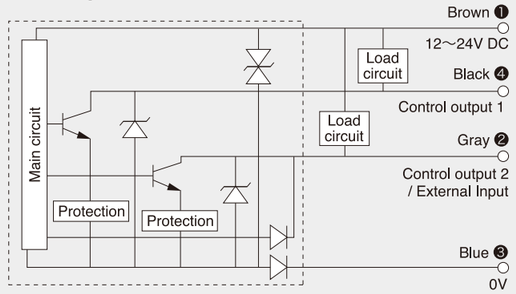


PNP output

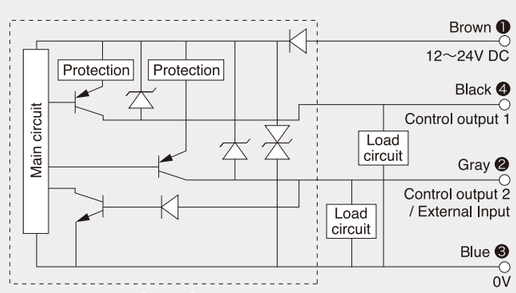


Interconnection model

NPN output



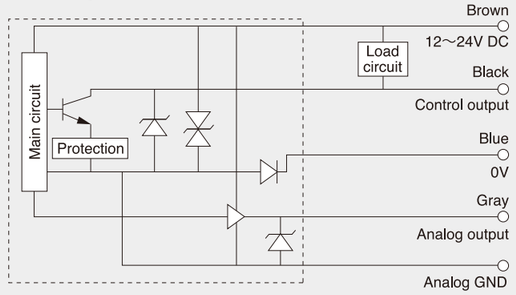
PNP output



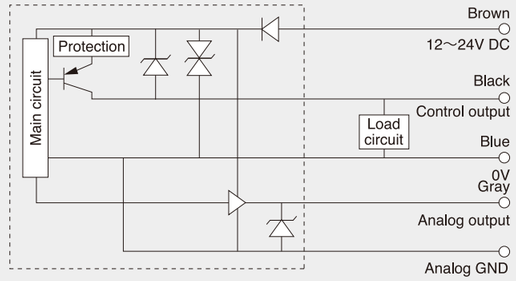
· Power wires (Brown ❶. Blue ❸) are not attached to Handset unit, both on cable and connector type.

Analogue model

NPN output



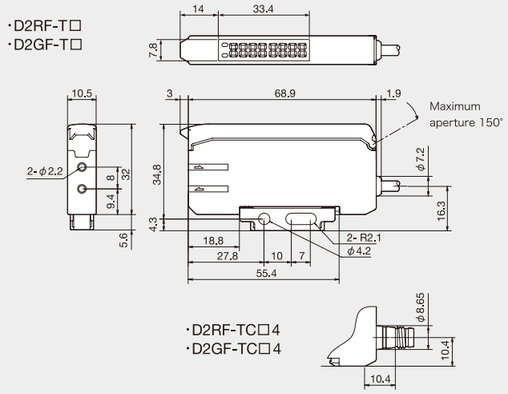
PNP output



Dimensions

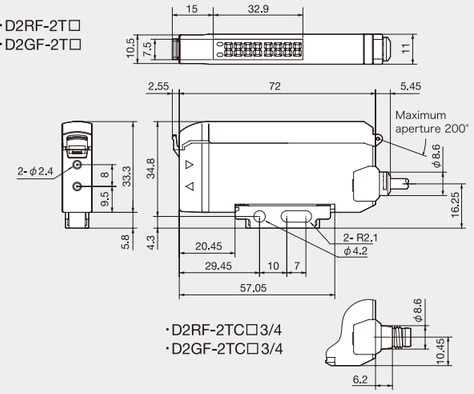
Stand-alone model

・D2RF-T□
・D2GF-T□



・D2RF-TC□4
・D2GF-TC□4

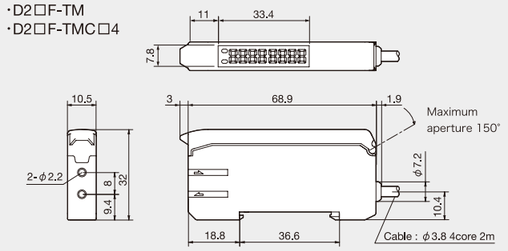
・D2RF-2T□
・D2GF-2T□



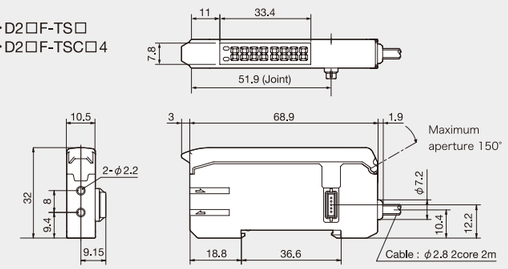
・D2RF-2TC□3/4
・D2GF-2TC□3/4

Interconnection model

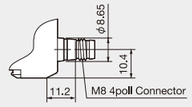
・D2□F-TM
・D2□F-TMC□4



・D2□F-TS□
・D2□F-TSC□4

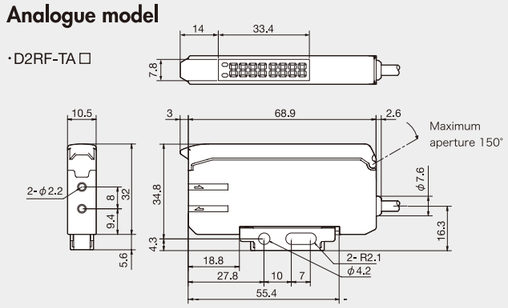


・M8 Connector type

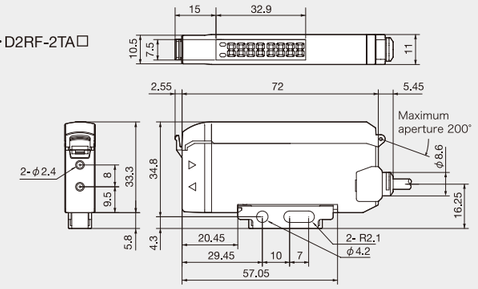


Analogue model

・D2RF-TA□



・D2RF-2TA□



Specifications

Model		Standard	Mark sensor	Analogue
Stand-alone Type				
IP50 type	**Cable type NPN / PNP**	D2RF-TN / TP	D2GF-TN / TP	D2RF-TAN / TAP
	M8 QD 4pin, NPN / PNP	D2RF-TCN4 / TCP4	D2GF-TCN4 / TCP4	NA
IP66 type	**Cable type NPN / PNP**	D2RF-2TN / 2TP	D2GF-2TN / 2TP	D2RF-2TAN / 2TAP
	M8 QD 4pin, NPN / PNP	D2RF-2TCN4 / 2TCP4	D2GF-2TCN4 / 2TCP4	NA
	M8 QD 3pin, NPN / PNP	D2RF-2TCN3 / 2TCP3	D2GF-2TCN3 / 2TCP3	NA
Interconnection Type				
Master unit	**Cable type NPN / PNP**	D2RF-TMN / TMP	D2GF-TMN / TMP	NA
	M8 QD 4pin, NPN / PNP	D2RF-TMCN4 / TMCP4	D2GF-TMCN4 / TMCP4	NA
Slave unit	**Cable type NPN / PNP**	D2RF-TSN / TSP	D2GF-TSN / TSP	NA
	M8 QD 4pin, NPN / PNP	D2RF-TSCN4 / TSCP4	D2GF-TSCN4 / TSCP4	NA
Light source		Red LED	Green LED	Red LED
Response time		60 micro sec (Fast mode), 250 micro sec (standard), 2.0 ms (Long distance)		
Auto control system		APC / ASC		
LED Power control		3 steps ; 100%, 50% and 25%		
Timer functions		On delay/Off delay /One shot, 1-9,999msec (1msec increment)		
Sensitivity adjustment		Teach-in + fine adjustment		
Output indicator		Output (orange) : 1CH / 2CH common		Output (orange)
Digital indicator		7 segment LED, 4 digits in Red, 4 digits in Green		
Teach-in mode		Full Power / One point / Two points / Full Automatic / Differential / Zone / Transparent		
Control output		2CH, NPN or PNP open collector, DC30V, 100mA Max		1CH, NPN or PNP
Analogue output		NA		4-20mA, Resolution 0.1%FS
Parallel installation		Up to 16 sets		
Crosstalk prevention		Up to 4 sets		
Operating mode		Light on / Dark on selectable		
Sensing mode		Long Distance Mode, Standard, Fast mode,		
Display		Regular dislay plus ; bar, %, eco (off, run mode only)		
External input		Teaching / Counter Reset		
Supply voltage		DC 10-24V +/- 10% ripple		
Power consumption		45mA Max (24V)		
Circuit protection		Reverse Polarity, Overcurrent, Short circuit		
Warm-up time		100m sec		
Operating temp / humidity		–25 to 55°C, 35 to 85% RH		
Storage temp / humidity		–40 to 70°C, 35 to 85% RH		
Environmental illuminance		Sunlight 10,000 lux, High Frequency Lamp 3,000 lux		
Protection category		IEC, IP50 (except Stand-alone IP66 types)		
Comformity		IEC, CE		
Shock resistance		IEC 68, 50G		
Weight		Cable type 21g, M8 connector type 23g		
Factory default settings		Response time (Standard), Output (Light On), Timer (OFF), APC (OFF),		

・Independent settings between CH1 and CH2 are possible at Threshold setting. Timer setting and Light/Dark setting.
・Ambient Temperature is limited up to 50°c when amplifires are connected in parallel over 4 pcs.

Options

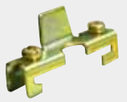
JCN-S : M8 Straight type

JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

JCN-L : M8 L-shape type

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

BEF EB01-W190



Fiber Sensor

BRF series

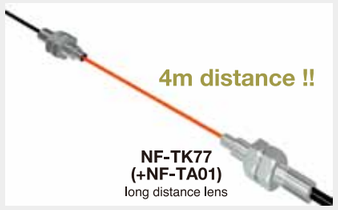
Standard type
Stand alone ·BRF-N / P / CN / CP

High speed type
Stand alone ·BRF-HN / HP / CHN / CHP

Mark detection type
Stand alone ·BGF-N / P / CN / CP

- ***3 models: Standard, High Speed, Mark Detection.***
- ***High Speed type (50 micro sec) and Green LED type for Mark Sensing.***
- ***Crosstalk prevention. IP66 protection.***
- ***10 turn adjustment potentiometer for fine tuning.***

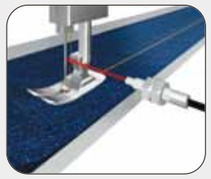
Long distance sensing



Min object ϕ0.015mm

High Speed response 50μsec

Applications



Standard type (BRF-N)

High speed type (BRF-HN)

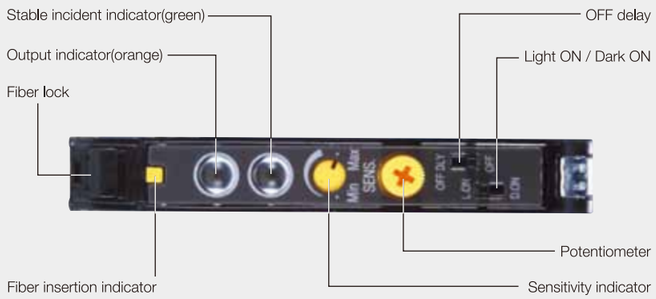
Mark detection type (BGF-N)

System requirements

Stand-alone type		
with cable	BRF-N / BRF-P	No additional cables are required
M8 connector	BRF-CN / BRF-CP	M8 connector cable JCN-L JCN-S

Features

Part Identification



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Dimensions

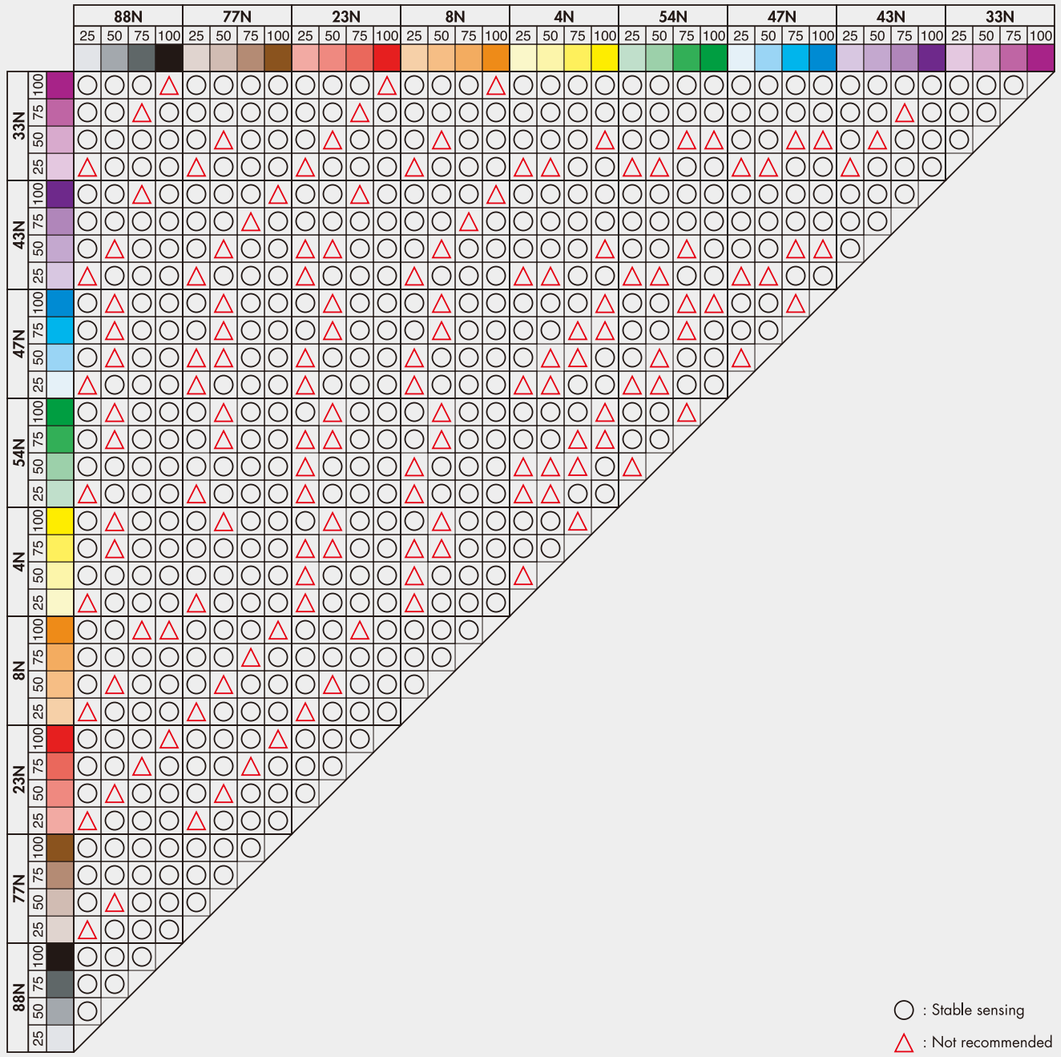
Cable Type Stand-alone

M8 Connector Stand-alone

<4 Pin configuration>
① DC10~30V
② –
③ 0V
④ Control Output

(Unit : mm)

Sensing Chart by colours (BGF series Mark Sensor)



Specifications

Model		Standard type	High speed type	Mark type
Stand-alone	Cable type	BRF-N / P	BRF-HN / HP	BGF-N / P
	M8 QD type	BRF-CN / CP	BRF-CHN / CHP	BGF-CN / CP
Sensing distance (*1)	90% 250mm×200mm DK-06 Diffuse Fiber	150mm	50mm	40mm
Response time		250 μsec	50 μsec	250 μsec
Control output		NPN or PNP Open Collector 100mA/DC30V max. 1.8V/100mA max.		
Light source		Red LED		Green LED
LED Indicator	Stable output	Green		
	Output	Orange		
Potentiometer		10 turn		
Operating mode		Dark On/Light On selectable		
Timer		Off Delay 40msec fixed		
Supply voltage		DC10 ~ 30V Inc. 10% ripple		
Power consumption		25mA/30V (30mA/30V Interconnection type)		
Environmental illuminance	Sunlight	10,000 lx min.		
	Incandescent lamp	3,000 lx min.		
Operating temp		−25 ~ +55°C		
Operating humidity		35 ~ 85%		
Storage temp / humidity		−40 ~ +70°C/35 ~ 95%		
Insulation resistance		Min. 20MΩ/DC500V		
Conformity	EMC Test	CE regulation		
	Failen Test (house test)	Level 3		
Temperature drift		±5% max.		
LED Compensation ratio		−10% max./1000 h		
Vibration resisitance	IEC68	10 ~ 55Hz, 1.5mm		
Shock resistance	IEC68	500m/s²		
Protection category	Stand-alone	IP66		
	Interconnection	IP50		
Warm-up time		100ms max.		
Circuit protection		Overcurrent (output), Reverse Polarity, Short Circuit		
VED classification		Class 3		
Material	Housing	PBT G10		
	Cover	PC		
Dimensions		W10.5 x D80 x H35.5mm		
Regulation	UL	cRU recognition		
	CE	CE sign		

* 1 See NF series Fiber optics.

Fiber Sensor

BIF series

Moisture detection type
(Sensing distance : 50mm)
Stand alone ·BIF-WN / WP / CWN / CWP

- ***Unique "Moisture Sensing Type" BIF-W series senses the presence of moisture in a product.***

Applications

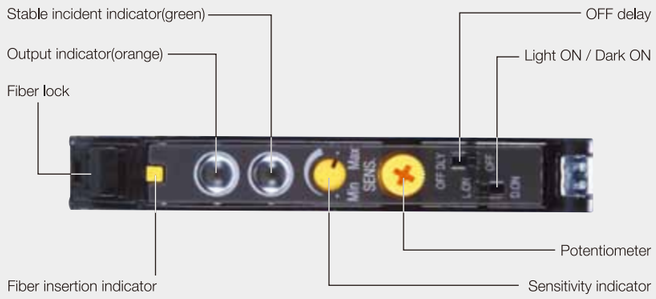
Moisture detection type (BIF-WN)

System requirements

Stand-alone type		
with cable	**BIF-WN / BIF-WP**	**No additional cables are required**
M8 connector	**BIF-CWN / BIF-CWP**	**M8 connector cable** **JCN-L** **JCN-S**

Features

Part Identification



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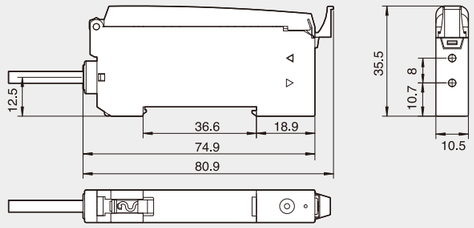
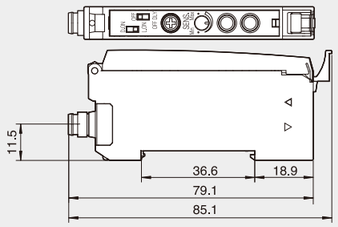
Dimensions

Cable Type Stand-alone



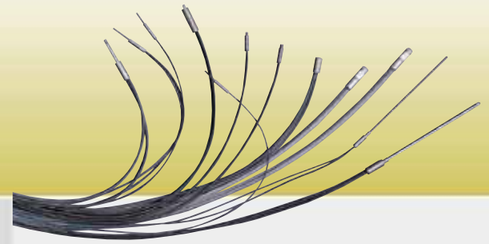
M8 Connector Stand-alone



(Unit : mm)

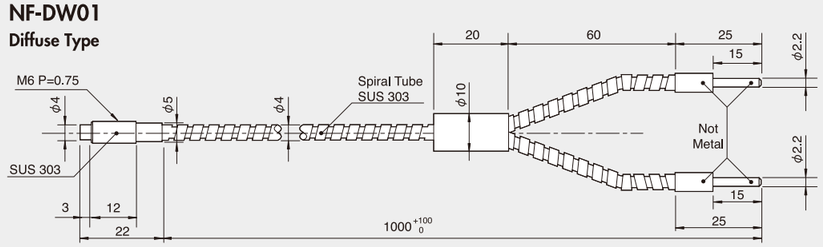
Specifications

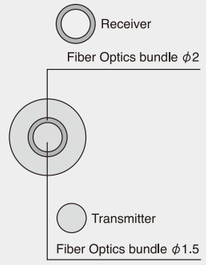
Model		Moisture type
Stand-alone	**Cable type**	BIF-WN / WP
	Connector type	BIF-CWN / CWP
Sensing distance	**90% 250mm×200mm**	30mm Diffuse
	DK-06 Diffuse Fiber	100mm Thru-beam
Response time		1msec
Control output		NPN or PNP Open Collector 100mA/DC30V max. 1.8V/100mA max.
Light source		Infrared LED
LED Indicator	**Stable output**	Green
	Output	Orange
Potentiometer		10 turn
Operating mode		Dark On/Light On selectable
Timer		Off Delay 40msec fixed
Supply voltage		DC10 ~ 30V Inc. 10% ripple
Power consumption		25mA/30V (30mA/30V Interconnection type)
Environmental illuminance	**Sunlight**	10,000 lx min.
	Incandescent lamp	3,000 lx min.
Operating temp		–25 ~ +55°C
Operating humidity		35 ~ 85%
Storage temp / humidity		–40 ~ +70°C/35 ~ 95%
Insulation resistance		Min. 20MΩ/DC500V
Conformity	**EMC Test**	CE regulation
	Failen Test (house test)	Level 3
Temp drift		±5% max.
LED Compensation ratio		–10% max./1000 h
Vibration resisitance	**IEC68**	10 ~ 55Hz, 1.5mm
Shock resistance	**IEC68**	500m/s²
Protection category	**Stand-alone**	IP66
	Interconnection	IP50
Warm-up time		100ms max.
Circuit protection		Overcurrent (output), Reverse Polarity, Short Circuit
VED classification		Class 3
Material	**Housing**	PBT G10
	Cover	PC
Dimensions		W10.5 x D80 x H35.5mm
Regulation	**UL**	cRU recognition
	CE	CE sign



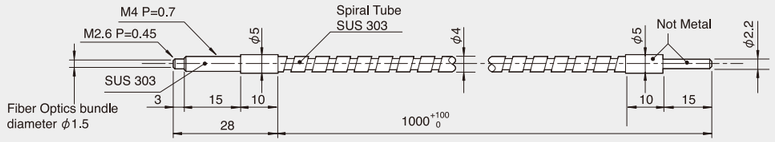
Special fiber unit for BIF-W Moisture Type

NF-DW01
Diffuse Type





NF-TW01
Thru-beam Type



Fiber Sensors Overview

A complete fiber optic sensor consists of the amplifier and a fiber optic cable. The fiber optic cable is chosen based upon the specific application. Optex offers more than 80 different cables in both Thru-beam and Diffuse sensing modes.

