2013 Product catalog

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Attention: Not to be Used for Personnel Protection.

Never use these products as sensing devices for personnel protection.
Doing so could lead to serious injury or death.
These sensors do not include the self-checking redundant circuitry necessary to allow their use in personnel safety applications.
A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
Please consult our distributors about safety products which meet OSHA, ANSI and IEC standards for personnel protection.

- **Specifications are subject to change without prior notice.**
- **Specifications and technical information not mentioned here are written in Operation Manual. Or visit our website for details.**
- **All the warnings and cautions to know prior to use are given in Operation Manual.**

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OPTEX FA CO., LTD.

Cost efficient Unique Sensors

# Product catalog

2013

# All lineup catalog

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# PHOTOELECTRIC SENSORS

Optex FA is now the second largest supplier of photoelectric sensors in Japan. Optex provides an extensive selection of sensors to solve most applications. All sensors are available in Cabled or M8 QD versions and are offered with a choice of NPN or PNP outputs.






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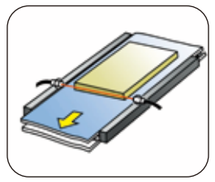
Photoelectric Sensor

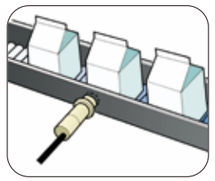
# C series

- Epoxy filled housing ensures resistance to vibration.
- M12 QD types are available.
- Rigid Nickel Plated Brass housing.

## Applications



**Positioning of wooden plate**



**Counting food packages**

## Nickel plated brass body, resistant to vibration and damage from chemicals.

Superior in performance to sensors with plastic bodies in terms of durability and resistance to chemicals, oils and mechanical vibration.

## CRDF retro-reflection type with built-in polarizing filter.

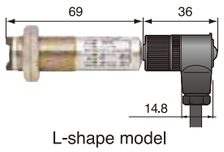
## The beam can be turned 90 degrees by using the optional side view attachments.

type T000
for CTD-1500, CDR-300

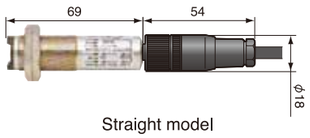
type T110
for CDD-11

type T400
for CDD-40

## Optional Straight and 90 degree connectors




L-shape model
DOS-1204-W



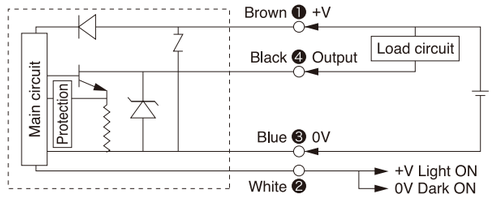

Straight model
DOS-1204-G



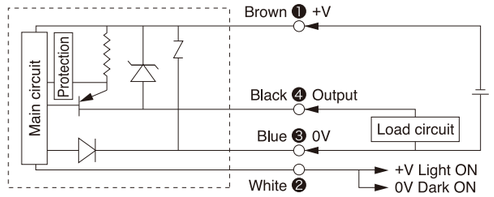


## Circuit diagram

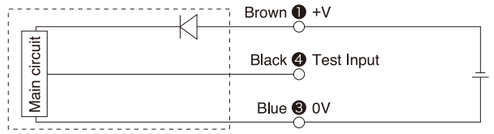
**NPN output**




**PNP output**

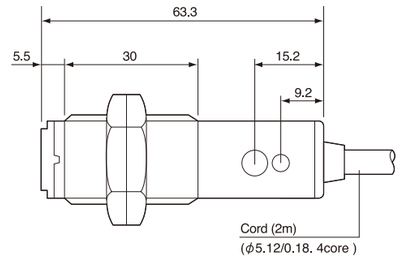



**Emitter**

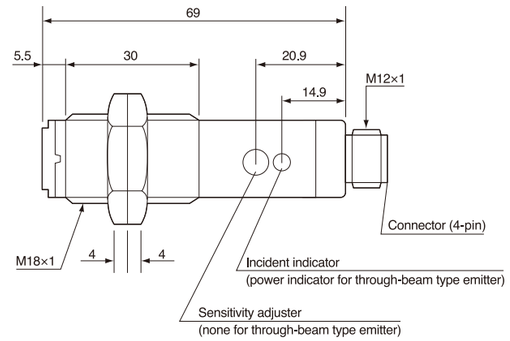



## Dimensions

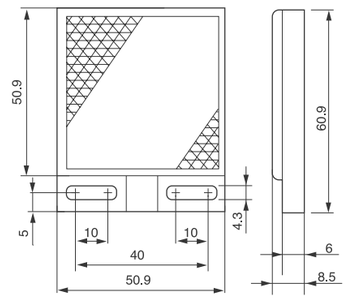
**Cable type**



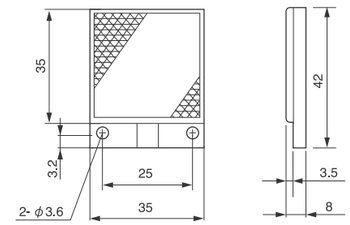

**M12 QD type**



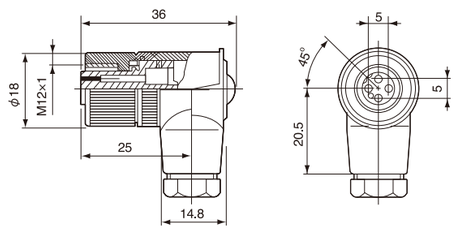

**Standard reflector V-61**



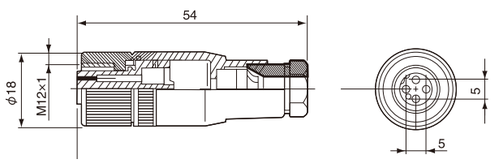

**Small reflector V-42**




**90 degree QD connector** DOS-1204-W




**Standard QD connector** DOS-1204-G




(Unit : mm)

# Specifications

| Model | | Thru-beam | Retro-reflective | Retro-reflective w Polarizing filter | Diffuse reflective 11cm | Diffuse reflective 40cm |
|---|---|---|---|---|---|---|
| Cable type | NPN | CTD-1500N | CRD-300N | CRDF-100N | CDD-11N | CDD-40N |
| | PNP | CTD-1500P | CRD-300P | CRDF-100P | CDD-11P | CDD-40P |
| Connector type | NPN | CTD-1500CN | CRD-300CN | CRDF-100CN | CDD-11CN | CDD-40CN |
| | PNP | CTD-1500CP | CRD-300CP | CRDF-100CP | CDD-11CP | CDD-40CP |
| Sensing distance | | 15m | 3m | 1m | 11cm | 40cm |
| Response time | | 1.5msec Max | | | | |
| Operating mode | | Light ON / Dark ON selectable | | | | |
| Hysteresis | | NIL | | | 10% Max | |
| Light source | | Infrared | | Red | Infrared | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | |
| Supply voltage | | DC 10 to 30V including 10% of ripple | | | | |
| Conformity | | JIS / C4525, CE, UL | | | | |
| Power consumption | | 40mA Max | 30mA Max | | | |
| Operating temp / humidity | | –25 up to 55 °C / 35 up to 95% RH | | | | |
| Sensitivity adjustment | | Single turn potentiometer | | | | |
| Protection category | | IEC 144 IP66 | | | | |
| Shock resistance | | 50G (500m/S$^2$), X-Y-Z axis 3 times | | | | |
| Material | | Case : BSBM+Ni, Lens : PC | | | | |
| Reflector | | – | V-61 | | – | |

# Options

**Standard reflector V-61**

**Small reflector V-42**

DOS-1204-W
**90 degree QD connector**

DOS-1204-G
**Standard QD connector**

Photoelectric Sensor

# C2 series

Well known for its conventional shape but not conventional in quality.
An ultimate cylindrical sensor designed in Japan.

## Custom ASIC with Power Circuit

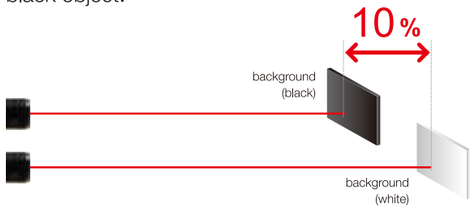
The electronic circuit consists mainly of Optex FA's custom ASIC with only 27 electronic components.
The ASIC contains power circuit and this helps to avoid defects by electric damage from the power line.

## RoHS products

Both plastic housing and metal housing are RoHS compliant.
With an Eco-minded electric design, the current consumption is only 18mA (Diffuse type)

## Hysteresis of Max 10%. Between black/white colors.

Between black/white colors, hysteresis is Max at 10% (Diffuse type). C2DM-11 gives a sensing distance of 110mm for white object and 90mm for black object.




## Trimmer of Silicon plastic for high durability against chemical impact.

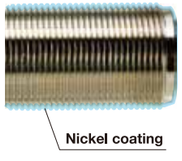
The trimmer is tightly sealed against water with IP67 rating. Silicon plastic trimmer is the best solution against water, oil. chemical and environmental heat.

## Easy Alignment and installation

Ample sensing area provides easy alignment when installing the thru-beam sensor. For instance, there is an allowance of 70cm to align the sensor at 10M distance. The highly bright LED is visible at long distance as well.

## Nickel coating of 20μ thickness for anti-rust solution.

Metal type consists of brass-nickel housing with extra nickel coating of 20u thickness. This coating is done for the external and internal of the housing. It helps protect the metal housing against rust and toughen it.




## BGS type sensors

BGS type sensors are designed to detect any target regardless of the color and/or background.

## Durable to 70N (7kg) of tension

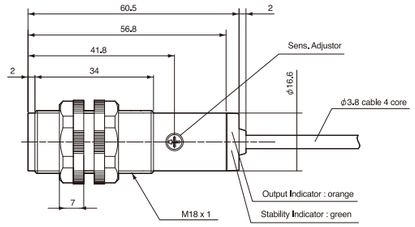
The cable is firmly fixed to the internal circuit board so that it can withstand pulling tension of up to 70N (7kg).