When to use Fiber optics

- **Confined areas**
  The small size and flexibility of fibers allows precise positioning where space is limited.
- **High temperature applications**
  Fiber optic assemblies can tolerate elevated temperatures in some cases as high as 300°F.
- **High vibration and shock**
  The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **Noisy environments**
  Fibers are non-electronic mechanical components, and are completely immune to electrical noise.
- **Corrosive and wet environments**
  Special purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **Unique target shapes and requirements**
  Fiber optic sensing heads can be custom-designed and optimally “shaped” to the physical and optical requirements of a specific application.

1. Amplifiers

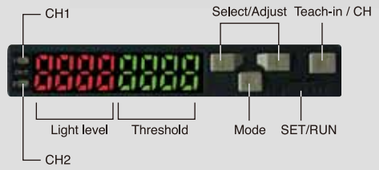
The amplifier contains the electronics, transmitting / receiving LED’s and is the mechanical interface for the fiber. The D2RF series amplifiers are sealed and have an IP67 rating. They can easily be DIN-rail mounted directly on the machine or in a centralized control enclosure.

OPTEX FA Amplifiers for NF series Fibers

(Red LED) Digital Amplifier
D2RF series

(Green LED) Digital Mark Sensor
D2GF series

Amplifier Features



- Digital Fiber Amplifier with Two Independent Outputs.
- High speed 60 micro second response.
- SAM Circuit gives automatic sensitivity control.
- 6 different teach functions

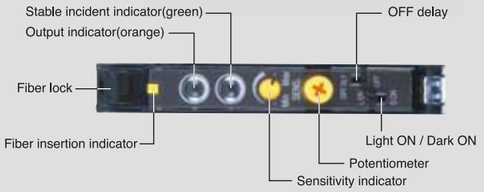
(Red LED) Fiber Amplifier
BRF series

(Red LED) High Speed Type
BRF-H series

(Green LED) Mark Sensor
BGF series

(Infrared LED) Moisture Sensing Amplifier
BIF series

Amplifier Features



- 4 models: Standard, High Speed, Mark Detection and Moisture Detection.
- Unique “ Moisture Sensing Type” BIF-W series senses the presence of moisture in a product.
- Interconnection of up to 100 amplifiers is possible (ambient temp. approx 45°C, @ 12VDC)

2. Fibers

Fiber optic cables are non-electronic, light-transmitting, optical quality glass or plastic strands with cladding. The fibers serve as a light guide, they are used to transmit the light from and return the light to the amplifier. Glass fibers are arranged in bundles, while plastic fibers are typically packaged as monofilaments with a protective jacket of polyethylene, PVC, stainless steel braid or other material. Fiber cable sensing tips can have a wide variety of shapes and configurations.

Plastic Fibers

Plastic fibers are best for general purpose use, and where severe flexing like R=2 is required; they can be cut-to-length in the field, and are less expensive than glass fibers.

Features:

- Inexpensive and easily cut to length during installation.
- Bend very easily to fit precisely where you want them.
- Special high-flex models withstand flexing.
- Special jackets withstand corrosion, impact and abrasion.
- Quickly custom-designed and built for your unique applications.

Glass Fibers

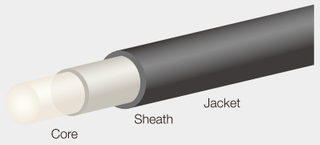
Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Features:

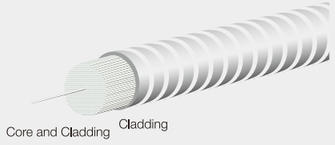
- Solve numerous challenging sensing requirements.
- For hostile environments such as high temperatures up to 300°C (572°F), corrosive materials, and extreme moisture.
- Withstand high levels of shock and vibration.
- Inherently immune to extreme electrical noise.
- Sheathing is typically stainless steel flexible conduit, but can be PVC or other flexible tubing.
- Quickly custom-designed and built for your unique applications.

Plastic vs Glass Fiber Construction

Plastic Fibers



Glass Fibers



Notes on fibers:

Core
Thin glass or plastic center of the fiber through which light travels.

Cladding
Outer optical material surrounding the core that reflects light back into the core.

Jacket
Protective layer to protect plastic fiber from damage and moisture.

Fiber Unit Selection Guide

Standard
Acrylic monofilament fiber of Bend Radius between R = 15mm and 25mm.

Coaxial
For tight alignment to the target.

Multi-core
Multi-cored under cladding and jacket.

Flexible
Repeat bending type of between R = 2mm and 4mm.

Sleeve
A long tip that can be bent to focus on the target.

Sideview
Fiber Optic with 90 degree angled end tip.

Convergent
Specular reflective optics with convergent beam spot.

High temperature
Durable to high temp not having transmission loss and fiber shrinkage.

Chemical resistant
Unlike acrylic fibers the jacket protects the fiber from chemical environments.

Liquid
For liquid level sensing.

Array
For applications of area sensing

Mapping application
For Mapping applications.

Water
Water/Moisture sensing type with 1.45 µm IR element.

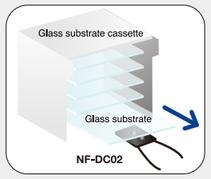
NF series Plastic Fiber Optics

- ***Optex FA plastic fiber optic cables are easy to use and are more economical than glass fiber optic cables. Plastic cables can be used in confined area as where the mounting space is limited and the use of a self-contained photoelectric sensor is not practical.***
  Plastic fiber optic cables are ideally suited for applications involving small-sized objects or for repeated bending.

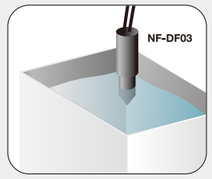
- ***Plastic fiber optic cables are designed in the following configurations Regular, Coaxial, Multi-core, Side-view, Convergent, Chemical resistant, Liquid level detection, High temperature and with bendable metal sleeve.***
  A minimum bend radius of R=2 mm is avaliable for some fibers.

- ***Special fibers ideal for various applications are available upon request.***

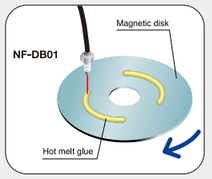
Applications



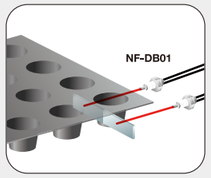
Detecting glass substrate



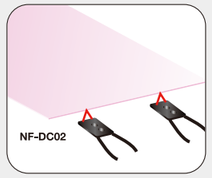
Detecting liquid level



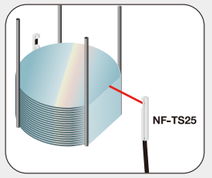
Detection of hot melt glue on magnetic disk



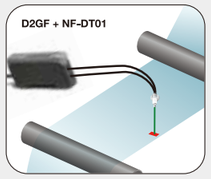
Positioning tray



Detecting glass substrate



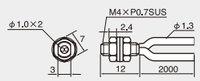
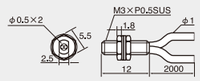
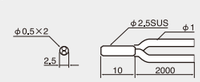
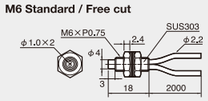
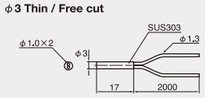
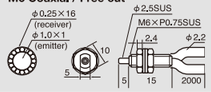
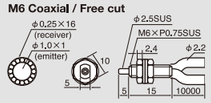
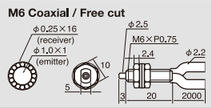
Detecting wafer position



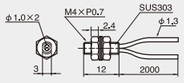
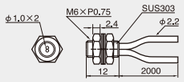
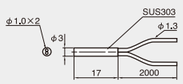
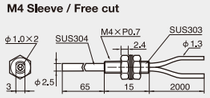
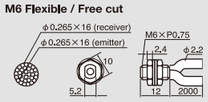
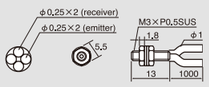
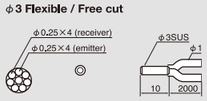
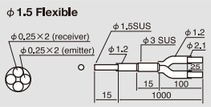
Detection of mark on sheet

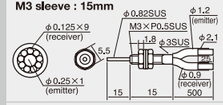
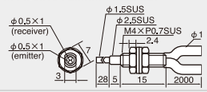
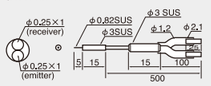
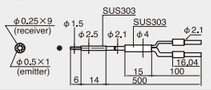
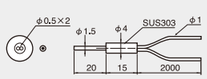
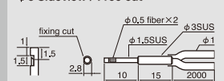
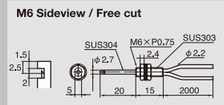
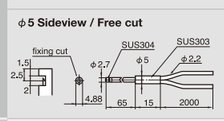
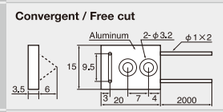
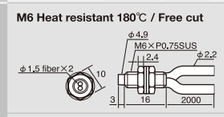
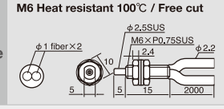
Standard
Coaxial
Multi-core
Flexible
Sleeve
Sideview
Convergent
High temperature
Chemical resistant
Liquid
Array
Mapping application

Specifications (Diffuse Type Fibers)

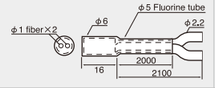
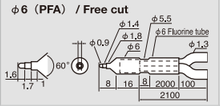
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
Standard	**M4 Long Distance / Free cut** 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DM01
	M3 Long Distance / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DS06
	ϕ2.5 Thin / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DT03
	M6 Standard / Free cut 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK06
	ϕ3 Thin / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK04
Coaxial	**M6 Coaxial / Free cut** 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB01
	M6 Coaxial / Free cut 	—	—	—	—	−40～70	R=25	NF-DB01-10
	M6 Coaxial / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 60 Highspeed mode 25 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB03
	M3 Coaxial / Free cut	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DT01
	M4 Coaxial / Free cut	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DM02
	ϕ3 Coaxial	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK23
	M3 Coaxial	Long mode 70 Standard mode 40 Highspeed mode 15 (0.015)	BRF 20 BRF-H 5 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 4 (0.015)	BGF 4 (0.015)	−40～70	R=15	NF-DK21

Specifications (Diffuse Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
Multi-core	**M4 Small / Free cut** 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK66
	M6 Small / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK67
	ϕ3 Smooth / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK04Z
	M4 Sleeve / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK63Z
Flexible	**M6 Flexible / Free cut** 	Long mode 350 Standard mode 200 Highspeed mode 80 (0.015)	BRF 130 BRF-H 45 (0.015)	Long mode 100 Standard mode 50 Highspeed mode 30 (0.015)	BGF 15 (0.015)	−40～70	R=4	NF-DR01
	M3 Flexible / Free cut 	Long mode 70 Standard mode 30 Highspeed mode 15 (0.015)	BRF 20 BRF-H 8 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR02
	ϕ3 Flexible / Free cut 	Long mode 120 Standard mode 50 Highspeed mode 25 (0.015)	BRF 35 BRF-H 10 (0.015)	Long mode 25 Standard mode 12 Highspeed mode 5 (0.015)	BGF 5 (0.015)	−40～70	R=4	NF-DR03
	ϕ1.5 Flexible 	Long mode 70 Standard mode 30 Highspeed mode 15 (0.015)	BRF 20 BRF-H 8 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR04
	M4 Flexible / Free cut	Long mode 120 Standard mode 50 Highspeed mode 25 (0.015)	BRF 35 BRF-H 10 (0.015)	Long mode 25 Standard mode 12 Highspeed mode 5 (0.015)	BGF 5 (0.015)	−40～70	R=4	NF-DR06
Sleeve	**M6 Sleeve : 90mm / Free cut**	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB02
	M4 Sleeve : 90mm / Free cut	Long mode 120 Standard mode 50 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DM03
	M3 sleeve : 15mm / Free cut	Long mode 40 Standard mode 15 Highspeed mode 5 (0.015)	BRF 10 BRF-H 3 (0.015)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DT02

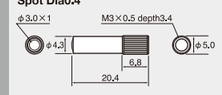
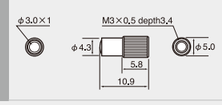
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Sleeve	**M3 sleeve : 15mm** 	Long mode 70 Standard mode 40 Highspeed mode 15 (0.015)	BRF 15 BRF-H 8 (0.015)	Long mode 12 Standard mode 6 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DT04
	M4 sleeve : 28mm / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DT05
	ϕ3 Sleeve : 5mm 	Long mode 40 Standard mode 15 Highspeed mode 5 (0.015)	BRF 10 BRF-H 3 (0.015)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR05
	ϕ2.5 Sleeve : 6mm 	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DK22
	ϕ4 Sleeve : 20mm / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 12 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DK43
Sideview	**ϕ5 Sideview / Free cut**	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DV01
	ϕ3 Sideview / Free cut 	Long mode 80 Standard mode 30 Highspeed mode 7 (0.015)	BRF 15 BRF-H 5 (0.015)	Long mode 15 Standard mode 8 Highspeed mode 3 (0.015)	BGF 3 (0.015)	−40～70	R=15	NF-DV02
	M6 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DV03
	ϕ5 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DK33
Convergent	**Convergent / Free cut** 	Long mode 6 Standard mode 6 Highspeed mode 6 (0.05)	BRF 6 BRF-H 4 (0.015)	Long mode 6 Standard mode 6 Highspeed mode 6 (0.05)	BGF 3 (0.015)	−40～70	R=25	NF-DC02
High temperature	**M6 Heat resistant 180℃ / Free cut** 	Long mode 450 Standard mode 250 Highspeed mode 150 (0.015)	BRF 210 BRF-H 90 (0.015)	Long mode 100 Standard mode 60 Highspeed mode 25 (0.015)	BGF 40 (0.015)	−40～180 ※1	R=35	NF-DH01
	M6 Heat resistant 100℃ / Free cut 	Long mode 250 Standard mode 150 Highspeed mode 50 (0.015)	BRF 110 BRF-H 40 (0.015)	Long mode 20 Standard mode 10 Highspeed mode 5 (0.015)	BGF 7 (0.015)	−40～100 ※1	R=25	NF-DH02

Specifications (Diffuse Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Chemical resistant	**ϕ6（PFA） / Free cut** 	Long mode 100 Standard mode 70 Highspeed mode 50 (0.02)	BRF 45 BRF-H 25 (0.015)	Long mode 50 Standard mode 20 Highspeed mode 10 (0.02)	BGF 10 (0.015)	−40～100	R=60	NF-DY01
Liquid	**ϕ6（PFA） / Free cut** 	For transparent / opaque liquids				−40～70	R=60	NF-DF03

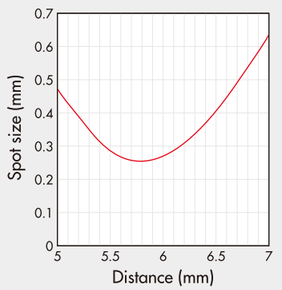
※1 Continuous use over 1,000 hours. Optical power 85% or more.

Fine Spot Lens for Diffuse Type Fibers

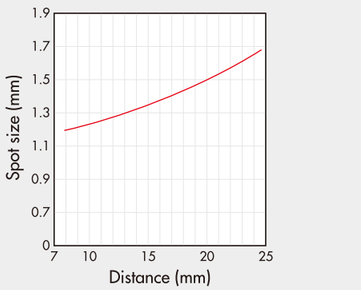
	Lens detail	Applicable fiber	Minimum detectable object (mm)	Focus distance (Minimum object) DRF-T	Focus distance (Minimum object) BRF	Part Number
Fine spot lens	**Spot Dia0.4** 	NF-DT01	DRF-T 0.01 BRF 0.01 VRF-T / JRF 0.01	6±1		NF-DA01
		NF-DT01	DRF-T 0.02 BRF 0.02 VRF-T / JRF 0.02	15±1		NF-DA02

Sensing Distance with Fine Spot Lens

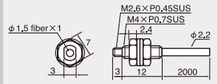
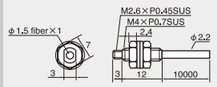
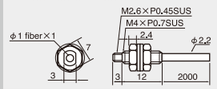
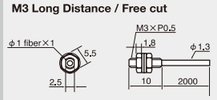
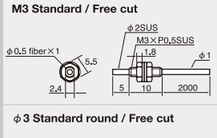
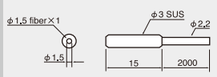
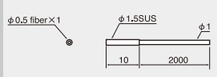
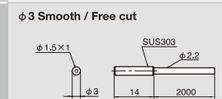
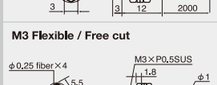
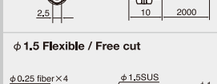
NF-DA01 + NF-DT01



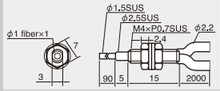
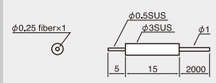
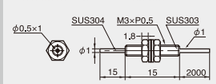
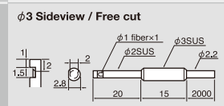
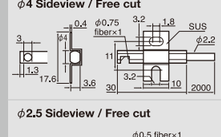
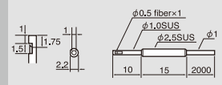
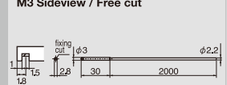
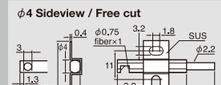
NF-DA02 + NF-DT01



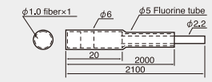
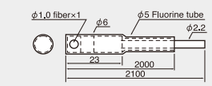
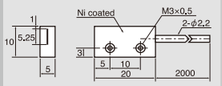
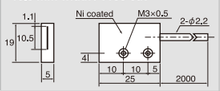
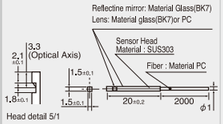
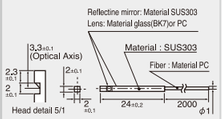
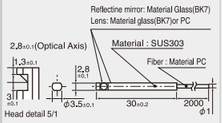
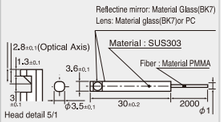
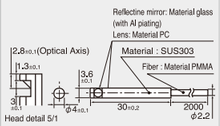
Specifications (Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	BRF/BRF-H	Green LED for Mark Sensing D2GF	BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Standard	**M4 Long Distance / Free cut** 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0.5)	BRF 700 BRF-H 350 (0.5)	Long mode 800 Standard mode 400 Highspeed mode 200 (0.5)	BGF 350 (0.5)	−40～70	R=30	NF-TB01
	M4 Long Distance / Free cut 	—	—	—	—	−40～70	R=30	NF-TB01-10
	M4 Standard / Free cut 	Long mode 1000 Standard mode 500 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 450 Standard mode 250 Highspeed mode 100 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TB02
	M3 Long Distance / Free cut 	Long mode 1000 Standard mode 500 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TM01
	M3 Standard / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 120 Standard mode 60 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TM02
	ϕ3 Standard round / Free cut 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0.5)	BRF 700 BRF-H 350 (0.5)	Long mode 800 Standard mode 400 Highspeed mode 200 (0.5)	BGF 350 (0.5)	−40～70	R=30	NF-TS07
	ϕ1.5 Thin / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 120 Standard mode 60 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TM03
Multi-core	**ϕ3 Smooth / Free cut** 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 360 BRF-H 120 (0.2)	Long mode 350 Standard mode 200 Highspeed mode 90 (0.2)	BGF 110 (0.2)	−40～70	R=2	NF-TK05
	M4 Coaxial / Free cut	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 360 BRF-H 120 (0.2)	Long mode 350 Standard mode 200 Highspeed mode 90 (0.2)	BGF 110 (0.2)	−40～70	R=2	NF-TK77
Flexible	**M4 Flexible / Free cut**	Long mode 800 Standard mode 400 Highspeed mode 250 (0.3)	BRF 330 BRF-H 120 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.3)	BGF 120 (0.2)	−40～70	R=4	NF-TR01
	M3 Flexible / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 110 BRF-H 35 (0.1)	Long mode 70 Standard mode 40 Highspeed mode 20 (0.1)	BGF 20 (0.1)	−40～70	R=4	NF-TR02
	ϕ1.5 Flexible / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 110 BRF-H 35 (0.1)	Long mode 70 Standard mode 40 Highspeed mode 20 (0.1)	BGF 20 (0.1)	−40～70	R=4	NF-TR03

Specifications (Diffuse Type Fibers)

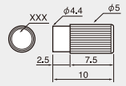
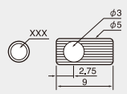
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	BRF/BRF-H	Green LED for Mark Sensing D2GF	BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Sleeve	**M4 sleeve : 90mm / Free cut** 	Long mode 1000 Standard mode 600 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TB03
	ϕ3 sleeve : 5mm / Free cut 	Long mode 80 Standard mode 40 Highspeed mode 20 (0.1)	BRF 30 BRF-H 12 (0.1)	Long mode 25 Standard mode 10 Highspeed mode 5 (0.1)	BGF 4 (0.1)	−40～70	R=15	NF-TT01
	M3 sleeve : 15mm / Free cut 	Long mode 300 Standard mode 150 Highspeed mode 70 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 100 Standard mode 55 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TK75
Sideview	**ϕ3 Sideview / Free cut** 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 300 Standard mode 150 Highspeed mode 80 (0.2)	BGF 85 (0.2)	−40～70	R=25	NF-TV01
	ϕ4 Sideview / Free cut 	Long mode 900 Standard mode 500 Highspeed mode 250 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 400 Standard mode 200 Highspeed mode 100 (0.2)	BGF 110 (0.2)	−40～70	R=25	NF-TS08
	ϕ2.5 Sideview / Free cut 	Long mode 200 Standard mode 150 Highspeed mode 60 (0.1)	BRF 75 BRF-H 25 (0.1)	Long mode 80 Standard mode 45 Highspeed mode 15 (0.1)	BGF 15 (0.1)	−40～70	R=15	NF-TV02
	M3 Sideview / Free cut 	Long mode 200 Standard mode 150 Highspeed mode 60 (0.1)	BRF 75 BRF-H 25 (0.1)	Long mode 80 Standard mode 45 Highspeed mode 15 (0.1)	BGF 15 (0.1)	−40～70	R=15	NF-TV04
	ϕ4 Sideview / Free cut 	Long mode 4000 Standard mode 3000 Highspeed mode 2000 (0.5)	BRF 1700 BRF-H 830 (0.5)	Long mode 1600 Standard mode 900 Highspeed mode 400 (0.5)	BGF 750 (0.5)	−40～70	R=25	NF-TS12
	ϕ3 Sideview / Free cut	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 300 Standard mode 150 Highspeed mode 70 (0.2)	BGF 85 (0.2)	−40～70	R=25	NF-TK34
	ϕ4 Sideview / Free cut	Long mode 4000 Standard mode 3000 Highspeed mode 2000 (0.2)	BRF 2000 BRF-H 900 (0.2)	Long mode 1800 Standard mode 1000 Highspeed mode 450 (0.2)	BGF 800 (0.2)	−40～70	R=25	NF-TK16
High temperature	**M4 Heat resistant 100℃ / Free cut**	Long mode 700 Standard mode 400 Highspeed mode 200 (0.2)	BRF 300 BRF-H 120 (0.2)	Long mode 150 Standard mode 80 Highspeed mode 40 (0.2)	BGF 45 (0.2)	−40～100 ※2	R=25	NF-TH01
	M4 Heat resistant 180℃ / Free cut	Long mode 1000 Standard mode 700 Highspeed mode 350 (0.5)	BRF 600 BRF-H 250 (0.5)	Long mode 350 Standard mode 180 Highspeed mode 80 (0.5)	BGF 120 (0.5)	−40～180 ※1	R=35	NF-TH02

※1 Continuous use over 1,000 hours. Optical power 85% or more. ※2 Continuous use over 2,000 hours. Optical power 90% or more.