# DIMENSIONS

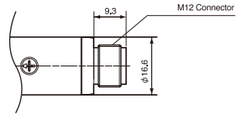
## Plastic housing

### Standard

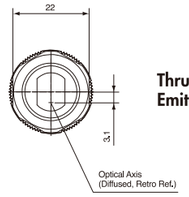
Cable type



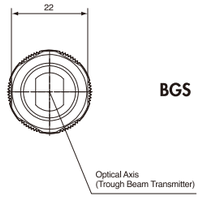

M12 Connector type



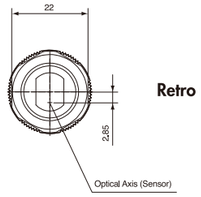

**Diffuse-reflective**
(110,400,800mm Type)
**Thru-beam reciever**



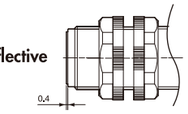

**Thru-beam Emitter**




**BGS**

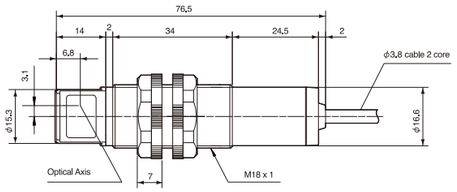



**Retro reflective**

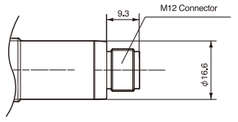



### Angle (90 degree)

Cable type

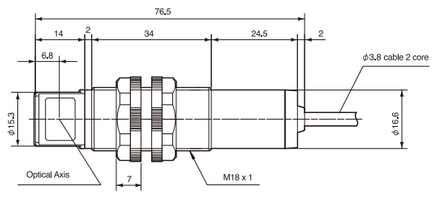


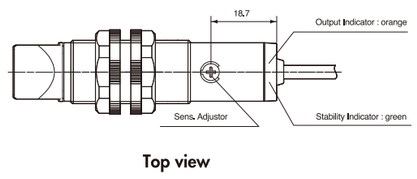

M12 Connector type




**Diffuse-reflective**
**Thru-beam reciever**

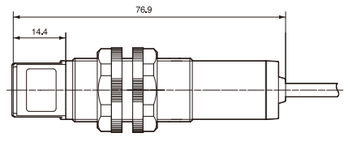
**Thru-beam Emitter**

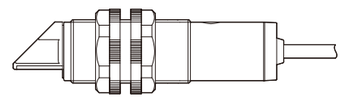



**Top view**

**Retro reflective**



**Side view**



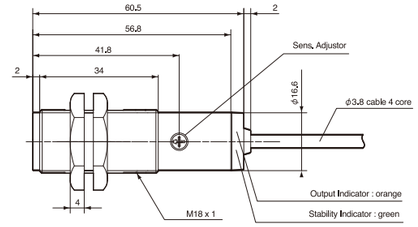




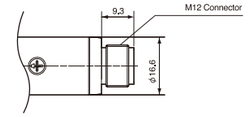
## Metal housing

### Standard

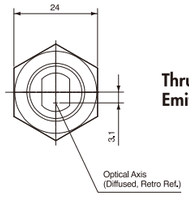
Cable type



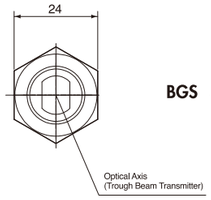

M12 Connector type



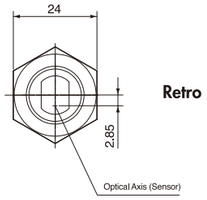

**Diffuse-reflective**
(110,400,800mm Type)
**Thru-beam reciever**



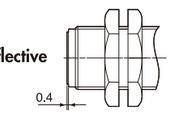

**Thru-beam Emitter**




**BGS**

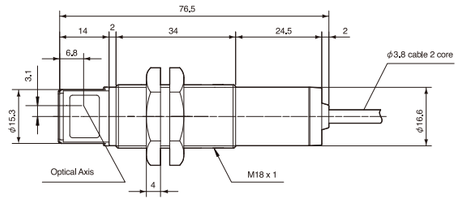



**Retro reflective**

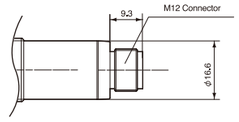



### Angle (90 degree)

Cable type

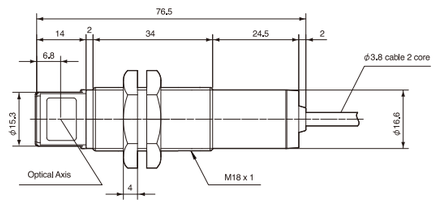


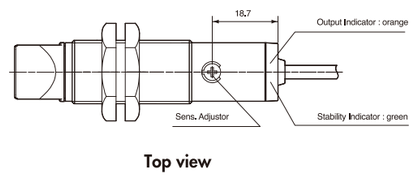

M12 Connector type




**Diffuse-reflective**
**Thru-beam reciever**

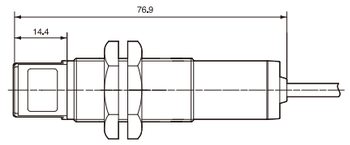
**Thru-beam Emitter**

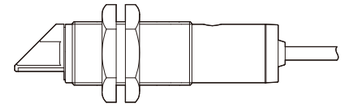



**Top view**

**Retro reflective**



**Side view**

(mm)