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Chemical resistant	**ϕ6(PFA)Straight / Free cut** 	Long mode 3500 Standard mode 2500 Highspeed mode 1200 (0.3)	BRF 2000 BRF-H 400 (0.3)	Long mode 1800 Standard mode 1000 Highspeed mode 300 (0.3)	BGF 380 (0.3)	−40～70	R=60	NF-TY01
	ϕ6(PFA)Sideview / Free cut 	Long mode 1500 Standard mode 800 Highspeed mode 400 (0.3)	BRF 550 BRF-H 220 (0.3)	Long mode 400 Standard mode 300 Highspeed mode 130 (0.3)	BGF 210 (0.3)	−40～70	R=60	NF-TY02
Array	**5.25 mm width / Free cut** 	Long mode 800 Standard mode 500 Highspeed mode 250 (1.0)	BRF 330 BRF-H 120 (1.0)	Long mode 300 Standard mode 200 Highspeed mode 80 (1.0)	BGF 85 (1.0)	−40～70	R=25	NF-TS10
	10.5 mm width / Free cut 	Long mode 800 Standard mode 500 Highspeed mode 250 (0.5)	BRF 330 BRF-H 120 (0.5)	Long mode 300 Standard mode 200 Highspeed mode 80 (0.5)	BGF 85 (0.5)	−40～70	R=25	NF-TS14
	Super Slim Shape 	Long mode 500 Standard mode 280 Highspeed mode 220 (0.06)	—	—	—	−40～105	R=10	NF-TS25
	Narrow Aperture 2.5° 	Long mode 800 Standard mode 500 Highspeed mode 400 (0.06)	—	—	—	−40～105	R=10	NF-TS23
Mapping application (Polyethylene)	**Long distance 1,700mm** 	Long mode 1700 Standard mode 700 Highspeed mode 600 (0.06)	—	—	—	−40～105	R=10	NF-TS22H
	Long distance 1,800mm 	Long mode 1800 Standard mode 800 Highspeed mode 700 (0.06)	—	—	—	−40～105	R=10	NF-TS22M
	R=1mm flexible, 1,700mm 	Long mode 1700 Standard mode 700 Highspeed mode 600 (0.06)	—	—	—	−40～70	R=1	NF-TS22V

※ Mapping Application Fibers are applicable only with D2RF series amplifiers.

Specifications (Thru-beam Type Fibers)

	Lens detail	Applicable fiber	Minimum detectable object (mm)	Sensing distance D2RF	Sensing distance BRF	Part Number
Extension lens NF-TA01	Extended sensing distance 	NF-TB01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 3500 Highspeed mode 1500	Standard type 3000 High speed type 1200 Mark sensor type 1200	NF-TA01
		NF-TB02	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 4000 High speed type 1600 Mark sensor type 1700	
		NF-TR01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 3000 High speed type 1500 Mark sensor type 1100	
		NF-TH01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 3500 Highspeed mode 2500	Standard type 4000 High speed type 1500 Mark sensor type 800	
		NF-TK77	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 4000 High speed type 1400 Mark sensor type 1500	
Sideview lens NF-TA02	Right Angle Sensing 	NF-TB01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 800 Highspeed mode 400	Standard type 600 High speed type 200 Mark sensor type 200	NF-TA02
		NF-TB02	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 1000 Highspeed mode 450	Standard type 600 High speed type 250 Mark sensor type 250	
		NF-TR01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1000 Standard mode 700 Highspeed mode 450	Standard type 500 High speed type 200 Mark sensor type 150	
		NF-TH01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1000 Standard mode 800 Highspeed mode 450	Standard type 500 High speed type 200 Mark sensor type 90	
		NF-TK77	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 800 Highspeed mode 450	Standard type 600 High speed type 200 Mark sensor type 200	

Plastic Fiber Optics - Additional Models Available

In addition to the configurations shown, custom designed fiber optics are available on request:

- Reduce or increase plastic fiber optic bundle diameters.
- Change and tip material from brass to stainless steel.
- Modify straight or angled probe tip dimensions.
- Modify overall fiber length.
- Modify high temperature rating.
- Chemical resistance modifications.

Application notes and Warnings

- Terminated plastic fiber assemblies are optically ground and polished, and cannot be shortened, spliced, or otherwise modified.
- Do not subject the plastic fibers to sharp bends, pinching, high tensile loads, or high levels of radiation.
- When ordering fiber lengths in excess of 2m, take into account light signal attenuation due to the additional length.
- Due to the light transmission properties of plastic fiber optic cables it is recommended that they are only used with amplifiers that have a visible light source. If used with an Infrared LED light source the sensing distance cannot be guaranteed.
- Use cation when applying fiber optics in hazardous locations. Although fiber optics assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT.

Fiber Sensor
D2RF
BRF
BIF
NF
NF02
NF25

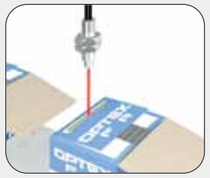
NF series Water (Moisture) Sensing Type (Unique!!)

Water

- *Optex FA Water (moisture) sensing type fiber optic cables are designed for use with the "BIF series" amplifiers. A special Infrared LED in the 1.45 micron spectral response range is used as the light source. Water and Humidity will absorb optical energy at this spectral range. The sensor is able to detect the presence of moisture in the target due to the absorption of this energy.*
- *Thru-Beam and Diffuse types are available.*

BIF series

Applications



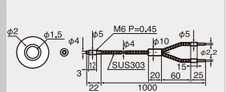
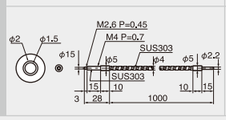
Presence of cold or hot glue in packaging

IV solution bag

Water in the dark colored bottle

Level check of water

Specifications

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
Water		—	Applicable with "BIF" series amplifier only. (30)※1	—	—	−40～200	R=25	NF-DW01
		—	Applicable with "BIF" series amplifier only. (100)	—	—	−40～200	R=25	NF-TW01

※ 1 Amplifier BIF-W

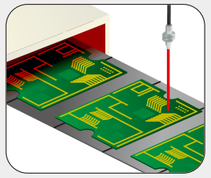
NF series Glass Fiber Optics

High temperature

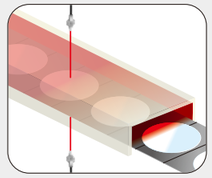
Mapping application

- *Optex FA glass fiber optic cables are excellent for use in harsh sensing environments such as high temperatures up to 300˚C (572˚F), around corrosive materials, extreme moisture, etc.*
- *Glass fiber optic cables are constructed of a combination of optical glass fibers, stainless steel, PVC and optical grade epoxy, they are able to withstand high levels of mechanical shock and vibration. They are also immune to electrical noise.*
- *Special fibers ideal for various applications are available upon request.*

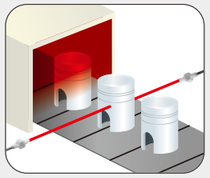
Applications



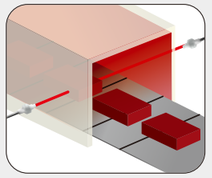
Post heated board



Disks in the furnace

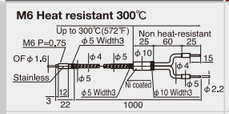
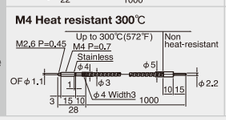


Post heat metals



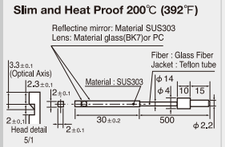
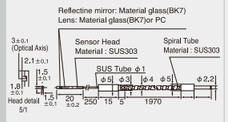
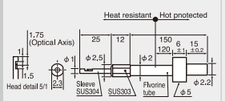
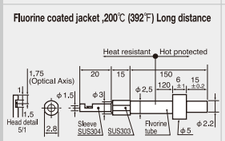
Bricks in the furnace

Specifications (Diffuse & Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
High temperature	**M6 Heat resistant 300℃** 	Long mode 300 Standard mode 200 Highspeed mode 100 (0.015)	BRF 140 BRF-H 55 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 5 (0.015)	BGF 25 (0.015)	−40～300	R=25	NF-DH83
	M4 Heat resistant 300℃ 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 350 BRF-H 150 (0.2)	Long mode 350 Standard mode 180 Highspeed mode 80 (0.2)	BGF 130 (0.2)	−40～300	R=25	NF-TH84

※ Non-catalogue products are available upon request.

Specifications (Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Mapping application (Glass)	**Slim and Heat Proof 200℃ (392℉)** 	Long mode 500 Standard mode 400 Highspeed mode 300 (0.06)	—	—	—	—40～200	R=30	NF-TS27
	Heat Proof 300℃ (572℉), SUS303 armed 	Long mode 650 Standard mode 380 Highspeed mode 330 (0.06)	—	—	—	—40～300	R=25	NF-TS24
	Fluorine coated jacket. 200℃ (392℉) 	Long mode 100 Standard mode 80 Highspeed mode 60 (0.06)	—	—	—	—40～200	R=30	NF-TH04S
	Fluorine coated jacket ,200℃ (392℉) Long distance 	Long mode 350 Standard mode 250 Highspeed mode 200 (0.06)	—	—	—	—40～200	R=30	NF-TH05S

Glass Fiber Optics - Additional Models Available

In addition to the configurations shown, custom designed fiber optics are available on request:

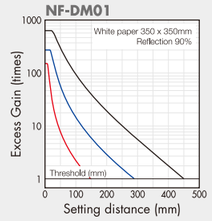
- Substitute PVC over monocoil sheathing for stainless steel.
- Reduce or increase plastic fiber optic bundle diameters.
- Substitute a rectangular-shaped fiber bundle (0.5mm x 2.5mm) for a circular bundle, or vice versa.
- Change sensing tip material from brass to stainless steel.
- Modify straight or angled probe tip dimensions.
- Modify overall fiber length.

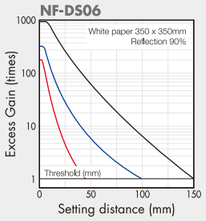
Application notes and Warnings

- The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced, or otherwise modified.
  Terminated plastic fiber assemblies are optically ground and polished, and cannot be shortened, spliced, or otherwise modified.
- Use cation when applying fiber optics in hazardous locations. Although fiber optics assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT.
- In applications where glass fibers are being used to insulate the control from high voltage, specify silicone rubber, teflon, or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.
- Do not subject the fibers to sharp bends, repeated flexing, or high levels of radiation.
- When ordering fiber lengths in excess of 1m, take into account light signal reduction of 5percent per 300mm of additional length.

Diffuse Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

NF-DM01


NF-DS06


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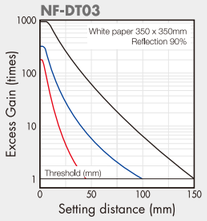
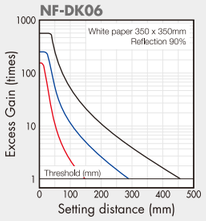
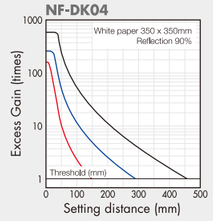
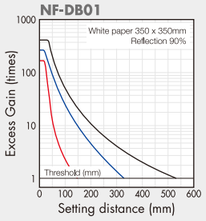
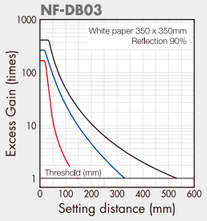
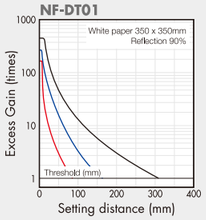


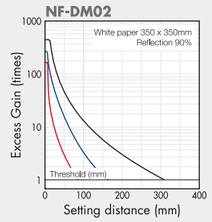
NF-DK06


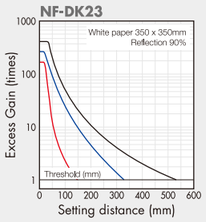
NF-DK04


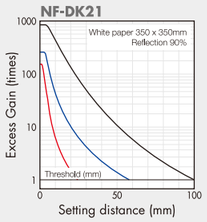
NF-DB01


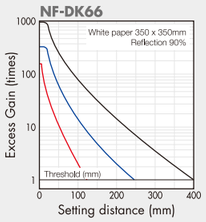
NF-DB03


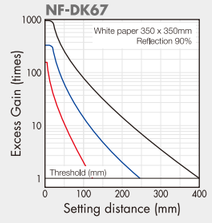
NF-DT01


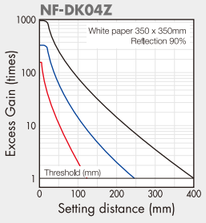
NF-DM02


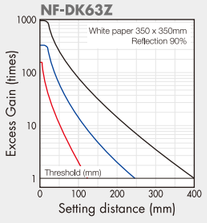
NF-DK23


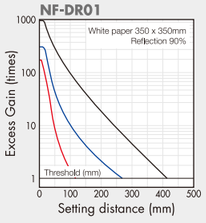
NF-DK21


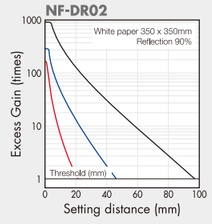
NF-DK66


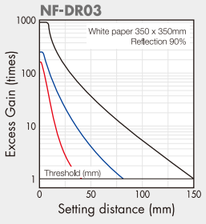
NF-DK67


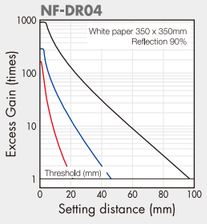
NF-DK04Z


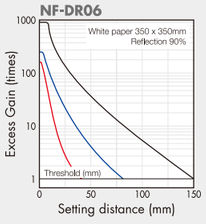
NF-DK63Z


NF-DR01


NF-DR02


NF-DR03


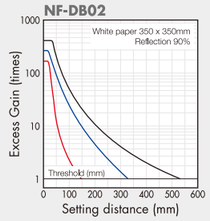
NF-DR04


NF-DR06


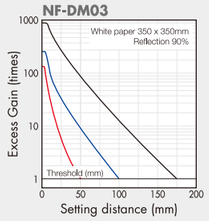
Diffuse Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

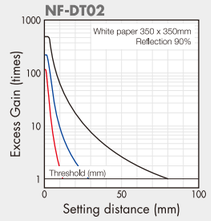
NF-DB02



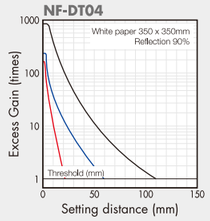
NF-DM03



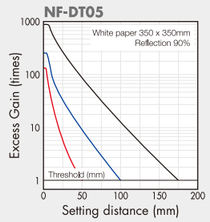
NF-DT02



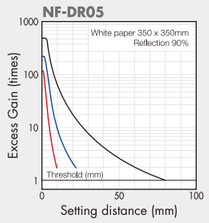
NF-DT04



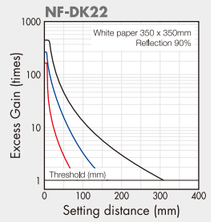
NF-DT05



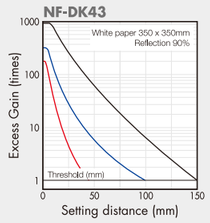
NF-DR05



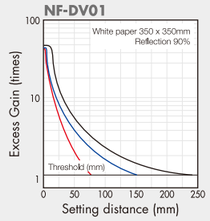
NF-DK22



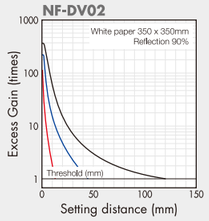
NF-DK43



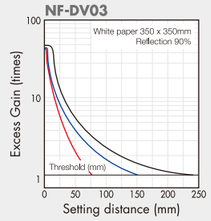
NF-DV01



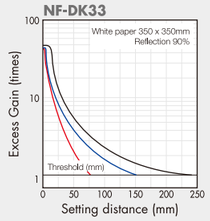
NF-DV02



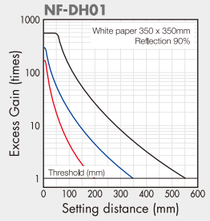
NF-DV03



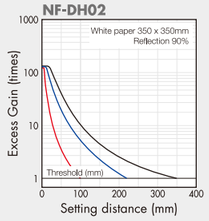
NF-DK33



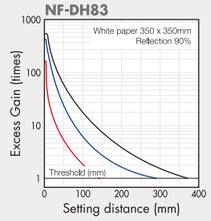
NF-DH01



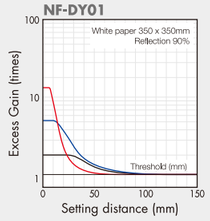
NF-DH02



NF-DH83



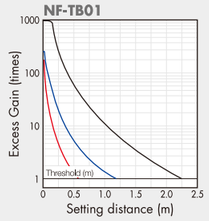
NF-DY01



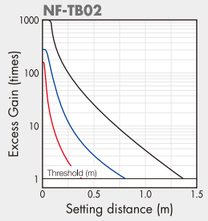
Thru-beam Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

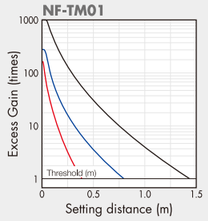
NF-TB01



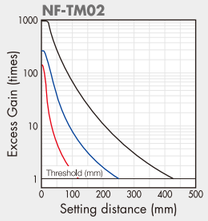
NF-TB02



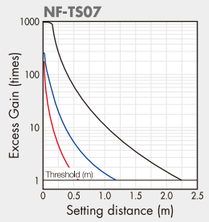
NF-TM01



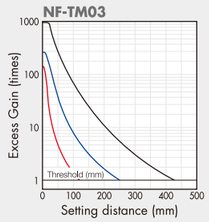
NF-TM02



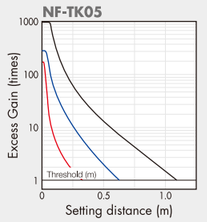
NF-TS07



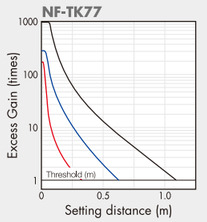
NF-TM03



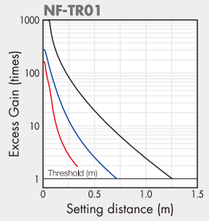
NF-TK05



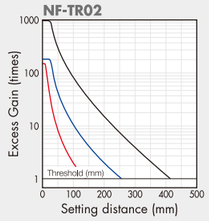
NF-TK77



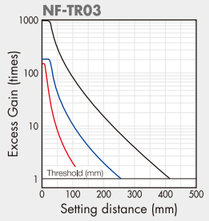
NF-TR01



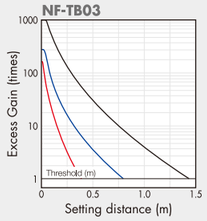
NF-TR02



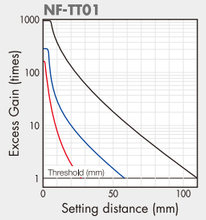
NF-TR03



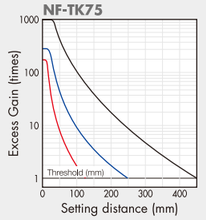
NF-TB03



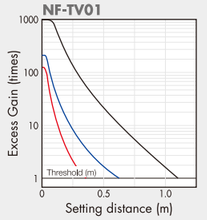
NF-TT01



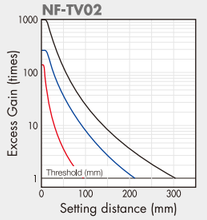
NF-TK75



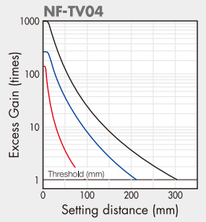
NF-TV01



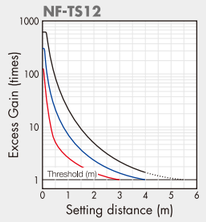
NF-TV02



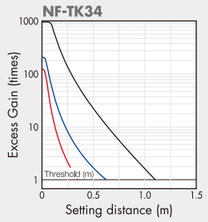
NF-TV04



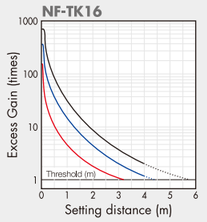
NF-TS12



NF-TK34



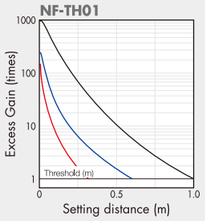
NF-TK16



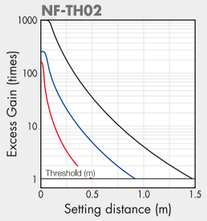
Thru-beam Type Fibers + D2RF amplifier
Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

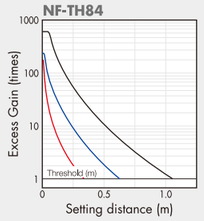
NF-TH01



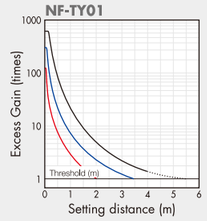
NF-TH02



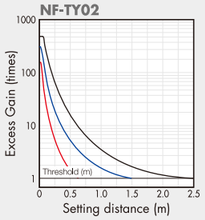
NF-TH84



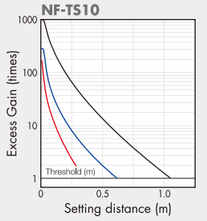
NF-TY01



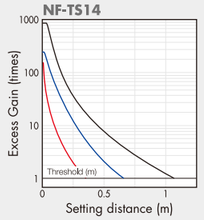
NF-TY02



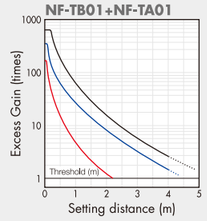
NF-TS10



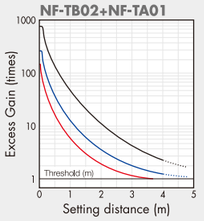
NF-TS14



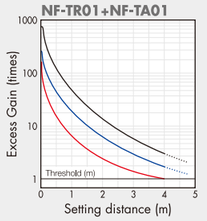
NF-TB01+NF-TA01



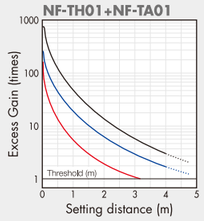
NF-TB02+NF-TA01



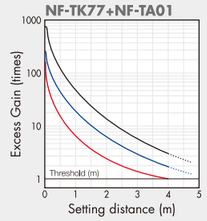
NF-TR01+NF-TA01



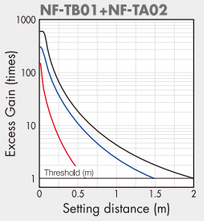
NF-TH01+NF-TA01



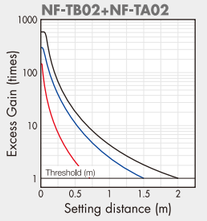
NF-TK77+NF-TA01



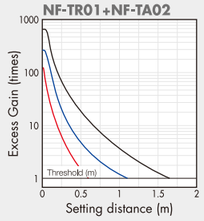
NF-TB01+NF-TA02



NF-TB02+NF-TA02



NF-TR01+NF-TA02



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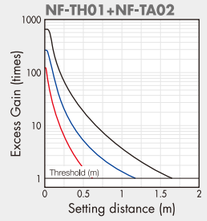
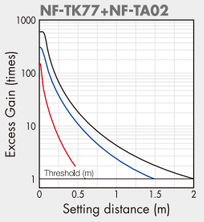
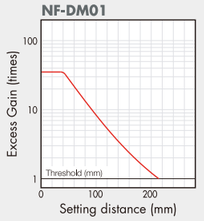


NF-TK77+NF-TA02

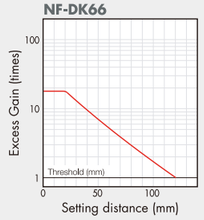


Diffuse Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)

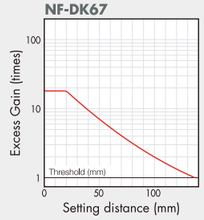
NF-DM01



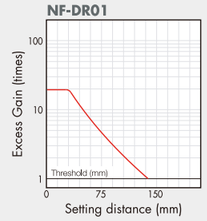
NF-DK66



NF-DK67



NF-DR01



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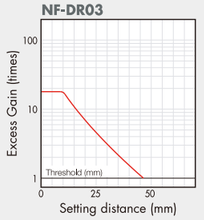
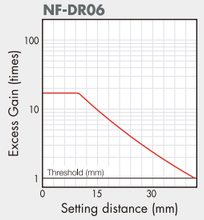
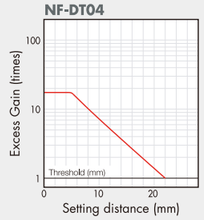


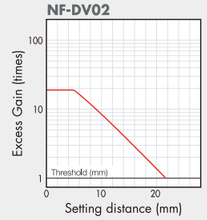
NF-DR06



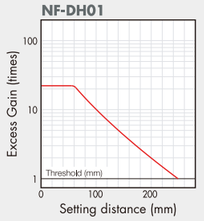
NF-DT04



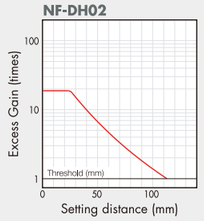
NF-DV02



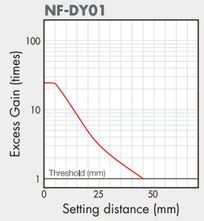
NF-DH01



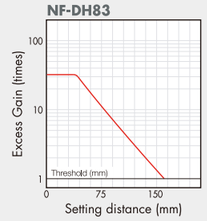
NF-DH02



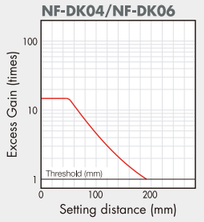
NF-DY01



NF-DH83



NF-DK04/NF-DK06



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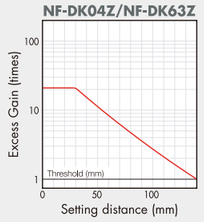
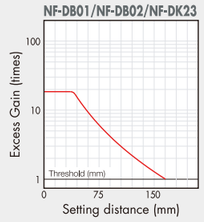
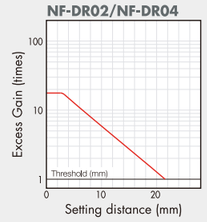


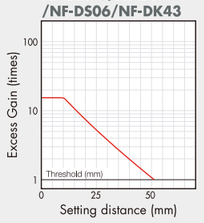
NF-DB01/NF-DB02/NF-DK23



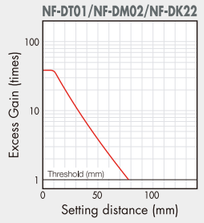
NF-DR02/NF-DR04



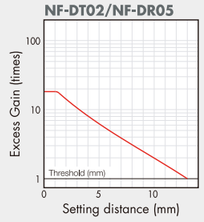
NF-DM03/NF-DT03 /NF-DS06/NF-DK43



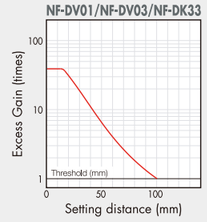
NF-DT01/NF-DM02/NF-DK22



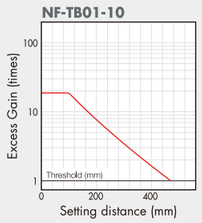
NF-DT02/NF-DR05

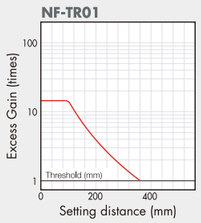


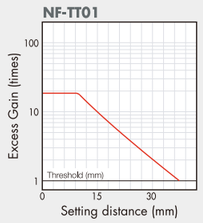
NF-DV01/NF-DV03/NF-DK33

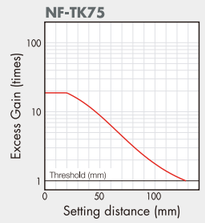


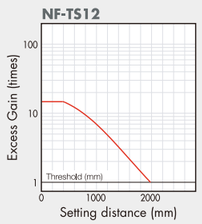
Thru-beam Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)

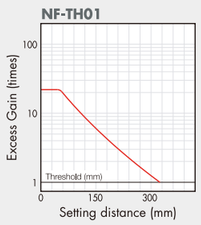


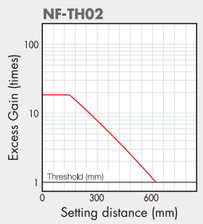


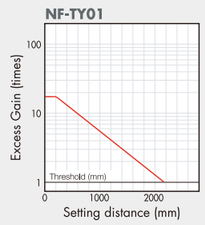


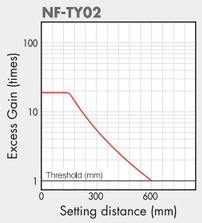


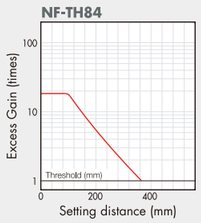


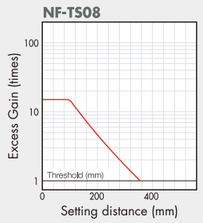


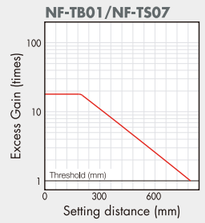


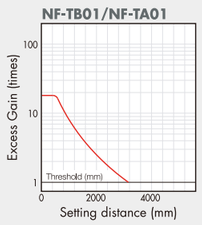


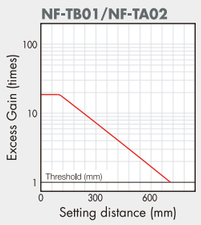


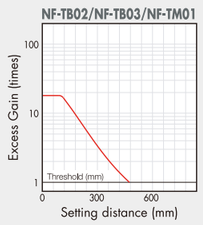


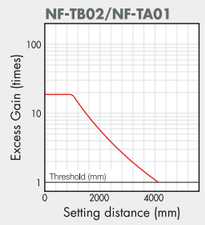


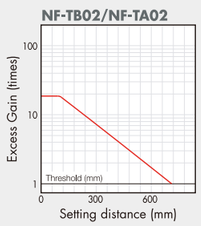


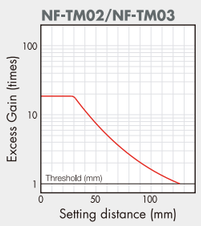


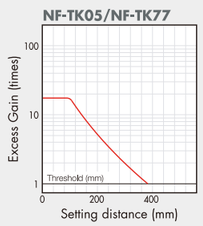


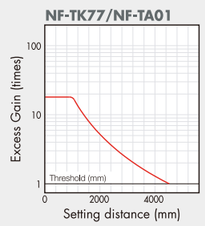


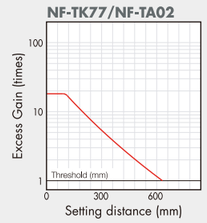


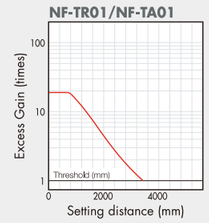


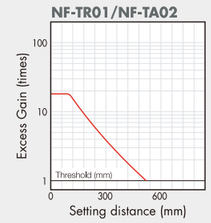


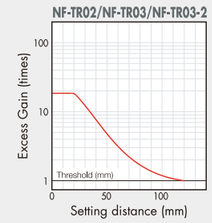


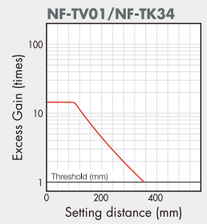


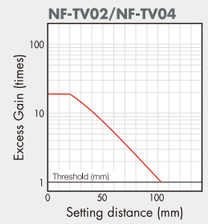


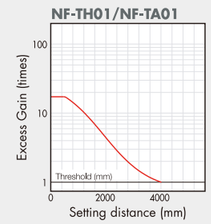


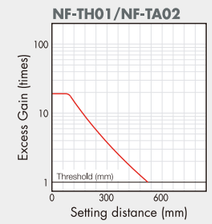










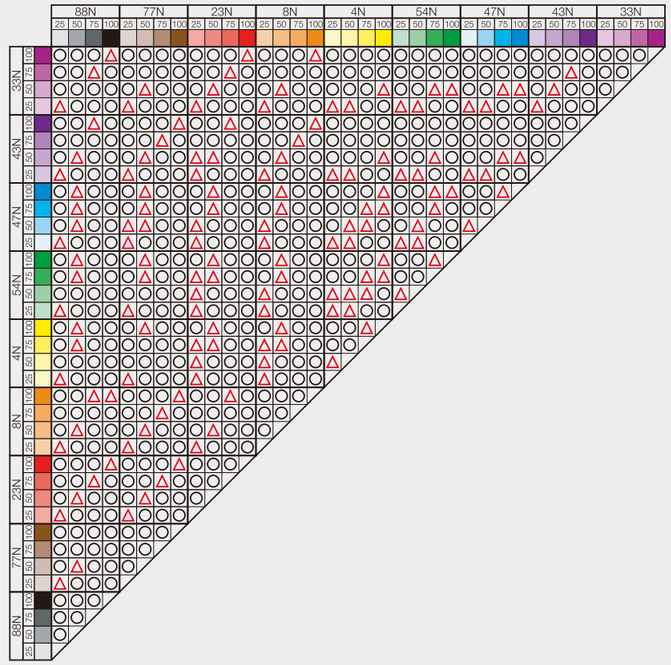


Color combination reference by amplifiers.

BGF series

○ : Stable

△ : Not recommended



Thru-beam type
- NF02-TK
- NF25-T
- NF25-TH

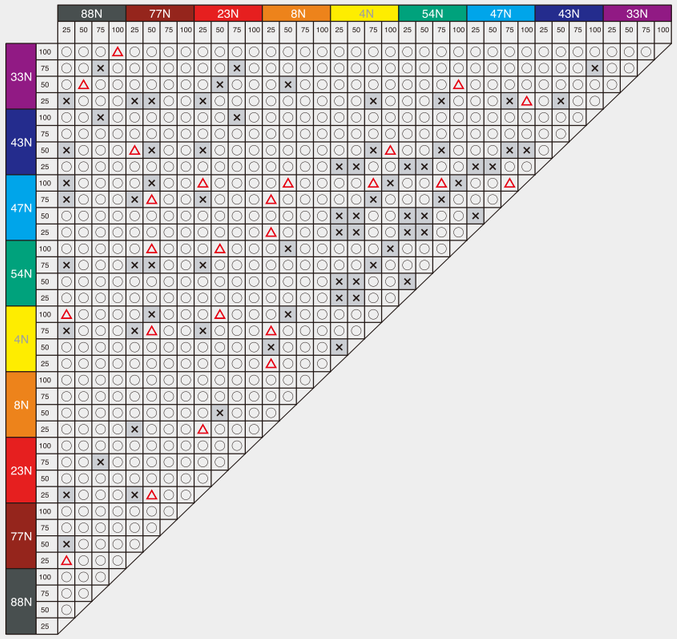
Diffuse reflective type
- NF02-DK
- NF25-D
- NF25-DH

- ***Hex shaped fiber sensing head is ideal for space-savings and easy mounting.***
- ***Available in Standard, Tight Bend and High Temperature models.***

Color combination reference by amplifiers.

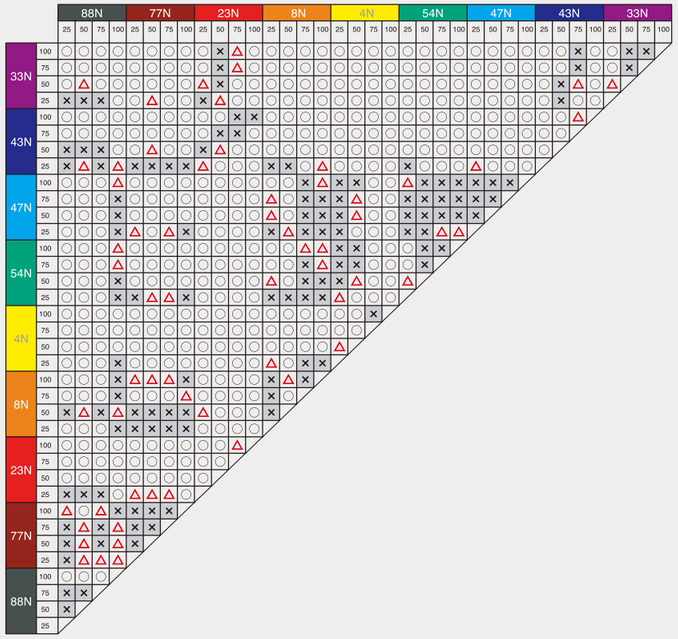
D2GF series (Standard mode)

◯ : Stable
△ : Not recommended
× : Impossible

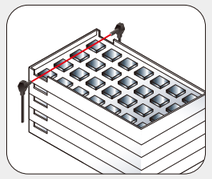


D2GF series (Long mode)

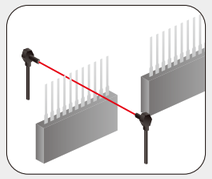
◯ : Stable
△ : Not recommended
× : Impossible



Applications



Detecting IC height

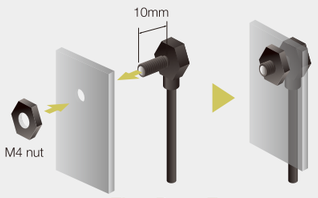


Checking IC pins (using slit masks)

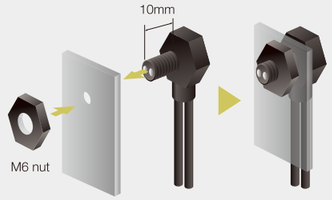
Features

Easy Mounting

The NF25/02 fiber cables (M4 Thru-beam / M6 Diffuse Reflective) are easily mounted using the threaded tip. All that is required for mounting is a single nut.
The threaded tip is sufficient in length to extend through most mounting surfaces.



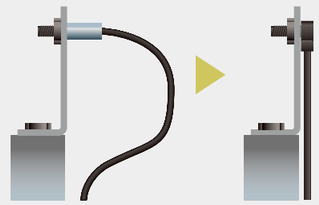
Thru-Beam Type



Diffuse Reflective Type

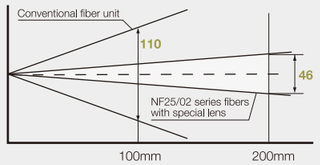
Space-saving installation

The design of the sensing head allows for installation in areas where a standard cable cannot be used.



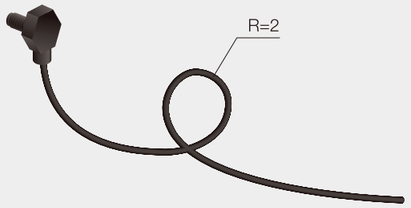
Narrow Beam Angle

The NF25/02 fiber cables have a lens mounted on the tip of the sensing head to project a narrow beam.



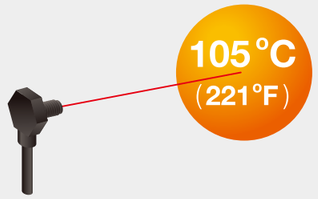
Tight Bend Type NF02 (R=2 mm)

The NF02 series can be bent to a 2 mm radius. This makes it ideal when mounting in areas where space is limited and helps to prevent the cable from becoming entangled with other parts of the equipment.



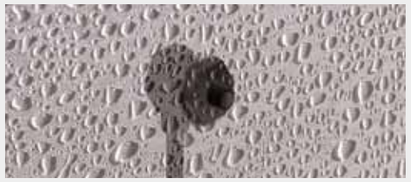
High Temperature Type NF25-H

The NF25-TH (Thru-beam) and NF25-DH type fibers are designed for use in high temperature applications.
The cables are rated up to 105 °C (221 °F).



IP67 Rating

Both the NF25 (Regular and High Temp) and the NF02 (Tight Bend) have a plastic housing, making them resistant to water and corrosion.



New Ergonomic Fiber Cutter

The NF25 and NF02 are free cut type fibers. The cutter that is included with the package has been ergonomically designed to make cutting the cable quick and easy.

The NF25/02 fiber cables can be used with any Optex FA Amplifier.