# Product family

**Plastic housing**

| | | | | Standard | Angle 90° |
|---|---|---|---|---|---|
| Retro-reflective Without Polarizing fillter | 2m cable | NPN | | C2RP-350N | C2RP-S350N |
| | | PNP | | C2RP-350P | C2RP-S350P |
| | M12 connector | NPN | | C2RP-350CN | C2RP-S350CN |
| | | PNP | | C2RP-350CP | C2RP-S350CP |
| Retro-reflective With Polarizing fillter | 2m cable | NPN | | C2RP-F400N | C2RP-SF400N |
| | | PNP | | C2RP-F400P | C2RP-SF400P |
| | M12 connector | NPN | | C2RP-F400CN | C2RP-SF400CN |
| | | PNP | | C2RP-F400CP | C2RP-SF400CP |
| Diffuse-reflective Focused 110mm type | 2m cable | NPN | | C2DP-11N | C2DP-S11N |
| | | PNP | | C2DP-11P | C2DP-S11P |
| | M12 connector | NPN | | C2DP-11CN | C2DP-S11CN |
| | | PNP | | C2DP-11CP | C2DP-S11CP |
| Diffuse-reflective Energetic 400mm type | 2m cable | NPN | | C2DP-40N | C2DP-S40N |
| | | PNP | | C2DP-40P | C2DP-S40P |
| | M12 connector | NPN | | C2DP-40CN | C2DP-S40CN |
| | | PNP | | C2DP-40CP | C2DP-S40CP |
| Diffuse-reflective Energetic 800mm type | 2m cable | NPN | | C2DP-80N | C2DP-S80N |
| | | PNP | | C2DP-80P | C2DP-S80P |
| | M12 connector | NPN | | C2DP-80CN | C2DP-S80CN |
| | | PNP | | C2DP-80CP | C2DP-S80CP |
| Thru-beam | 2m cable | NPN | | C2TP-2000N | C2TP-S2000N |
| | | PNP | | C2TP-2000P | C2TP-S2000P |
| | M12 connector | NPN | | C2TP-2000CN | C2TP-S2000CN |
| | | PNP | | C2TP-2000CP | C2TP-S2000CP |
| BGS | 2m cable | NPN | | BGS-CP30N | – |
| | | PNP | | BGS-CP30P | – |
| | M12 connector | NPN | | BGS-CP30CN | – |
| | | PNP | | BGS-CP30CP | – |

**Metal housing**

| | | | | | |
|---|---|---|---|---|---|
| Retro-reflective Without Polarizing fillter | 2m cable | NPN | | C2RM-350N | C2RM-S350N |
| | | PNP | | C2RM-350P | C2RM-S350P |
| | M12 connector | NPN | | C2RM-350CN | C2RM-S350CN |
| | | PNP | | C2RM-350CP | C2RM-S350CP |
| Retro-reflective With Polarizing fillter | 2m cable | NPN | | C2RM-F400N | C2RM-SF400N |
| | | PNP | | C2RM-F400P | C2RM-SF400P |
| | M12 connector | NPN | | C2RM-F400CN | C2RM-SF400CN |
| | | PNP | | C2RM-F400CP | C2RM-SF400CP |
| Diffuse-reflective Focused 110mm type | 2m cable | NPN | | C2DM-11N | C2DM-S11N |
| | | PNP | | C2DM-11P | C2DM-S11P |
| | M12 connector | NPN | | C2DM-11CN | C2DM-S11CN |
| | | PNP | | C2DM-11CP | C2DM-S11CP |
| Diffuse-reflective Energetic 400mm type | 2m cable | NPN | | C2DM-40N | C2DM-S40N |
| | | PNP | | C2DM-40P | C2DM-S40P |
| | M12 connector | NPN | | C2DM-40CN | C2DM-S40CN |
| | | PNP | | C2DM-40CP | C2DM-S40CP |
| Diffuse-reflective Energetic 800mm type | 2m cable | NPN | | C2DM-80N | C2DM-S80N |
| | | PNP | | C2DM-80P | C2DM-S80P |
| | M12 connector | NPN | | C2DM-80CN | C2DM-S80CN |
| | | PNP | | C2DM-80CP | C2DM-S80CP |
| Thru-beam | 2m cable | NPN | | C2TM-2000N | C2TM-S2000N |
| | | PNP | | C2TM-2000P | C2TM-S2000P |
| | M12 connector | NPN | | C2TM-2000CN | C2TM-S2000CN |
| | | PNP | | C2TM-2000CP | C2TM-S2000CP |
| BGS | 2m cable | NPN | | BGS-CM30N | – |
| | | PNP | | BGS-CM30P | – |
| | M12 connector | NPN | | BGS-CM30CN | – |
| | | PNP | | BGS-CM30CP | – |