D2RF series
Digital amplifier

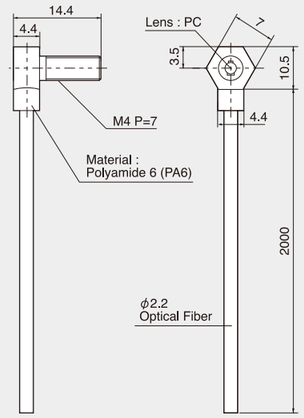
▶P117

BRF series
Pot type economical amplifier

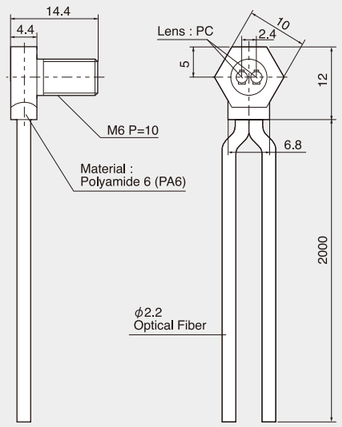
▶P125

Dimensions

Thru-Beam Type



Diffuse Reflective Type



(Unit : mm)

Sensing Distance

Thru-Beam Type

Type		Distance / Response		Radius	Operating Temp.
D2RF					
NF25-T	Standard	60μs	200	R25	–40C°~70C°
		250μs	600		
		2ms	800		
NF25-TH	High temperature	60μs	170	R25	–40C°~105C°
		250μs	500		
		2ms	750		
NF02-TK	Tight bend	60μs	150	R2	–40C°~70C°
		250μs	500		
		2ms	600		
D2GF					
NF25-T	Standard	60μs	100	R25	–40C°~70C°
		250μs	250		
		2ms	400		
NF25-TH	High temperature	60μs	40	R25	–40C°~105C°
		250μs	120		
		2ms	150		
NF02-TK	Tight bend	60μs	70	R2	–40C°~70C°
		250μs	250		
		2ms	300		
BRF					
NF25-T	Standard		350	R25	–40C°~70C°
NF25-TH	High temperature		300	R25	–40C°~105C°
NF02-TK	Tight bend		270	R2	–40C°~70C°
BGF					
NF25-T	Standard		150	R25	–40C°~70C°
NF25-TH	High temperature		100	R25	–40C°~105C°
NF02-TK	Tight bend		130	R2	–40C°~70C°
BRF-H					
NF25-T	Standard		150	R25	–40C°~70C°
NF25-TH	High temperature		130	R25	–40C°~105C°
NF02-TK	Tight bend		130	R2	–40C°~70C°

Diffuse Reflective Type

Type		Distance / Response		Radius	Operating Temp.
D2RF					
NF25-D	Standard	60μs	25	R25	–40C°~70C°
		250μs	80		
		2ms	120		
NF25-DH	High temperature	60μs	25	R25	–40C°~105C°
		250μs	80		
		2ms	120		
NF02-DK	Tight bend	60μs	10	R2	–40C°~70C°
		250μs	45		
		2ms	65		
D2GF					
NF25-D	Standard	60μs	5	R25	–40C°~70C°
		250μs	25		
		2ms	40		
NF25-DH	High temperature	60μs	-	R25	–40C°~105C°
		250μs	9		
		2ms	15		
NF02-DK	Tight bend	60μs	-	R2	–40C°~70C°
		250μs	10		
		2ms	18		
BRF					
NF25-D	Standard		45	R25	–40C°~70C°
NF25-DH	High temperature		45	R25	–40C°~105C°
NF02-DK	Tight bend		15	R2	–40C°~70C°
BGF					
NF25-D	Standard		15	R25	–40C°~70C°
NF25-DH	High temperature		10	R25	–40C°~105C°
NF02-DK	Tight bend		10	R2	–40C°~70C°
BRF-H					
NF25-D	Standard		15	R25	–40C°~70C°
NF25-DH	High temperature		10	R25	–40C°~105C°
NF02-DK	Tight bend		10	R2	–40C°~70C°

Timing Comparator

What is a "Timing Comparator"? - It's a brand new concept in sensing.
The TMC Timing Comparator is a signal processing unit that senses not only the On and Off transitions but also memorizes the timing of the incoming signals. These On and Off signals are indicators of the shape of the target that the TMC uses to determine if the correct part is present.

TMC series 159

Timing Comparator

TMC series

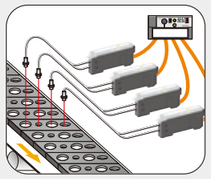
·TMC-N11 NPN type ·TMC-P11 PNP type

- ***TMC "Timing Comparator" a new concept in product sorting applications.***
- ***Any sensor (Digital output, Analog output) is applicable for use with the TMC module.***
- ***Monitor the signals from 1 analog output device or 4 digital output devices.***

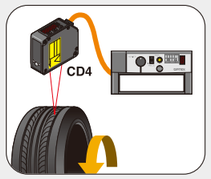
  The timing of the output signals can be used to determine the shape of the object.

  The "CVS-M1 remote monitor" can be used to monitor the settings of the TMC.

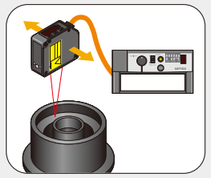
Applications



To identify the pattern of holes in a rubber piece.



Depth of tread



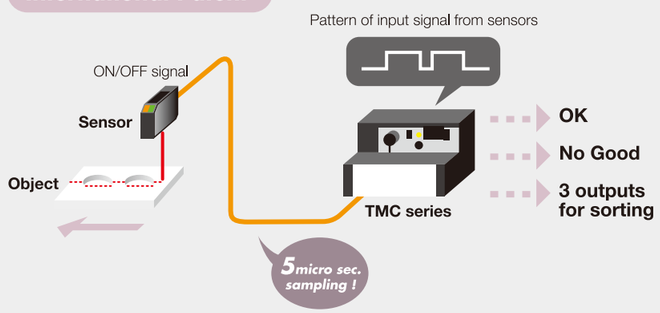
Shape of cast part

Features

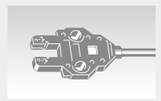
A brand new concept in sensing.

The TMC Series "Timing Comparator" is a Signal Processing Unit that senses not only the ON / OFF signal from a sensor but also memorizes the "timing" of the incoming signals. It can monitor the signals from up to 4 devices. These ON / OFF signals are indicators of the shape. The TMC uses this to identify the shape of the object. This is quite a new way of sorting / identifying. Any sensor that outputs an ON / OFF signal is applicable for use with the TMC Series Timing Comparator. It is possible to not only detect the presence of an object, but to also detect the orientation, shape, etc.

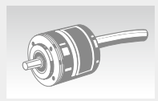
International Patent



The TMC works with any type of sensor with an ON / OFF output.



Photomicro sensor



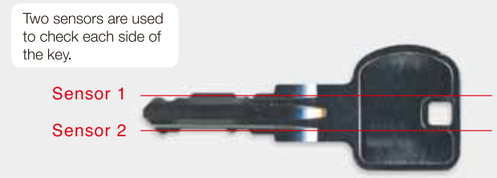
Encoder

Pressure sensor

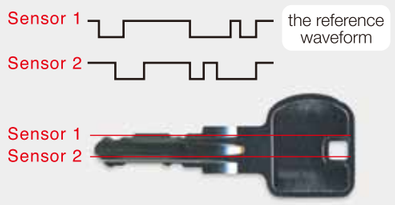
Inductive / Capacitive sensor

"Timing" is stored and compared like this

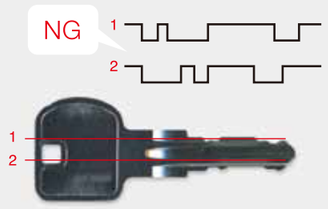
The TMC Timing Comparator memorizes the timing pattern of the incoming signals (sensor outputs). It is possible to monitor a maximum of 4 sensors. Once the pattern of the object has been stored by teaching, the TMC will compare the preset pattern with the incoming signals. The photo at the below shows an example where a key is being checked for the correct orientation. Two sensors are used.



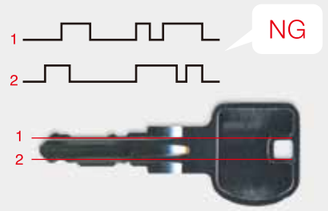
Sampled pattern for Teach-in



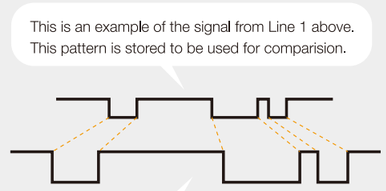
Opposite direction



Reverse



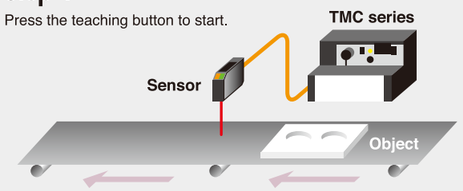
Line speed doesn't matter.



Easy setup just 3 steps!

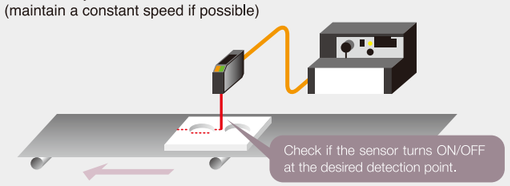
Step 1

Press the teaching button to start.



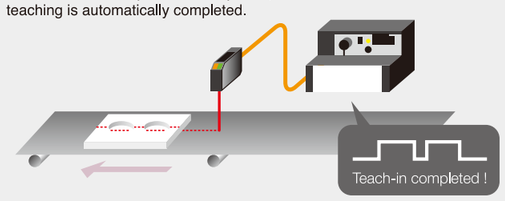
Step 2

Scan the object
(maintain a constant speed if possible)



Step 3

Then, after time-out period that is preset, teaching is automatically completed.

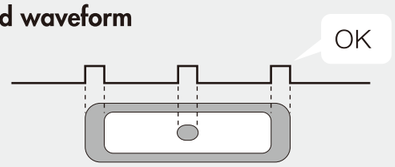


STANDARD MODE : Detection of incorrect objects.

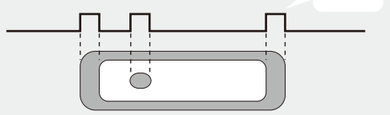
The outside shape is OK, but the position, the number or the size of the inner pins is incorrect. In the past you may have been using an expensive vision system for this type of workpiece. These can be complicated to setup and use.

The TMC Timing Comparator offers a simple and easy solution in a totally new concept. It features simple setup and easy processing at a much lower cost than vision systems.

Stored waveform

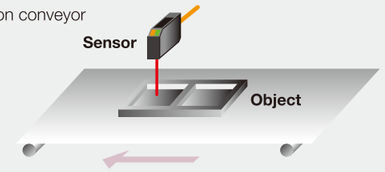


Incorrect position of hole.

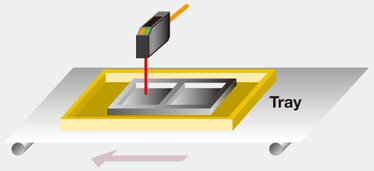


For teach-in and sensing, the object must move but not necessarily at a constant speed.

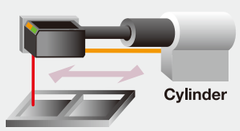
(1) Inspection on conveyor



(2) Inspection when the index table is moving



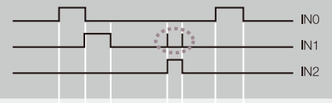
(3) Inspection by moving the sensor



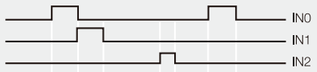
ANALOG MODE : Pushbutton Teach is fast and simple, for Analog mode too.

Use the analog output of the CD3 or CD4 Displacement sensors to sort products. For example, sorting tires by measuring the depth of tread.

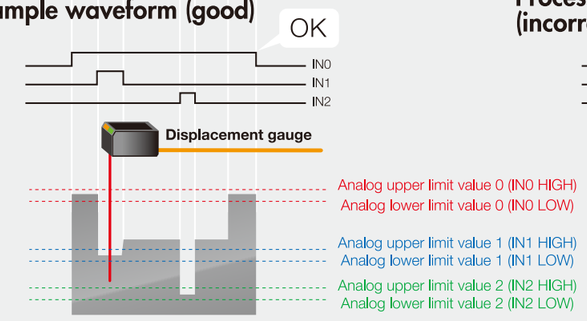
By comparing the stored patterns against the CD3 or CD4 Displacement sensor output it is possible to identify the product.



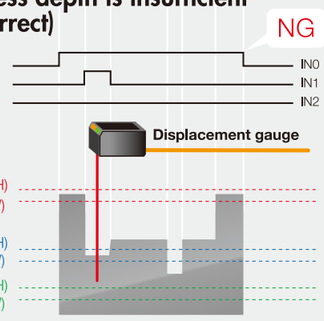
Teaching waveform



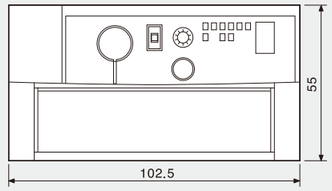
Sample waveform (good)



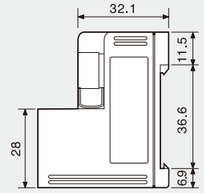
Process depth is insufficient (incorrect)



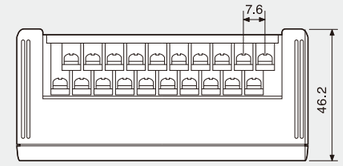
Dimensions



Front



Side



bottom

(Unit : mm)

Specifications

Model	TMC-N11	TMC-P11
Supply voltage	12 - 24V DC ±10%	
Power consumption	Max. 80 mA / 24 V DC	
Input signal	NPN	PNP
Output signal	NPN Open collector	PNPOpen collector
Sensor input	1 to 4	
Teaching / clear input	1 Teaching input and 1 Clear input	
Bank selection	3 (7 types with binary format)	
Input response time	5 µs - 25.6 ms	
Output response time	Max. 5 µs	
OK / NG output	1 OK output and 1 NG output	
Sorting output	3 (7 types with binary format)Used together with Bank selection input	
Maximum open / close capacity	Max. 100 mA	
Output leakage current	Max. 100 µA	
Output residual voltage	Max. 0.8 V	Max. 1.8 V
Analog resolution	10 bit (1 bit = 6.45 mV / 25.8 µA)	
Accuracy	± 0.2 % of F.S. (F.S. = 6.6 V / 26.4 mA)	
Linearity	± 0.2 % of F.S.	
Input ON voltage	Min. 7.8 V	
Input OFF current	Max. 1.0 mA	
Input current (typical)	7.1 mA / 24 V DC	
Input impedance, Input voltage range	3.3kΩ, 0 - Supply voltage (AIN excluded)200kΩ, 0 - 6.5 V (AIN voltage input)250Ω, 0 - 26 mA (AIN current input)	
Temp drift	± 80 ppm/°C	
Operating temp	0 - 55°C	
Operating humidity	35 - 85 %/RH	
Storage temp	–20 - 70°C	
Storage humidity	25 - 95 %/RH	
Vibration resistance	10 - 55 Hz Amplitude 1.5 mm	
Shock resistance	5 G (10 times)	
Housing material	ABS	
Weight	Approx. 130 g	

Displacement Sensors

Displacement sensors must be easy to operate, compact in size and have high accuracy.
Optex-FA offers the CD1 and the CD3 series of laser displacement sensors for OEM use that may demand compact dimensions.
CD4 series Specular Type provides 0.1 µm resolution as well as +/- 0.1% accuracy.

CD1 series	165
CD3 series	171
CD4 series	177
CD4L-25 series	185

Laser Displacement Sensor : PSD system

CD1 series

(Sensing distance : 30±4mm)
・CD1-30N / P / CN / CP

(Sensing distance : 50±10mm)
・CD1-50N / P / CN / CP

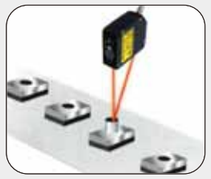
(Sensing distance : 100±35mm)
・CD1-100N / P / CN / CP

(Sensing distance : 130±50mm)
・CD1-130N / P / CN / CP

(Sensing distance : 250±150mm)
・CD1-250N / P / CN / CP

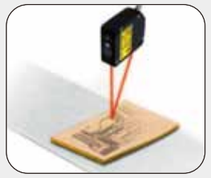
- ***As small as the best dimensions for Built-in use for OEM machine.***
- ***Versatility from 30+/-4mm to 250+/-150mm distance.***
- ***Both transistor and analogue output applicable to digital panel meter if you need display and signal control.***

Applications



Checking mechanical parts.

Level check of food package



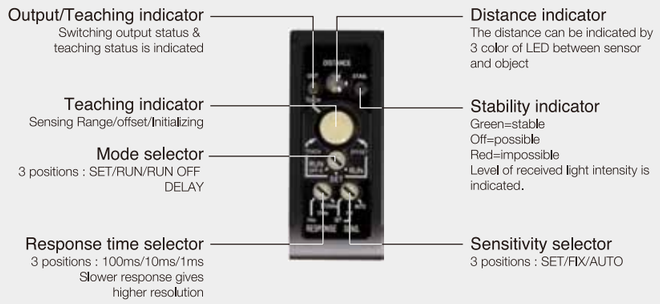
Checking height of components.

Cap of bottled beverage

Five different types of products give variety of distance

OEM Use CD1 series	measuring distance
CD1-30	30 +/- 4mm
CD1-50	50 +/- 10mm
CD1-100	100 +/- 35mm
CD1-130	130 +/- 50mm
CD1-250	250 +/- 150mm

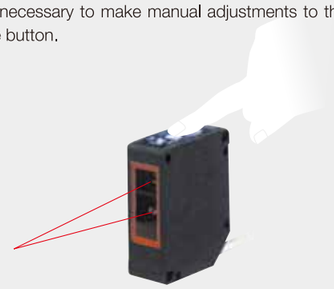
Control panel



Features

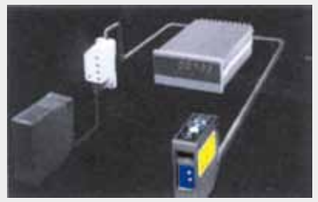
Teach-in system

The CD1 is simple to setup and easy to operate.
It is not necessary to make manual adjustments to the sensor, just push the button.



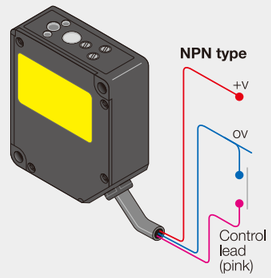
All-in-one solution

The amplifier and sensor are built-in, the CD1 is a complete self-contained sensor.



Remote teaching input

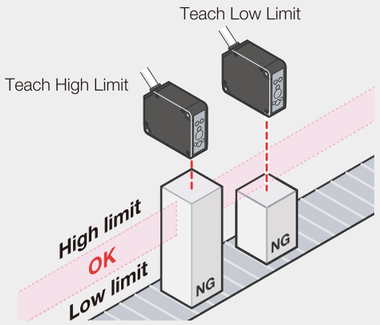
The teaching procedure can be carried out remotely by using the remote teach input. There is no need to perform this step at the sensor.
This feature is good for OEM machine builders.



Easy set-up and Measuring

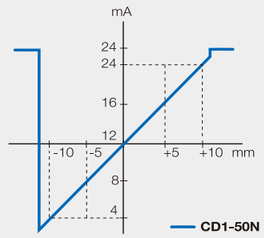
The High and Low limit of the measuring range can be set.

1: Go to the SET mode.
2: Teach the High and Low limit using the workpiece.
3: Return to RUN mode.



Dual Output - Digital On/Off and Analog

There is a choice of NPN or PNP transistor for the control output, choose the model number based on the desired type.
The 4 to 20 mA analog output is standard on both types.



IP67 rating

This stand-alone unit is protected with IP67 design.

Class 2 laser product

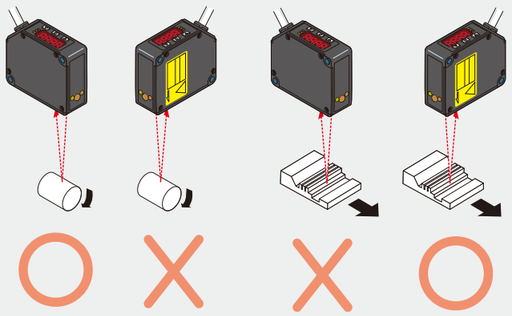
Classified to Class 2 laser, 650mm, Max 1mW.

Linearity

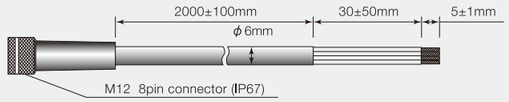
Analogue output in Voltage will increase in proportion to the distance to the traget. An ideal relation between analogue value and distance shall be theoretically indicated in a straight line (as illustrated), but the actual line deviates slightly. “Linearity” indicates the tolerance between the theoretical and actual value. Linearity is indicated by % against Full Scale (FS) value. For examples of CD3-30, Linearity is 1% against FS (8mm), therefore; +/- 8mm x 0.01 = +/- E1120.08mm will be the linearity.

Hint of installation for best accuracy

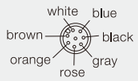
To obtain accuracy the sensor head must be oriented as shown below.



M12 exclusive connector CD3CN-S. Applicable for CD1 (2M standard. 5M type is available as option)



brown	— DC12-24V	gray	— Blank input
black	— Control output	rose	— Remote teach
blue	— OV	orange	– Ground
white	— Analogue		



Resolution

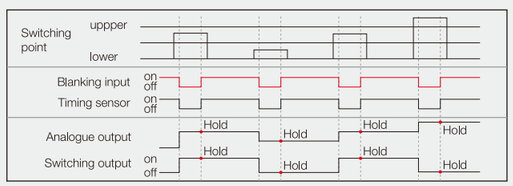
Analogue output is always influenced by internal noise and gives slight fluctuation at analogue output voltage. The amount of fluctuation is called as Resolution. Resolution is defined against FS (Full Scale), and depends on Response Time.

Temperature Drift

The analogue output is influenced as surrounding temperature fluctuates. Temperature Drift referes to the change of analogue output. This is defined as % against Full Scale (FS) for instance(CD3-30,FS 8mm) Temperature Drift 0.08% / Celsius means : 8mm x 0.0008 = 0.006mm / Celsius

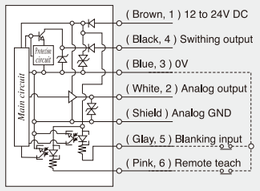
Blanking input

Measuring / switching timing can be easily provided via this input. Analogue and seitching output can be held according to the pulse duration a second sensor (NPN / PNP).

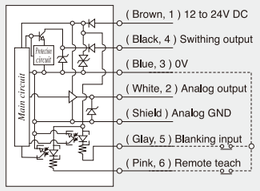


Circuit diagram

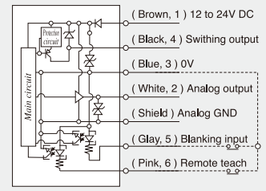
Cable type



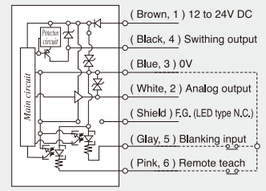
Connector type



Cable type

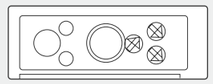


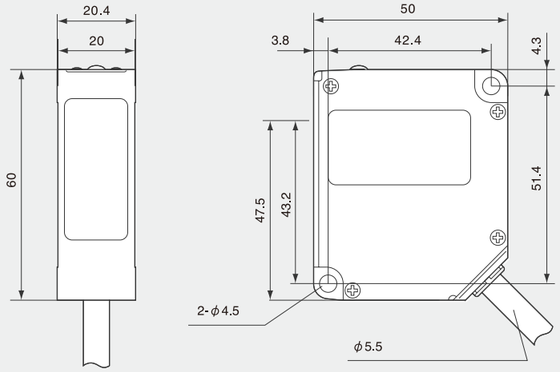
Connector type



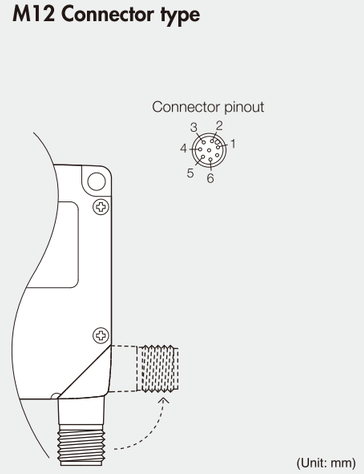
Dimensions

Cable type





M12 Connector type



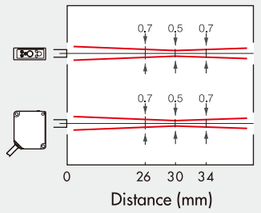
(Unit: mm)

Specifications

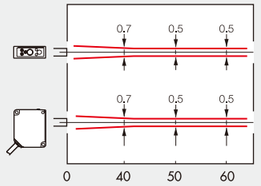
	CD1 Series, PSD system Laser type Displacement Sensor				
Cable	**CD1-30N/P**	**CD1-50N/P**	**CD1-100N/P**	**CD1-130N/P**	**CD1-250N/P**
M12 Connector	**CD1-30CN/CP**	**CD1-50CN/CP**	**CD1-100CN/CP**	**CD1-130CN/CP**	**CD1-250CN/CP**
Transistor output	N = NPN output, P = PNP output				
Measuring range	30+/-4mm	50 +/- 10mm	100 +/- 35mm	130 +/- 50mm	250 +/- 150mm
FS(full scale)	8mm	20mm	70mm	100mm	300mm
Light source	Class 2 Laser, 650nm, Max 3.3mW				
Spot size	ϕ0.1mm	ϕ0.5mm	0.5 X 1.2 mm	0.5 X 1.5 mm	0.8 X 1.2 mm
Supply voltage	12 - 24V DC (–5 to +10%)				
Power consumption	Max 120mA (DC12V), 75mA (DC24V), including analog output current				
Resolution (typical value)	(Unit : Micron. Under AUTO sensitivity. White ceramic as an object)				
(Response Speed 100msec)	1	3	15	20	150
(Response Speed 10msec)	3	10	50	70	500
(Response Speed 1msec)	10	30	150	200	1500
Linearity	+/- 2% FS	+/-1% FS	+/- 2% FS	+/- 3.5% FS	+/- 5% FS
Temp drift	+/- 0.02% FS/ Celsius				
Response time	100msec / 10msec / 1msec selectable				
Sensitivity adjustment	SET / FIX / AUTO				
Analogue output	4-20mA				
Control output	NPN or PNP, Max 100mA/DC30V, Residual Voltage Max 1.8V				
Distance indicator	Red = Near, Orange = Middle, Green = Far, Red/Green = Error *Remark : Errors as "out of measuring range", "Too high reflection", etc				
Stability indicator	Green = Stable, Red = Error, No light = Unstable, need adjustment				
Output indicator	Orange = Output				
Teach-in indicator	Green = Input, Red = Error				
Blanking input	NPN = Gray wire to 0V, PNP = Gray wire to +V				
Delay function	Off delay 40msec				
Environmental illuminance	Sun light : Max 10,000 lux, Incandescent Lamp = Max 3,000 lux				
Operating temp	–10 to 40°C				
Operating humidity	35 to 95% RH				
Material	Zinc diecast				
Protection category	IP67				
Conformity	CE				
Warm-up time	30 minutes				

Spot size (typical)

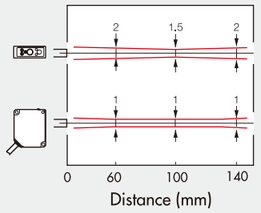
CD1-30N



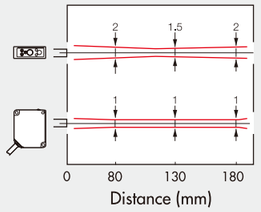
CD1-50N



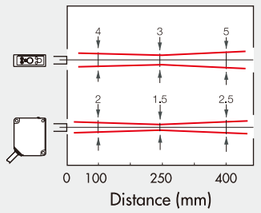
CD1-100N



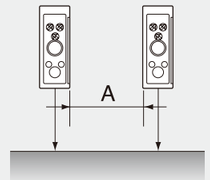
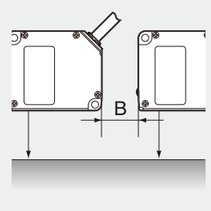
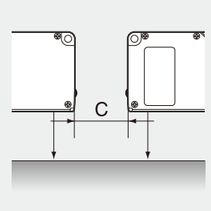
CD1-130N



CD3-250N



Cross-talk area (typical)

	CD1-30N **CD1-50N** **CD1-100N** **CD1-130N** **CD1-250N**
	A=10mm
	B=5mm
	C=10mm

M12 QD type

Cable type

Laser Displacement Sensor : CMOS system

CD3 series

(Sensing distance : 30±4mm)
・CD3-30N / P / CN / CP

(Sensing distance : 80±15mm)
・CD3-80N / P / CN / CP

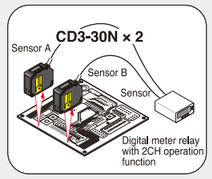
(Sensing distance : 250±150mm)
・CD3-250N / P / CN / CP

(Sensing distance : 50±10mm)
・CD3-50N / P / CN / CP

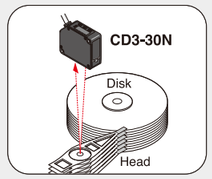
(Sensing distance : 100±40mm)
・CD3-100N / P / CN / CP

- ***CMOS Image Sensor for high accuracy displacement measurement.***
- ***Span adjustment and Offset functions for flexible control of analogue output.***
- ***Preset alarm for Peak/Bottom limit of analogue value.***
- ***Accurate detection of dark colored targets.***

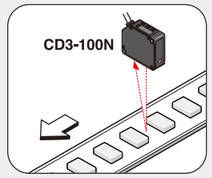
Applications



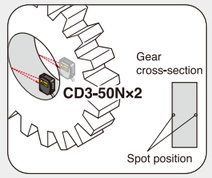
Detection of Warp in Circuit Board



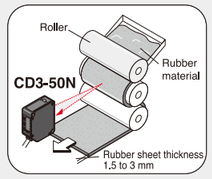
Detection of Warp in HDD Assembly and Actuator



Measurement of product thickness



Interior diameter inspection of gear



Thickness Measurement of Rubber Sheets

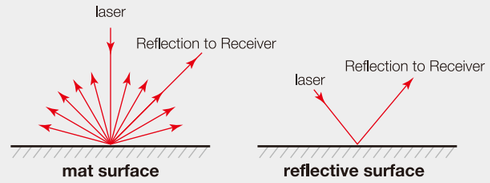
Five different types of products give variety of distance

Whith digital display CD3 series	measuring distance
CD3-30	30 +/- 4mm
CD3-50	50 +/- 10mm
CD3-80	80 +/- 15mm
CD3-100	100 +/- 40mm
CD3-250	250 +/- 150mm

Measurement Principle - CMOS Image sensor

CMOS Image Sensor CD3 Series Displacement Sensors use a Triangulation Measurement System. The CMOS Image element provides accurate measurement that has been impossible with conventional products.

While PSD type displacement sensors are sometimes influenced by the surface condition of the target.

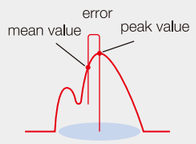


Displacement sensors operate by detecting the reflection of the projected light from the surface, this reflection can sometimes be effected if the surface is rough or reflective.

The CD3 series "CMOS Image" type displacement sensor gives stable and accurate measurement by detecting the "real peak value" for precise distance calculation.

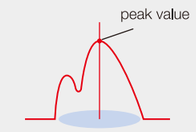
Spot of PSD

A conventional displacement sensors that uses a PSD sensing element detects the mean value of the reflected light. This can sometimes be at a different location than the peak value of incoming reflected light if the surface is too reflective.



Spot of CMOS image sensor (CD3 series)

The CD3 Series displacement sensor uses a CMOS Image sensing system that detects the peak value without being influenced by the dispersion of light from the surface. This method minimizes errors and provides accurate measurement.



Simple Pushbutton Teach, and Easy-to-view digital panel.

stability indicator

Green — Stable operation
Dark — Unstable operation
Red — No operation due to low light or too much light

distance indicator

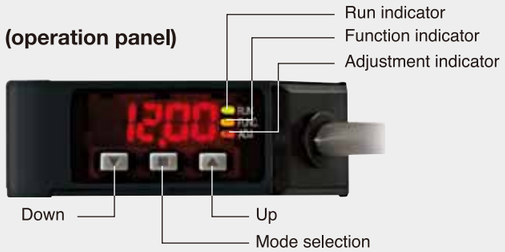
Actual distance between sensor and object as below.

green / red blinking	Out of range
red	Near limit
orange	+/- 5% of reference distance
green	Far limit
red / green blinking	Out of range

Remarks : The border between the Near / Far Limit and Out of range depends upon the sensor model.

output indicator

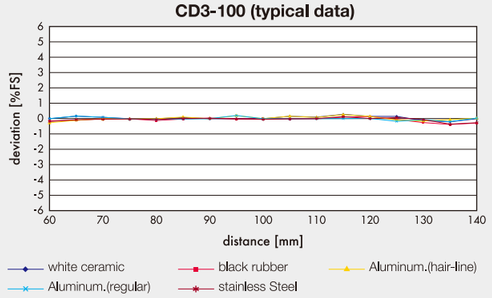
(operation panel)



Features

Stable measurement even of high reflection materials like glass.
Even black object doesn't matter.

CD3-100 (typical data)



Voltage output coverter CV-15

If you need to convert 4-20mA analogue output into 1-5V voltage output connect the resistor CV-15.

Digital Meter, etc

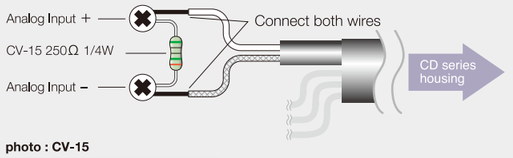
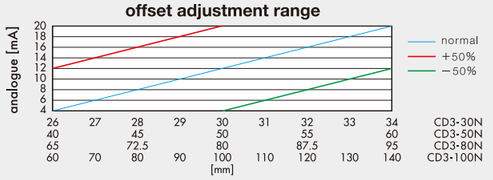


photo : CV-15

Offset

"Offset function" shifts the output value in either positive or negative direction. When the sensor is desired to use with relatively preset value of "0". This is possible as far as it is within the measuring range.

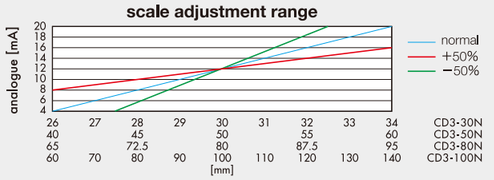
offset adjustment range



Span adjustment

Span adjustment changes the proportion of output value (displacement) to the distance. This is available within +/-50% against rated value.

scale adjustment range



Analogue restraint function

In case analogue value overflows the limit, you can choose ; CLP mode = Analogue value remains 24mA for any overflowing value.
HOLD mode = Analogue value is held at the last value before overflow.

AUX input

AUX input is customized by interconnecting between Rose and Gray wires to have BANK setting, Laser-off, Zero-reset, etc.

BANK memory

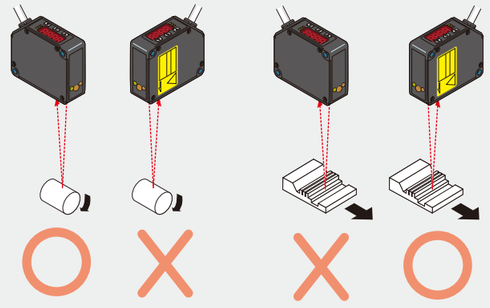
4 banks are available for memory.

IP67 rating

This stand-alone unit is protected whith IP67 design.

Hint of installation for best accuracy

To obtain accuracy the sensor head must be oriented as shown below.

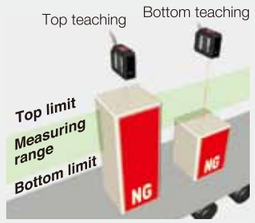


Class 2 laser product

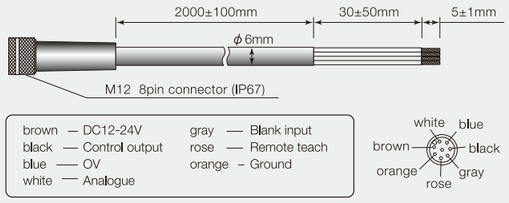
Classified to Class 2 laser, 650mm, Max 1mW.

Control output pre-setting enables to restrict top and bottom limit to work between.

By using built-in digital panel meter, you can set measuring range of open collector output without object.
Off course, teaching set-up is available by reading actual workpiece.



M12 exclusive connector CD3CN-S. Applicable for CD3 (2M standard. 5M type is available as option)



Resolution

Analogue output is always influenc ed by internal noise and gives slite fluctuation at analogue output voltage. The amount of fluctuation is called as Resolution. Resolution is defined against FS (Full Scale), and depends on Response Time.

Linearity

Analogue output in Voltage will increase in proportion to the distance to the traget. An ideal relation between analogue value and distance shall be theoretically indicated in a straight line (as illustrated), but the actual line deviates slightly. “Linearity” indicates the tolerance between the theoretical and actual value. Linearity is indicated by % against Full Scale (FS) value. For examples of CD3-30, Linearity is 1% against FS (8mm), therefore; +/- 8mm x 0.01 = +/- E1120.08mm will be the linearity.

Temperature Drift

The analogue output is influenced as surrounding temperature fluctuates. Temperature Drift referes to the change of analogue output. This is defined as % against Full Scale (FS) for instance(CD3-30,FS 8mm) Temperature Drift 0.08% / Celsius means : 8mm x 0.0008 = 0.006mm / Celsius

Response Time and Averaging

With Fixed Sensitivity (any value between 1 - 20)

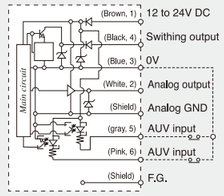
Averaging Value	Analogue output	Control Output
1	1.00 msec	2.2 msec
4	4.05 msec	5.06 msec
16	16.2 msec	17.2 msec
64	64.8 msec	65.8 msec
256	259 msec	260 msec
1024	1037 msec	1038 msec

With Auto Sensitivity

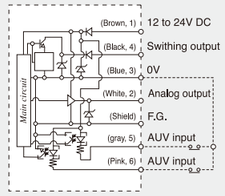
Averaging Value	Analogue output	Control Output
1	21.0 msec	22.5 msec
4	24.1 msec	25.5 msec
16	36.2 msec	37.2 msec
64	84.8 msec	85.8 msec
256	279 msec	280 msec
1024	1057 msec	1058 msec

Circuit diagram

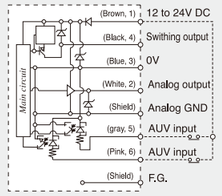
NPN Cable type



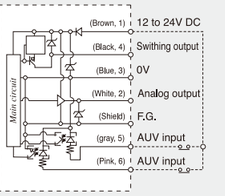
NPN Connector type



PNP Cable type



PNP Connector type

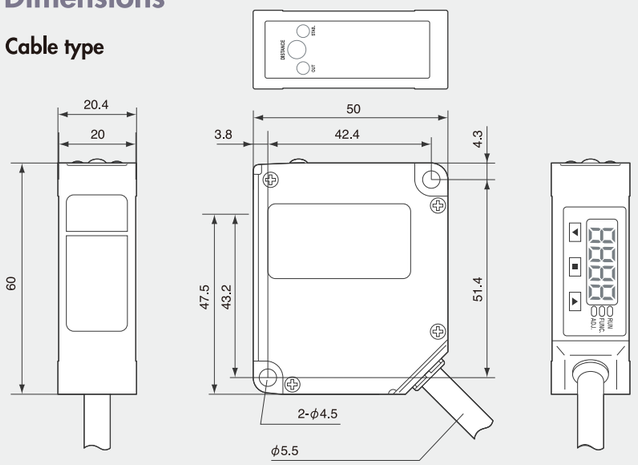


NPN Cable type
NPN Connector type

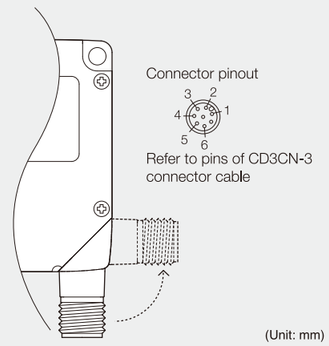
PNP Cable type
PNP Connector type

Dimensions

Cable type



M12 QD type



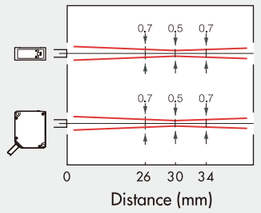
(Unit: mm)

Specifications

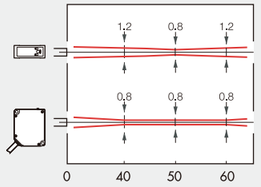
	CD3 Series, CMOS Image Laser Displacement Sensor				
Cable	**CD3-30N/P**	**CD3-50N/P**	**CD3-80N/P**	**CD3-100N/P**	**CD3-250N/P**
M12 Connector	**CD3-30CN/CP**	**CD3-50CN/CP**	**CD3-80CN/CP**	**CD3-100CN/CP**	**CD3-250CN/CP**
Transistor output	N = NPN output, P = PNP output				
Measuring range	30+/-4mm	50 +/- 10mm	80 +/- 15mm	100 +/- 40mm	250 +/- 150mm
FS (full scale)	8mm	20mm	30mm	80mm	300mm
Light source	Class 2 Laser, 650nm, Max 1mW				
Min spot size	ϕ@0.5 mm	ϕ@0.8 mm	1 X 1.5mm	1 X 1.5mm	3 X 1.5mm
Supply voltage	12 - 24V DC (–5 to +10%)				
Sensitivity adjustment	Nominal value 1-20, or AUTO				
Power consumption	Max 120mA (DC12V), 80mA (DC24V), including analog output current				
Resolution (typical value)	(Unit : Micron. Under AUTO sensitivity. White ceramic as an object)				
(Averaging 64: default value)	4	10	10	30	150
(Averaging 1)	12	30	40	80	2mm
(Averaging 4)	8	20	30	60	800
(Averaging 16)	6	12	20	40	400
(Averaging 256)	2	8	8	20	100
(Averaging 1024)	below 2	below 8	below 8	below 10	50
Linearity	+/- 1% FS				+/- 1.5%FS (up to 250mm) +/- 2.5%FS (up to 400mm)
Temp drift	+/- 0.08% FS / Celsius				
Response time	Max 2.2ms (at fixed sensitivity between 1-20),Max 15ms (at Auto sensitivity)				
Sampling rate	500 μs				
Analogue output	4-20 mA				
Control output	NPN or PNP, Max 100mA/DC24V, Residual Voltage Max 1.8V				
Timer	On delay / Off delay / Oneshot (1msec increment for 0-999ms, 1sec for 0-10 sec)				
Distance indicator	Red = Near, Orange = Middle, Green = Far, Red/Green = Error *Remark : Errors as "out of measuring range", "Too high reflection", etc				
Stability indicator	Green = Stable, Red = Error, No light = Unstable, need adjustment				
Control output indicator	Orange = Output (NPN or PNP)				
Environmental illuminance	Sun light : Max 10,000 lux, Incandescent Lamp = Max 3,000 lux				
Operating temp / humidity	–10 to 40 °C, 35 to 95% RH				
Insulation resistance	20 MΩ / DC 500V				
Material	Zinc diecast				
Protection category	IP67				
Conformity	CE				
Warm-up time	30 minutes				

Spot size (typical)

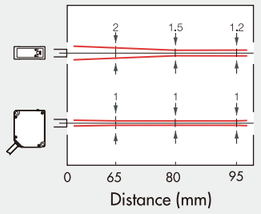
CD3-30N



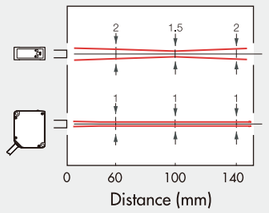
CD3-50N



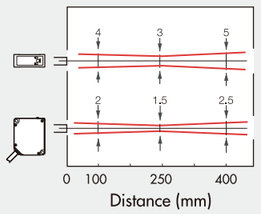
CD3-80N



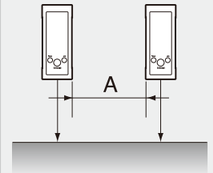
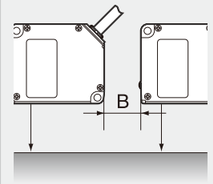
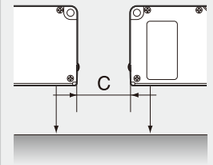
CD3-100N



CD3-250N



Cross-talk area (typical)

	CD3-30N CD3-50N CD3-80N CD3-100N	CD3-250N
	A=10mm	A=20mm
	B=5mm	B=10mm
	C=10mm	C=20mm

Displacement Sensor
CD1
CD3
CD4
CD4L-25

CD4-30
Cable type

Amplifiers

Laser Displacement Sensor

CD4 series

Sensor head

Regular type

(Measuring distance : 30+/-5mm) ・CD4-30

(Measuring distance : 85+/-20mm) ・CD4-85

(Measuring distance : 350+/-100mm) ・CD4-350

High Power type

(Measuring distance : 30+/-5mm) ・CD4-30-3R

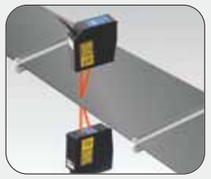
(Measuring distance : 85+/-20mm) ・CD4-85-3R

(Measuring distance : 350+/-100mm) ・CD4-350-3R

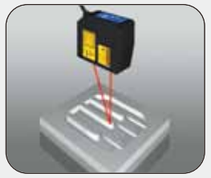
Next page

- ***Laser Displacement sensor features easy setup and operation.***
- ***CD4 Series Laser Displacement sensor with Linear Image Sensor and Electronic Shutter provides accurate measurement.***

Applications


Measuring thickness of black rubber sheet

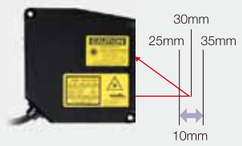
Tire inspection


Monitoring the die cast

Checking clear package of IC mounted on PCB

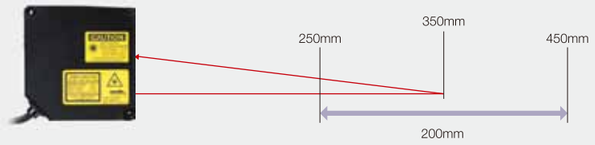
Quality check of gear

CD4-30 Short distance : 30 +/- 5mm



CD4-85 Middle distance : 85+/- 20mm

CD4-350 Long distance : 350 +/- 100mm



Class 3R - High power types

For matte black objects or any application that requires a higher power laser, there are models of the CD4 series available which use a Class 3R light source.