# SPECIFICATIONS

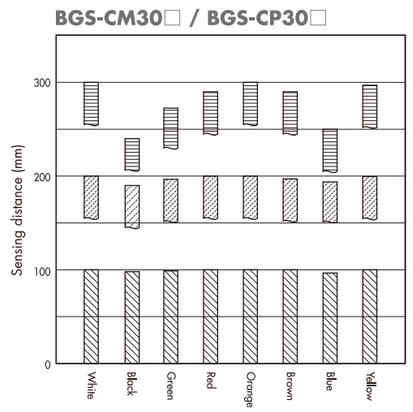
| Type | | Thru-beam | Retro-reflective | | Diffuse-reflective | | | BGS |
|---|---|---|---|---|---|---|---|---|
| | | | With polarizing filter | Without polarizing filter | 110mm type | 400mm type | 800mm type | |
| **Standard** | | | | | | | | |
| Plastic housing | 2m Cable | C2TP-2000(N,P) | C2RP-F400(N,P) | C2RP-350(N,P) | C2DP-11(N,P) | C2DP-40(N,P) | C2DP-80(N,P) | BGS-CP30(N,P) |
| | M12 | C2TP-2000C(N,P) | C2RP-F400C(N,P) | C2RP-350C(N,P) | C2DP-11C(N,P) | C2DP-40C(N,P) | C2DP-80C(N,P) | BGS-CP30C(N,P) |
| Metal housing | 2m Cable | C2TM-2000(N,P) | C2RM-F400(N,P) | C2RM-350(N,P) | C2DM-11(N,P) | C2DM-40(N,P) | C2DM-80(N,P) | BGS-CM30(N,P) |
| | M12 | C2TM-2000C(N,P) | C2RM-F400C(N,P) | C2RM-350C(N,P) | C2DM-11C(N,P) | C2DM-40C(N,P) | C2DM-80C(N,P) | BGS-CM30C(N,P) |
| **Angle (90 degree)** | | | | | | | | |
| Plastic housing | 2m Cable | C2TP-S2000(N,P) | C2RP-SF400(N,P) | C2RP-S350(N,P) | C2DP-S11(N,P) | C2DP-S40(N,P) | C2DP-S80(N,P) | – |
| | M12 | C2TP-S2000C(N,P) | C2RP-SF400C(N,P) | C2RP-S350C(N,P) | C2DP-S11C(N,P) | C2DP-S40C(N,P) | C2DP-S80C(N,P) | – |
| Metal housing | 2m Cable | C2TM-S2000(N,P) | C2RM-SF400(N,P) | C2RM-S350(N,P) | C2DM-S11(N,P) | C2DM-S40(N,P) | C2DM-S80(N,P) | – |
| | M12 | C2TM-S2000C(N,P) | C2RM-SF400C(N,P) | C2RM-S350C(N,P) | C2DM-S11C(N,P) | C2DM-S40C(N,P) | C2DM-S80C(N,P) | – |
| **Sensing distance** | | 20m | 0.01 ~ 4m (V-61) | 0.01 ~ 3.5m (V-61) | 11cm *1 | 40cm *1 | 80cm *1 | 300mm *1 |
| **Spot size** | | ⌀1100 mm / 20m | ⌀270 mm / 4m | ⌀240 mm / 3.5m | ⌀8 mm / 11cm | ⌀20 mm / 40cm | ⌀30 mm / 80cm | ⌀15 mm / 300mm |
| **Light source** | | Red LED | | IR LED | Red LED | | | |
| **Supply voltage** | | DC10 ~ 30V including ripple (P-P) 10% | | | | | | |
| **Power consumption** | | Emitter : 20mA Max<br>Receiver : 15mA Max | 20mA Max | | | | | 35mA Max |
| **Hysteresis** | | - | | | 10% Max | | | |
| **Response time** | | 0.5ms Max | | | | | | 1ms Max |
| **Control output** | | NPN/PNP Open Collector 100mA Max / DC30V Max (Residual voltage Max 1.8V / 100mA Max) | | | | | | |
| **Operation mode** | | Light ON / Dark ON selectable by control wires | | | | | | |
| **Sensitivity adjustment** | | 1 turn pot. | | | | | | 4 turn pot. |
| **LED indicator** | | Output indicator (Orange LED) / Stability indicator (Green LED) | | | | | | |
| **Environmental illuminance** | | Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux Max | | | | | | |
| **Vibration resistance** | | 10 ~ 55Hz amplitude 1.5mm X-Y-Z each 2 hours | | | | | | |
| **Shock resistance** | | 500m/S$^2$ (50G) X-Y-Z each 3 times | | | | | | |
| **Operating / Storage temperature** | | Operating temperature : − 25 ~ +55 °C ( no freezing ) / Storage temperature : − 30 ~ +70 °C | | | | | | |
| **Operating / Storage humidity** | | Operating humidity : 35 ~ 85%RH / Storage humidity : 35 ~ 95%RH | | | | | | |
| **Protection / Material** | | IEC IP67(common to any type) Plastic housing : PBT (glass included ) / Metal housing : BSBM, Front Cover , Lens : PMMA | | | | | | |