CD4-30-3R Short distance : 30 +/- 5mm

CD4-85-3R Middle distance : 85 +/- 20mm

CD4-350-3R Long distance : 350 +/- 100mm

Features

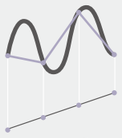
No other Displacement sensor has been this easy to use!
The CD4 controller is easy to operate with simple pushbutton setup and an LCD display to verify/change the settings.

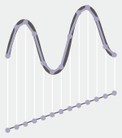
LCD Display

The CD4A-N(or P) controller has a built-in color display that indicates multiple data values on the same screen.
Distance Values from both heads, Calculated Value, Output Status, Bank Number, etc. are displayed on the normal Run screen.

High speed sampling rate

The CD4 Displacement Sensor has a 100μsec. sampling rate and High Density Linear Image detector.


Conventional Displacement Sensor with slow response.


CD4 Series sensors, high speed sampling rate improves overall accuracy.

IP67 Environmental rating

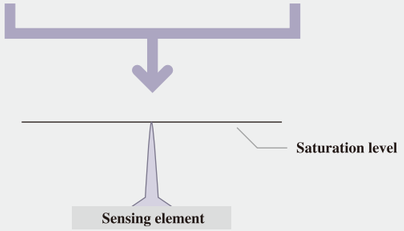
The sensing heads of the CD4 series have an IP67 rating for use in applications where they may be exposed to water.

Electronic Shutter

The Microcomputer in the CD4 controller will automatically control the shutter speed depending upon the reflectance of the target.
This will select the best light intensity level for accurate measurement and will help to minimize the error (AUTO Sensitivity Mode).

Highly reflective materials will result in excessive reflected light that may cause an error in finding the peak position.

Low reflective materials such as black rubber will have a very low amount of reflected light. This can cause unstable measurement.



Automatic control of light intensity will find the peak correctly.

Amplifier

NPN output type
・CD4A-N

PNP output type
・CD4A-P

RS-232C Communications

By connecting the CD4 controller to a PC, the following operations can be performed from the PC via RS232.
・Writing and reading out the setting value
・Reading out the measurement value
・Reading out the control output status
・Operating the control input
・Data buffer function

Communication method	RS-232C
Transmission type	Asynchronous
Baud rate	9600/19200/38400/115200 bps
Transmission code	ASCII
Data length	7/8 bit
Stop bit length	1 bit
Parity check	Nil/Ever number/Odd number
Data classification	STX・ETX

The underlined values are the factory default settings.

Adjust the communication settings of the PC and the CD4 using the values in the above table. The settings of the CD4 controller can be accessed in screen number 14 (RS232C).

Low / High Pass Filters

High / Low Pass filters are built into the CD4 controller.
A Low Pass filter will help to reduce any sudden changes in the measurement while the High Pass filter will eliminate slow gradual changes.

Easy disconnection of QD type.

Ten formulas of calculation

A	Sensor Head A
B	Sensor Head B
A+B	Adding of A and B
A-B	Gap between A and B
-A-B	Reverse of A+B
K-A-B	K = distance between sensors. Good for measuring thickness.
K+A+B	K = Offset value
K+A-B	K = Offset value
K+A	Offset the sensor A. K = Offset value
K+B	Offset the sensor B. K = Offset value

8 Banks selections

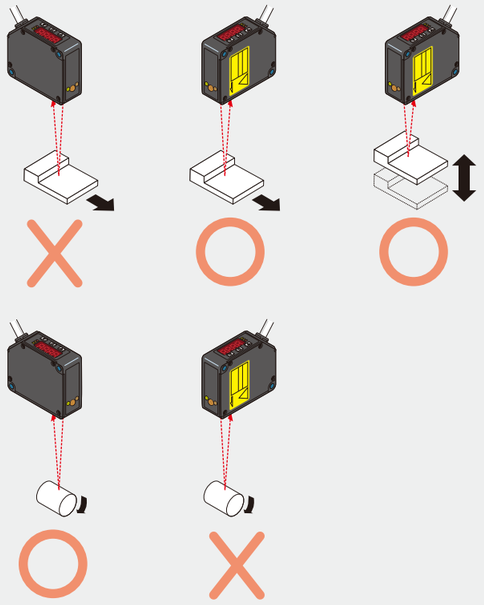
Bank No.	Bank 2 input	Bank 1 input	Bank 0 input
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

IP67 Environmental rating

The sensing heads of the CD4 series have an IP67 rating for use in applications where they may be exposed to water.

Hint of installation for best accuracy

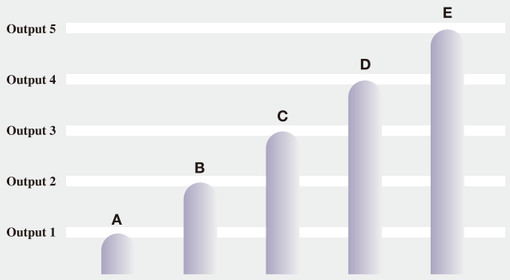
To obtain accuracy the sensor head must be oriented as shown below.



5 Independent outputs are available

This is convenient for sorting items according to size.

Each of the 5 comparator outputs can be set independently, all outputs have a High and Low threshold limit.



Two Sensing heads can be controlled

Therefore it computes for the purpose of measuring thickness, width, etc.

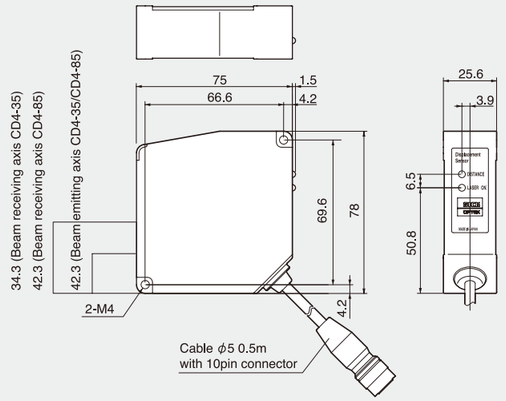
Independent measurement from each head is possible as well. Any combination of measurement heads (30, 85, 350) can be used together.

Class 2 (IEC/JIS) Class II (FDA) laser product

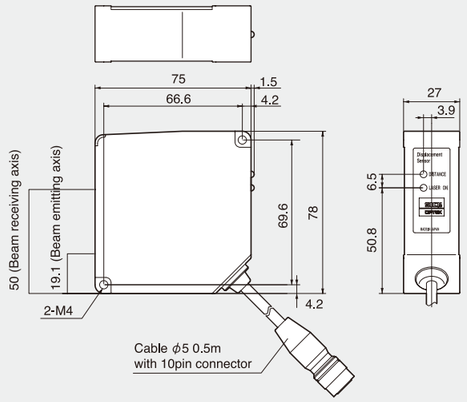
High power type (models with "-3R") has class 3 laser

Dimensions (Sensor head)

CD4-30 / CD4-30-3R
CD4-85 / CD4-85-3R



CD4-350 / CD4-350-3R



Extension cable to connect the sensor head

Length (L)	Cable type
2m	CD4CN-S-ROBOT
5m	CD4CN-5S-ROBOT

(Unit: mm)

Specifications

IEC Class 1 (FDA Class II) Type		CD4-30	CD4-85	CD4-350
High power Class 3R Type		**CD4-30-3R**	**CD4-85-3R**	**CD4-350-3R**
Measuring range		30+/-5mm	85+/-20mm	350+/-100mm
Light source	**(Regular type)**	Class 2 (IEC/JIS) Class II (FDA) Red Laser Diode , 650nm, Max 1m W)		
	(High Power type)	Class 3R (IEC/JIS) Class III a (FDA) Red Laser Diode, 650nm, Max 5mW)		
Spot size	(*1)	30 × 100μm	70 × 290μm	300 × 700μm
Linearity	(*2)	±0.1% FS		
Resolution	(*3)	1μm	3μm	40μm
Supply voltage		Supplied by CD4A-N/P Controller		
Temp drift		±0.01% FS/ C°,F°		
Laser emission LED		Green = Laser emission		
Measurement LED		Red = In range, closer than center 5% of measurement range (0 to 45%) Orange = Within +/- 5% of the center of the measuring range Green = In range, farther than center 5% of measurement range (55 to 100%) Red/Green alternating = Out of measuring range		
Protection category		IP67		
Operation temp / humidity		–10 to 45 °C (14 to 113 F°), 35 to 85% RH		
Storage temp / humidity		–20 to 60 °C (–4 to 140 F°), 35 to 85% RH		
Environmental illuminance		Incandescent Lamp = Max 3,000 lux		
Vibration resistance		10 to 55 Hz double amplitude 1.5mm for XYZ		
Shock resistance		50G (050m/s²)		
Cable		50cm (19.7 inch) cable		
Cable extension		CD4CN-S-ROBOT (2m, 78 inch), CD4CN-5S-ROBOT (5m, 197 inch)		
Material		Aluminum diecast		

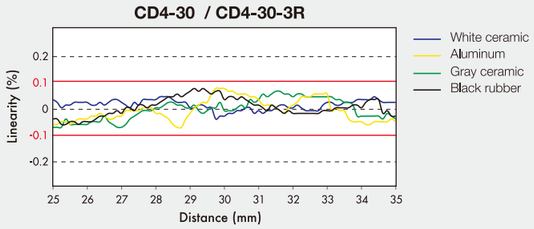
*1 Defined with center strength 1/e² (13.5%). There may be leak light other than the spot size.
The sensor may be affected when there is a highly reflective object close to the detection area.

*2 256 times in average (using the special amplifier), object: White Ceramic. The value is subject to objects.

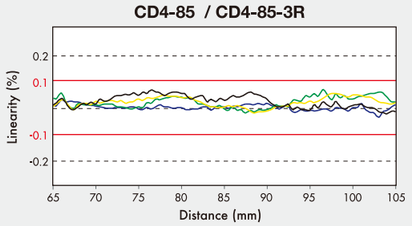
*3 The typical value in the conditions of 256 times in average (using the special amplifier), object: White Ceramic, distance range: Middle.
The value is subject to objects.

Linearity by materials

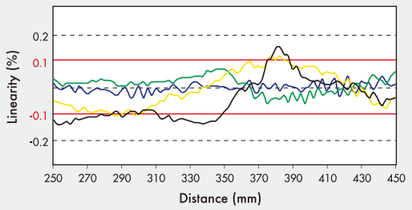
CD4-30 / CD4-30-3R



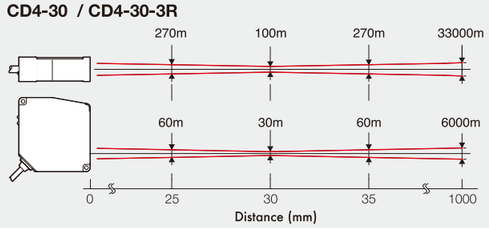
CD4-85 / CD4-85-3R



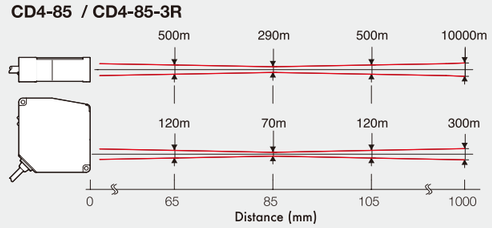
CD4-350 / CD4-350-3R



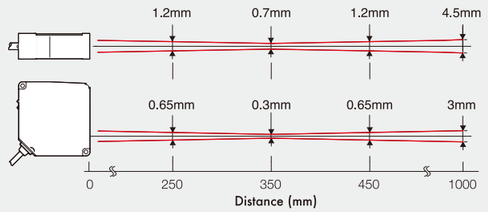
CD4-30 / CD4-30-3R



CD4-85 / CD4-85-3R

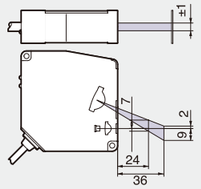


CD4-350 / CD4-350-3R

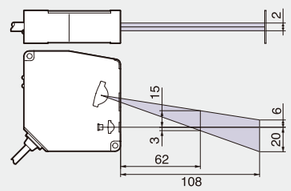


Measuring Area

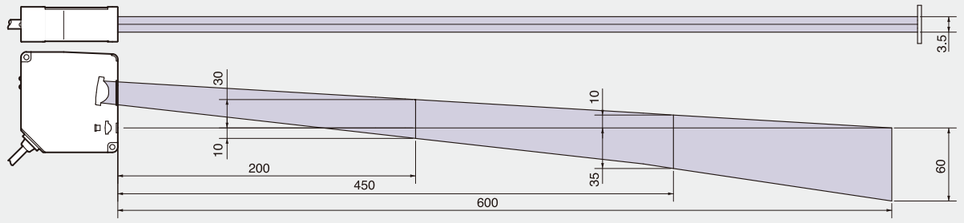
CD4-30 / CD4-30-3R



CD4-85 / CD4-85-3R

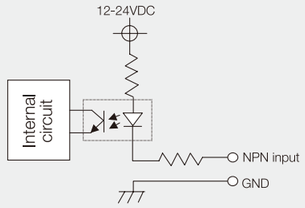


CD4-350 / CD4-350-3R

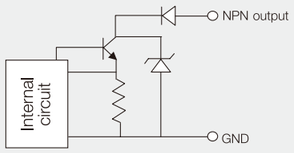


Input / Output diagrams

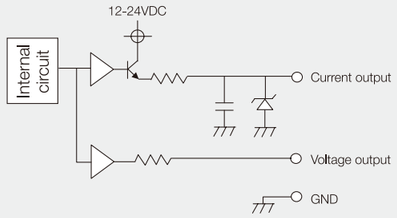
NPN model bank input
Hold input
Zero reset input



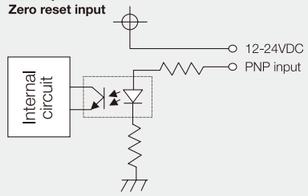
NPN model control output
Alarm output



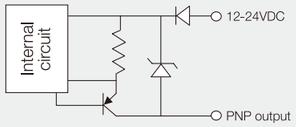
Analog output (A/B)



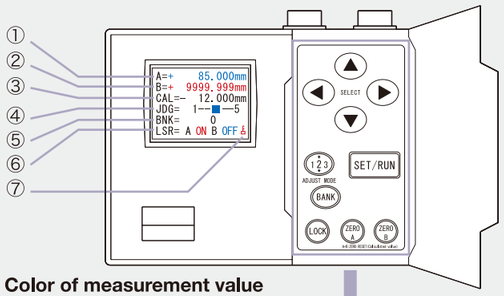
PNP model bank input
Hold input
Zero reset input



NPN model control output
Alarm output

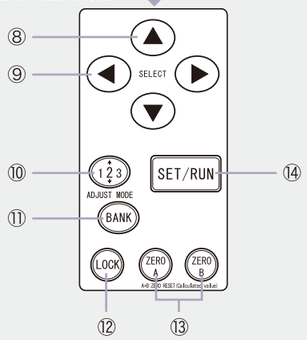


Parts identifications



Color of measurement value

Blue : The spot value in real time.
Black : The value held by the hold function.
Red : The sensor head is incapable of measurement.



① Setting value of Sensor Head A

② Setting value of Sensor Head B

③ Calculation result processed according to the Calculation function setting

④ Output status of the control output (output 1,2,3,4,5)

⑤ Bank number

⑥ Displays the laser emission status of each sensor.
ON : During laser emission, OFF : No laser emission.

⑦ Lock indicator

⑧ **UP / DOWN buttons**
Press to select the setting items.

⑨ **RIGHT / LEFT buttons**
Press to select the function display or change the setting items.

⑩ **Digit Position button**
Press to change the digit position of the setting items with a wide range of setting value.
(Activated only in Setup mode.)

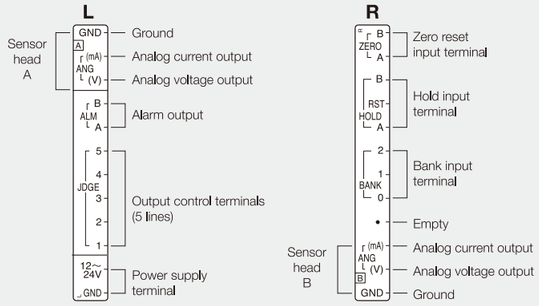
⑪ **Bank Selection button**
Press to select the bank containing the programmed measurement settings.
You can store up to eight(8) programs.

⑫ **Lock button**
Press and hold for one(1) second or more to lock the button operation.
*The backlights of the operation buttons turn off during Lock status.

⑬ **Zero reset input**
Press and hold one(1) second or more to preform zero reset of the sensor head(A or B).
Press and hold again for two(2) seconds or more to cancel the function.
Simultaneous pressing of the A and B buttons resets the calculation result (CAL).
Press and hold simultaneously for one(1) second or more to cancel the function.

⑭ **Mode Selection button**
Press to switch the display mode.

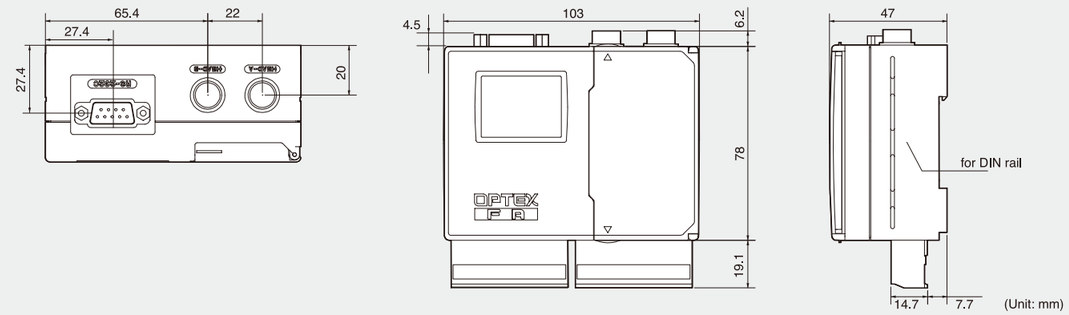
Wiring connections



● Zero reset input

Zero reset of single sensor (either A or B) is activated with input of 10 ms or more, and deactivated with 500 ms or more.
Zero reset of calculation reset is activated with simultaneous input from sensor A and B, and deactivated with simultaneous input of 500 ms or more. (For "simultaneous" input, the time difference between sensor A and B inputs should be within 10 ms.)