*1 White Paper 90%

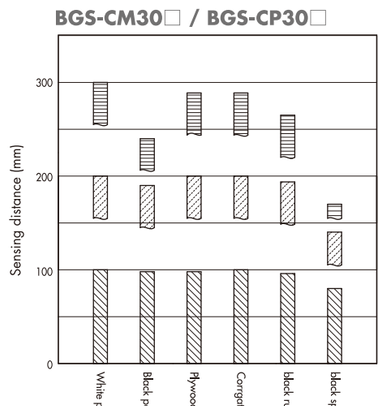
# BGS RESPONSE

*common among all the BGS types

## Color response




## Material response

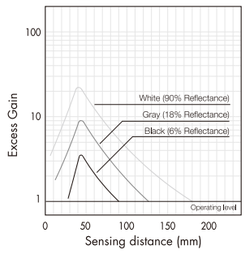


# EXCESS GAIN

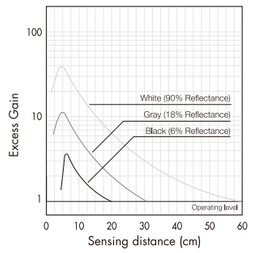
*common between plastic / metal housing

## Standard Types

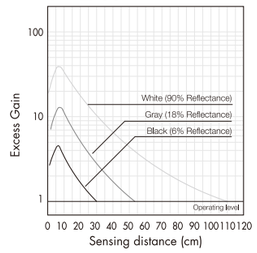
**C2D□-11**



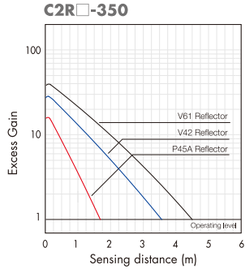

**C2D□-40**



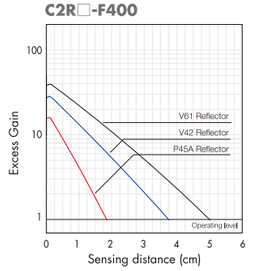

**C2D□-80**



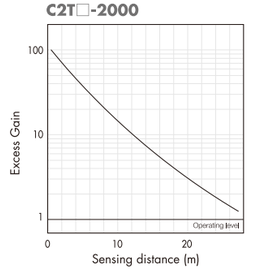

**C2R□-350**




**C2R□-F400**

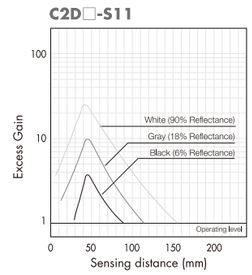



**C2T□-2000**

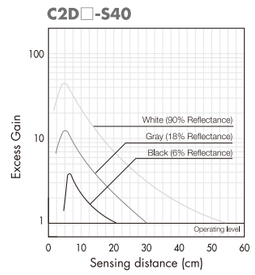



## Angle (90 degree)

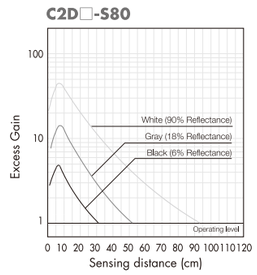
**C2D□-S11**



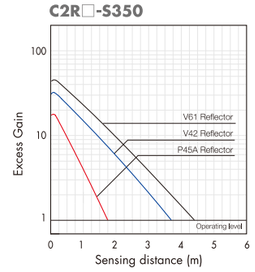

**C2D□-S40**



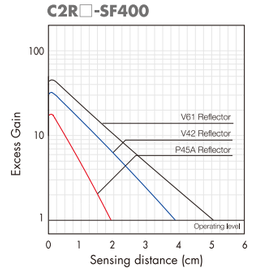

**C2D□-S80**



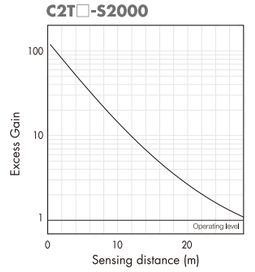

**C2R□-S350**




**C2R□-SF400**




**C2T□-S2000**









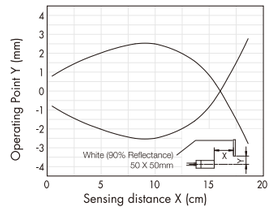



# SENSING AREA

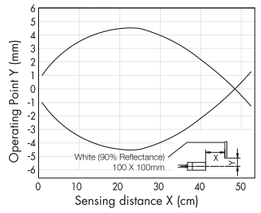
*common between plastic / metal housing

## Standard Types

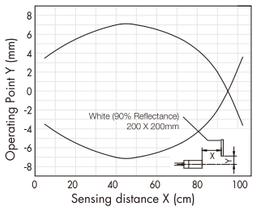
**C2D□-11**



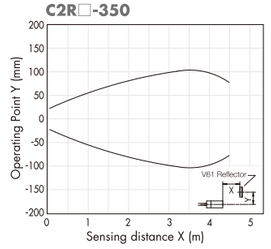

**C2D□-40**



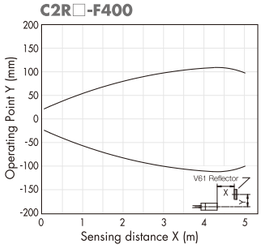

**C2D□-80**



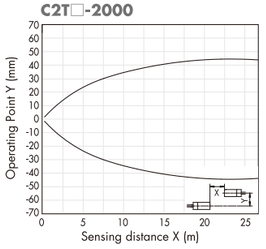

**C2R□-350**



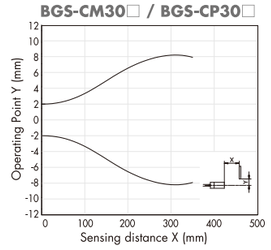

**C2R□-F400**




**C2T□-2000**

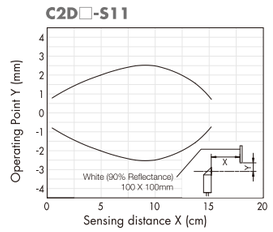



**BGS-CM30□ / BGS-CP30□**

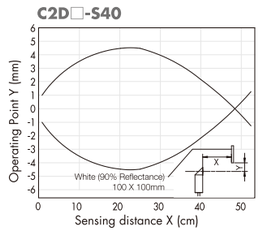



## Angle (90 degree)

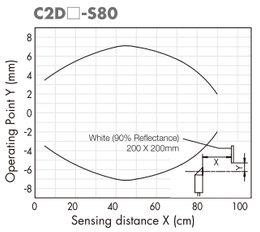
**C2D□-S11**



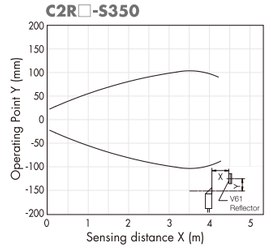

**C2D□-S40**



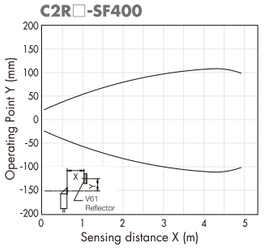

**C2D□-S80**



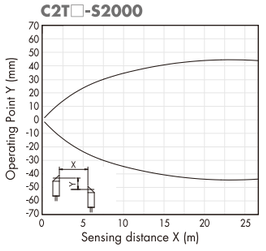

**C2R□-S350**




**C2R□-SF400**




**C2T□-S2000**

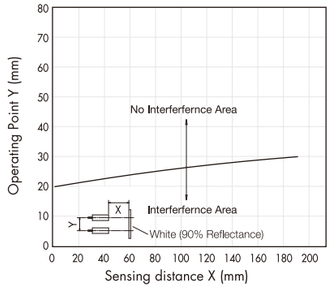


# INTERFERENCE AREA

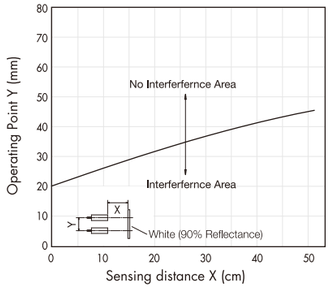
*common between plastic / metal housing

## Standard Types

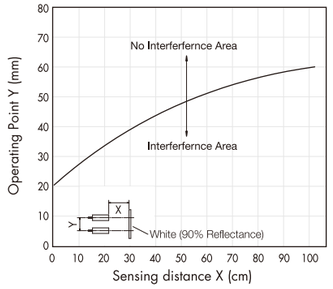
### C2D□-11



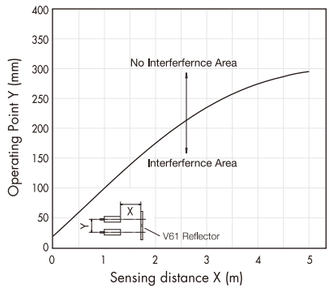

### C2D□-40



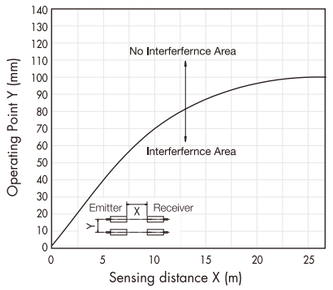

### C2D□-80



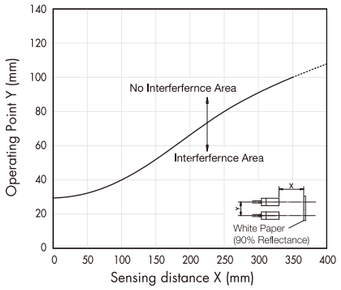

### C2R□-350 / C2R□-F400 common




### C2T□-2000

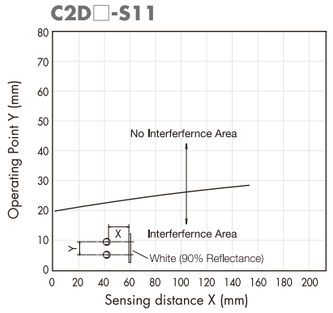



### BGS-CM30□ / BGS-CP30□

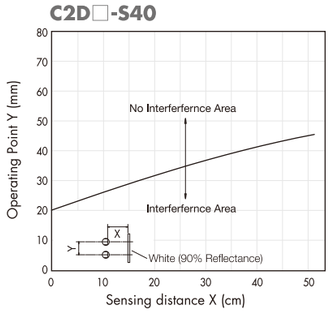



## Angle (90 degree)

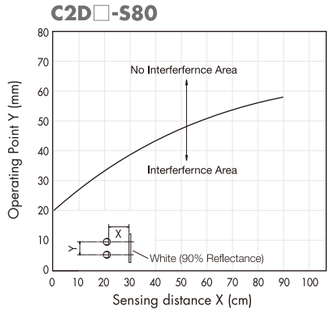
### C2D□-S11



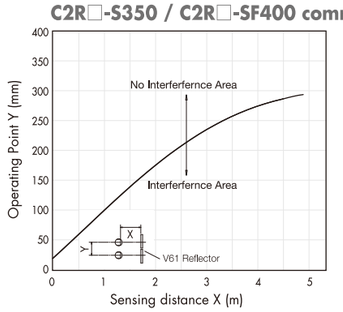

### C2D□-S40



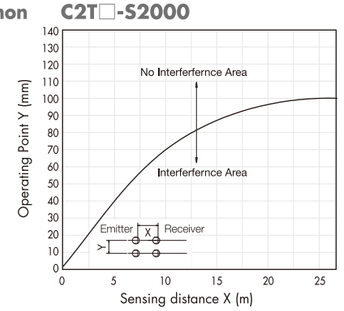

### C2D□-S80




### C2R□-S350 / C2R□-SF400 common




### C2T□-S2000







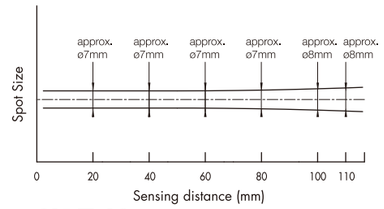