Dimensions (Amplifier)



Specifications

Model		CD4A-N (NPN output type)	CD4A-P (PNP output type)
Number of connected sensor heads		Max. 2 pcs	
Sampling frequency		100 μs	
Supply voltage		12 to 24V, DC ± 10%	
Power consumption		270 mA/24 V (When connected with 2 sensor heads. Including analog current output)	
Temp drift		±0.01 % F.S./°C	
Analog output	ANG (V) [A][B]	Voltage output ±5 V/F.S. (Output impedance 100Ω, resolution 1 mV)	
	ANG(mA) [A][B]	Current output 4 to 20 mA/F.S. (Load impedance 300Ω, resolution 1.5μA)	
Alarm output	ALM A,ALM B	NPN open collector	PNP open collector
		Max. 100mA / DC 24V (residual voltage Max. 1.8 V)	
Control output	JDGE 1 to 5	Turns ON when the sensor head fails in measurement.	
		NPN open collector	PNP open collector
		Max. 100mA / DC 24V (residual voltage Max. 1.8 V)	
		HI/LO setting and Hysteresis setting are available for each output.	
Bank input	BANK 0 to 2	ON when connected to GND	ON when connected to 12 to 24 V
		8 banks selectable	
Hold input	HOLD A, HOLD B, HOLD RST	ON when connected to GND	ON when connected to 12 to 24 V
		Laser off or measurement value holding (selectable in the menu)	
Zero reset input	ZERO A, ZERO B	ON when connected to GND	ON when connected to 12 to 24 V
		Zero reset of Head A measurement value / Head B measurement value / Calculation value is available.	
Optional features		Average sampling times, Filter mode (Cut-off frequency), Calculation, Hold setting, Output during alarm, Output control (Hysteresis), Analog output, Sensor head sensitivity control, Timer function, Memory function, Memory bank function, Auto zero reset	
Display type		LCD display	
Protection category		IP20	
Operation temp		–10 to +45°C (Non-condensing) / For storage : –20 to +60°C	
Operating humidity		35 to 85% RH / For storage: 35 to 85 % RH	
Vibration resistance		10 to 55 Hz, Double amplitude 1.5mm, 2 h for XYZ axis	
Shock resistance		20G (196m/S^2)	
Material		Chassis: Polycarbonate, Connection terminals: Nylon 66	
Weight		240g (including connection terminals)	

CD4L-25
Cable type

Amplifiers

Specular type Laser Displacement Sensor

CD4L-25 series

Sensor head **Specular type**
(Measuring distance : 25+/-1mm)
・CD4L-25

Amplifier **Specular type**
NPN output type ・CD4A-LN
PNP output type ・CD4A-LP

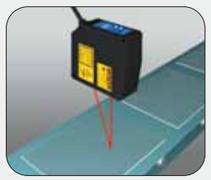
- ***Laser Displacement sensor features easy setup and operation.***
- ***High accuracy of 0.1 m resolution and +/- 0.1% linearity. (Specular Type)***
- ***Specular type optics that is ideal for glass sensing.***

Applications

Monitoring warping sagging of glass plate

Presence of glass material on pickup arm.

Mirror surface object


Glass plate running on conveyor

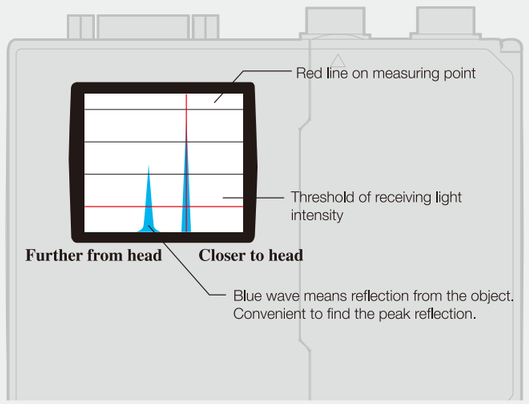
CD4L-25 Specular type : 25+/- 1mm

The optical path is designed to project the correct angle for the detection of specular reflections from transparent objects.

Features

Light Intensity Monitor (For specular type only)

For stable measurement and improved accuracy the light intensity needs to be adjusted to the optimum setting.
With the built-in monitor the status of the level can be verified.



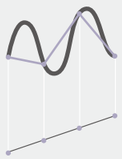
No other Displacement sensor has been this easy to use!
The CD4 controller is easy to operate with simple pushbutton setup and an LCD display to verify/change the settings.

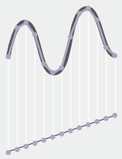
LCD Display

The CD4A-N(or P) controller has a built-in color display that indicates multiple data values on the same screen.
Distance Values from both heads, Calculated Value, Output Status, Bank Number, etc. are displayed on the normal Run screen.

High speed sampling rate

The CD4 Displacement Sensor has a 100μsec. sampling rate and High Density Linear Image detector.


Conventional Displacement Sensor with slow response.

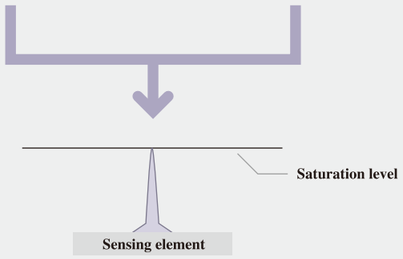

CD4 Series sensors, high speed sampling rate improves overall accuracy.

Electronic Shutter

The Microcomputer in the CD4 controller will automatically control the shutter speed depending upon the reflectance of the target.
This will select the best light intensity level for accurate measurement and will help to minimize the error (AUTO Sensitivity Mode).

Highly reflective materials will result in excessive reflected light that may cause an error in finding the peak position.

Low reflective materials such as black rubber will have a very low amount of reflected light. This can cause unstable measurement.



Automatic control of light intensity will find the peak correctly.

RS-232C Communications

By connecting the CD4 controller to a PC, the following operations can be performed from the PC via RS232.

- Writing and reading out the setting value
- Reading out the measurement value
- Reading out the control output status
- Operating the control input
- Data buffer function

Communication method	RS-232C
Transmission type	Asynchronous
Baud rate	9600/19200/38400/115200 bps
Transmission code	ASCII
Data length	7/8 bit
Stop bit length	1 bit
Parity check	Nil/Ever number/Odd number
Data classification	STX・ETX

The underlined values are the factory default settings.

Adjust the communication settings of the PC and the CD4 using the values in the above table. The settings of the CD4 controller can be accessed in screen number 14 (RS232C).

Low / High Pass Filters

High / Low Pass filters are built into the CD4 controller.
A Low Pass filter will help to reduce any sudden changes in the measurement while the High Pass filter will eliminate slow gradual changes.

Easy disconnection of QD type.

Ten formulas of calculation

A	Sensor Head A
B	Sensor Head B
A+B	Adding of A and B
A-B	Gap between A and B
-A-B	Reverse of A+B
K-A-B	K = distance between sensors. Good for measuring thickness.
K+A+B	K = Offset value
K+A-B	K = Offset value
K+A	Offset the sensor A. K = Offset value
K+B	Offset the sensor B. K = Offset value

8 Banks selections

Bank No.	Bank 2 input	Bank 1 input	Bank 0 input
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

IP67 Environmental rating

The sensing heads of the CD4 series have an IP67 rating for use in applications where they may be exposed to water.

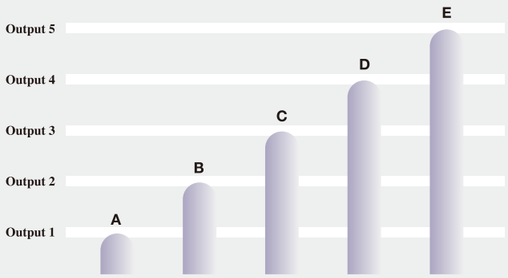
Class 1 (IEC) Class II (FDA) laser product

CD4L-25 is registered to CDRH. (Center df Devices and Radiological Health)

5 Independent outputs are available

This is convenient for sorting items according to size.

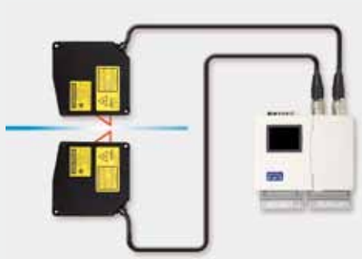
Each of the 5 comparator outputs can be set independently, all outputs have a High and Low threshold limit.



Two Sensing heads can be controlled

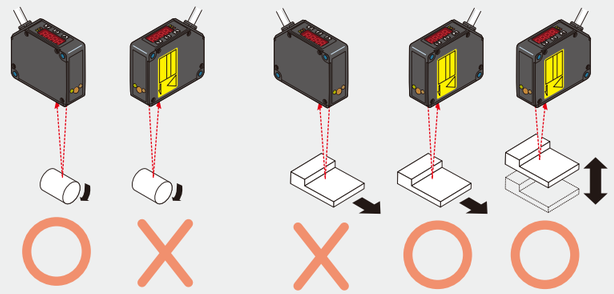
Therefore it computes for the purpose of measuring thickness, width, etc.

Independent measurement from each head is possible as well.



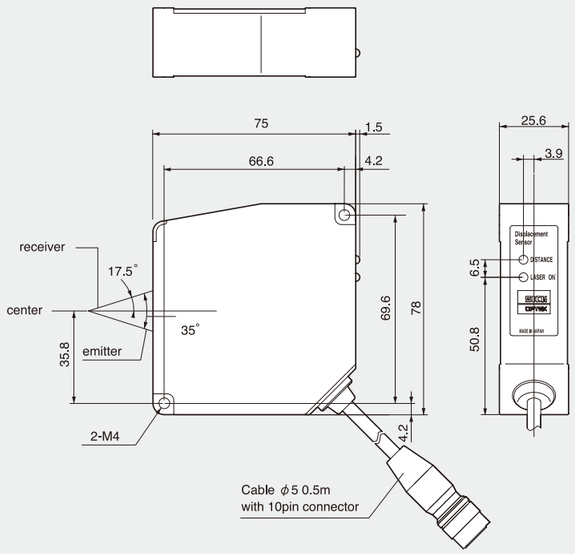
Hint of installation for best accuracy

To obtain accuracy the sensor head must be oriented as shown below.

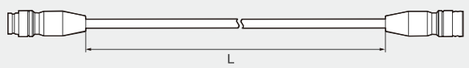


Dimensions (Sensor head)

CD4-L25



Extension cable to connect the sensor head



Length (L)	Cable type
2m	CD4CN-S-ROBOT
5m	CD4CN-5S-ROBOT

(Unit: mm)

Specifications

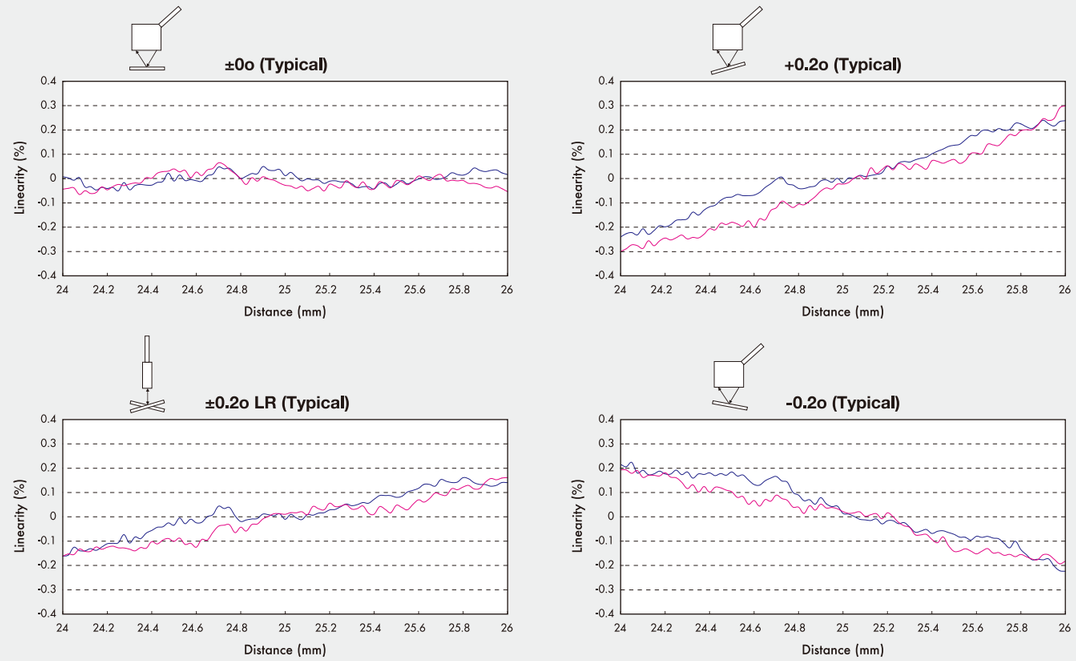
Model	CD4-L25
Measuring range	25+/-1mm
Light source	Class 1 (IEC/JIS) Class II (FDA) Laser, 650nm, Max 390 Micro W)
Spot size (*1)	25 × 35 μm
Linearity (*2)	± 0.1% FS
Resolution (*3)	0.1 μm
Supply voltage	supplied by CD4A-LN/LP Controller
Temp drift	± 0.01% FS/ C°,F°
Laser emission LED	Green = Laser emission
Measurement LED	Red = In range, closer than center 5% of measurement range (0 to 45%) Orange = Within +/- 5% of the center of the measuring range Green = In range, farther than center 5% of measurement range (55 to 100%) Red/Green alternating = Out of measuring range
Protection category	IP67
Operation temp / humidity	–10 to 45 °C (14 to 113 F°), 35 to 85% RH
Storage temp / humidity	–20 to 60 °C (–4 to 140 F°), 35 to 85% RH
Environmental illuminance	Incandescent Lamp = Max 3,000 lux
Vibration resistance	10 to 55 Hz double amplitude 1.5mm for XYZ
Shock resistance	50G (050m/s²)
Cable	50cm (19.7 inch) cable
Cable extension	CD4CN-S-ROBOT (2m, 78 inch), CD4CN-5S-ROBOT (5m, 197 inch)
Material	Aluminum diecast

*1 Defined with center strength 1/e² (13.5%). There may be leak light other than the spot size.

*2 The sensor may be affected when there is a highly reflective object close to the detection area.

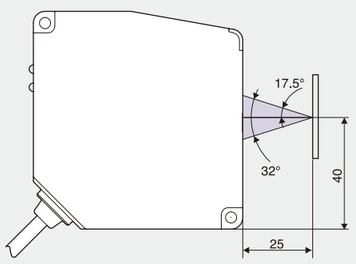
*3 256 times in average (using the special amplifier), object: White Ceramic. The value is subject to objects.
The typical value in the conditions of 256 times in average (using the special amplifier), object: White Ceramic, distance range: Middle.
The value is subject to objects.

Linearity by detection angle



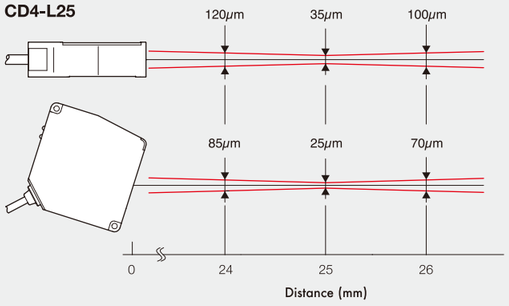
Measuring Area

CD4-L25



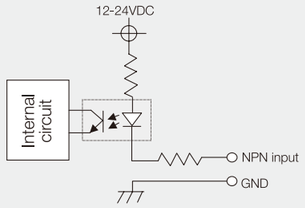
Spot size

CD4-L25

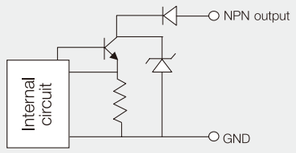


Input / Output diagrams

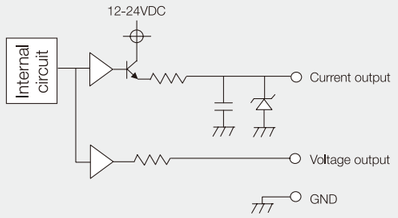
NPN model bank input
Hold input
Zero reset input



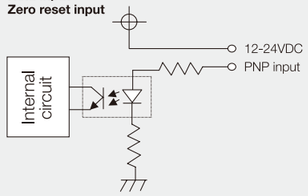
NPN model control output
Alarm output



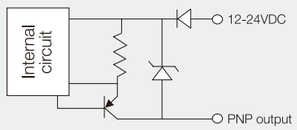
Analog output (A/B)



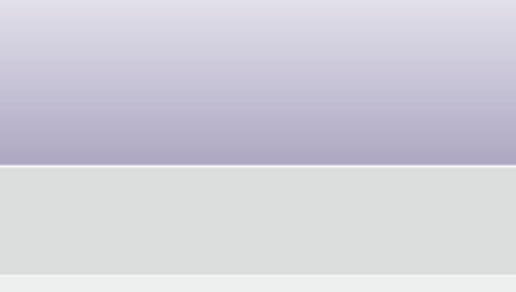
PNP model bank input
Hold input
Zero reset input



NPN model control output
Alarm output

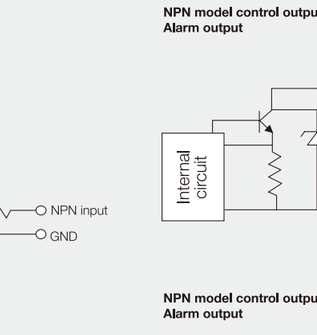


Parts identifications



Color of measurement value

Blue : The spot value in real time.
Black : The value held by the hold function.
Red : The sensor head is incapable of measurement.



① Setting value of Sensor Head A

② Setting value of Sensor Head B

③ Calculation result processed according to the Calculation function setting

④ Output status of the control output (output 1,2,3,4,5)

⑤ Bank number

⑥ Displays the laser emission status of each sensor.
ON : During laser emission, OFF : No laser emission.

⑦ Lock indicator

⑧ **UP / DOWN buttons**
Press to select the setting items.

⑨ **RIGHT / LEFT buttons**
Press to select the function display or change the setting items.

⑩ **Digit Position button**
Press to change the digit position of the setting items with a wide range of setting value.
(Activated only in Setup mode.)

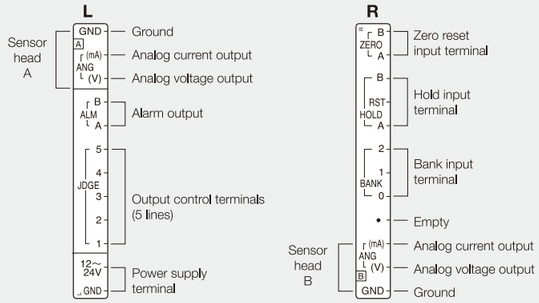
⑪ **Bank Selection button**
Press to select the bank containing the programmed measurement settings.
You can store up to eight(8) programs.

⑫ **Lock button**
Press and hold for one(1) second or more to lock the button operation.
*The backlights of the operation buttons turn off during Lock status.

⑬ **Zero reset input**
Press and hold one(1) second or more to preform zero reset of the sensor head(A or B).
Press and hold again for two(2) seconds or more to cancel the function.
Simultaneous pressing of the A and B buttons resets the calculation result (CAL).
Press and hold simultaneously for one(1) second or more to cancel the function.

⑭ **Mode Selection button**
Press to switch the display mode.

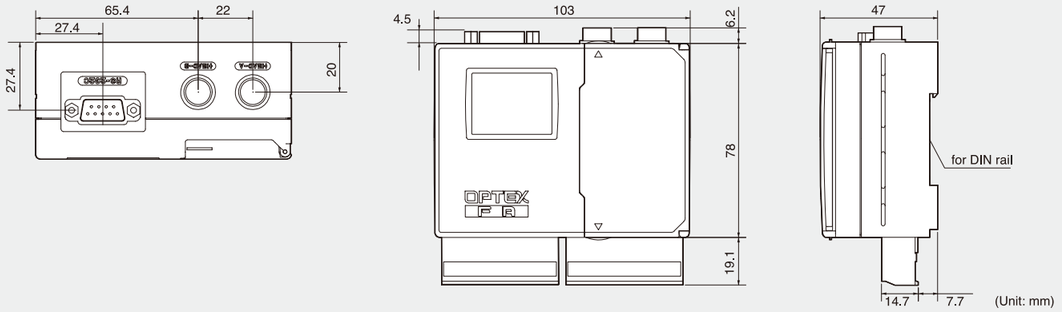
Wiring connections



● **Zero reset input**

Zero reset of single sensor (either A or B) is activated with input of 10 ms or more, and deactivated with 500 ms or more.
Zero reset of calculation reset is activated with simultaneous input from sensor A and B, and deactivated with simultaneous input of 500 ms or more. (For "simultaneous" input, the time difference between sensor A and B inputs should be within 10 ms.)

Dimensions (Amplifier)



Specifications

Model		CD4A-LN (NPN output type)	CD4A-LP (PNP output type)
Number of connected sensor heads		Max. 2 pcs	
Sampling frequency		100 μs	
Supply voltage		12 to 24V, DC ± 10%	
Power consumption		270 mA/24 V (When connected with 2 sensor heads. Including analog current output)	
Temp drift		±0.01 % F.S./°C	
Analog output	ANG (V) [A][B]	Voltage output ±5 V/F.S. (Output impedance 100Ω, resolution 1 mV)	
	ANG(mA) [A][B]	Current output 4 to 20 mA/F.S. (Load impedance 300Ω, resolution 1.5μA)	
Alarm output	ALM A,ALM B	NPN open collector	PNP open collector
		Max. 100mA / DC 24V (residual voltage Max. 1.8 V)	
Control output	JDGE 1 to 5	Turns ON when the sensor head fails in measurement.	
		NPN open collector	PNP open collector
		Max. 100mA / DC 24V (residual voltage Max. 1.8 V)	
		HI/LO setting and Hysteresis setting are available for each output.	
Bank input	BANK 0 to 2	ON when connected to GND	ON when connected to 12 to 24 V
		8 banks selectable	
Hold input	HOLD A, HOLD B, HOLD RST	ON when connected to GND	ON when connected to 12 to 24 V
		Laser off or measurement value holding (selectable in the menu)	
Zero reset input	ZERO A, ZERO B	ON when connected to GND	ON when connected to 12 to 24 V
		Zero reset of Head A measurement value / Head B measurement value / Calculation value is available.	
Optional features		Average sampling times, Filter mode (Cut-off frequency), Calculation, Hold setting, Output during alarm, Output control (Hysteresis), Analog output, Sensor head sensitivity control, Timer function, Memory function, Memory bank function, Auto zero reset	
Display type		LCD display	
Protection category		IP20	
Operation temp		–10 to +45°C (Non-condensing) / For storage : –20 to +60°C	
Operating humidity		35 to 85% RH / For storage: 35 to 85 % RH	
Vibration resistance		10 to 55 Hz, Double amplitude 1.5mm, 2 h for XYZ axis	
Shock resistance		20G (196m/S^2)	
Material		Chassis: Polycarbonate, Connection terminals: Nylon 66	
Weight		240g (including connection terminals)	