# SPOT SIZE

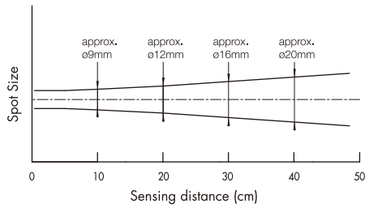
*common between plastic / metal housing

## Standard Types

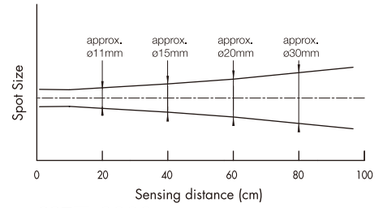
### C2D□-11



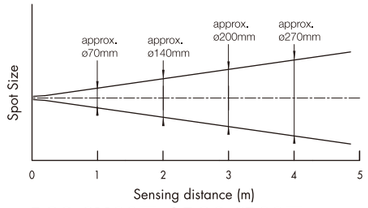

### C2D□-40



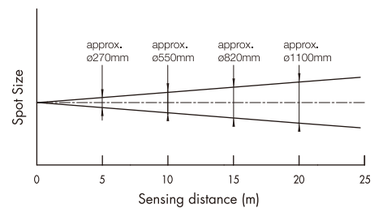

### C2D□-80



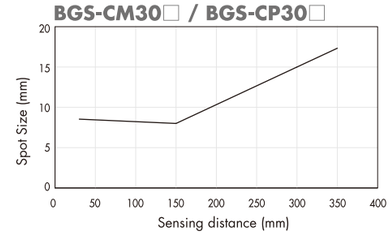

### C2R□-350




### C2T□-2000

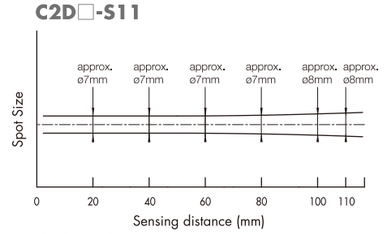



### BGS-CM30□ / BGS-CP30□

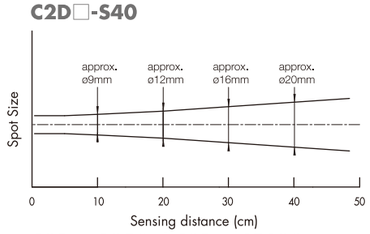



## Angle (90 degree)

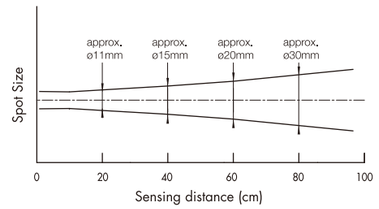
### C2D□-S11



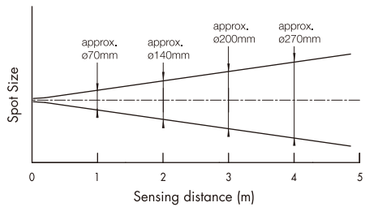

### C2D□-S40



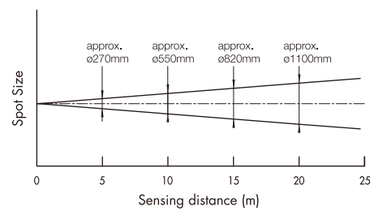

### C2D□-S80




### C2R□-S350 / C2R□-SF400 common




### C2T□-S2000

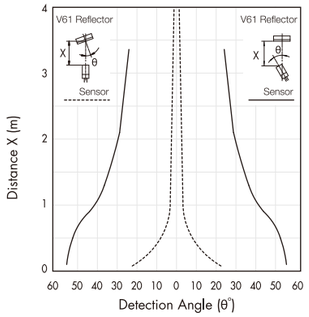


# ANGULAR DEVIATION

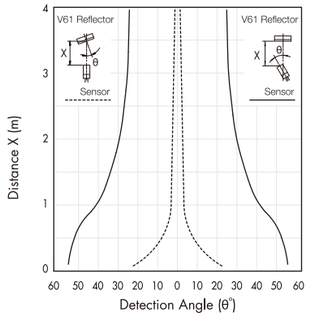
*common between plastic / metal housing

## Standard Types

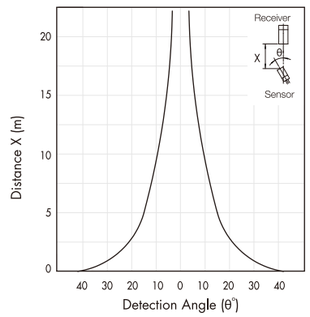
**C2R□-350**




**C2R□-F400**

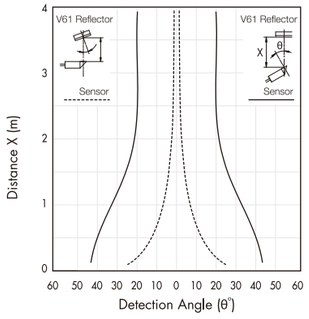



**C2T□-2000**

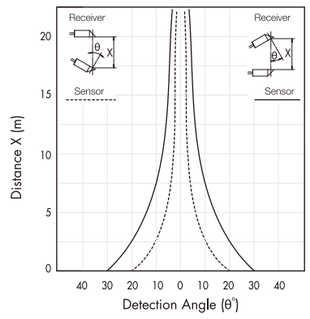



## Angle (90 degree)

**C2R□-S350 / C2R□-SF400 common**



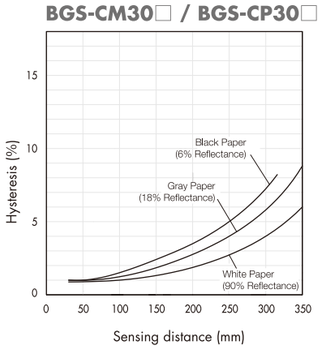

**C2T□-S2000**




# BGS HYSTERESIS

*common among all the BGS types

**BGS-CM30□ / BGS-CP30□**







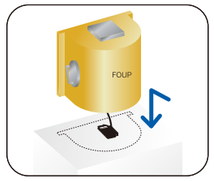



Photoelectric Sensor

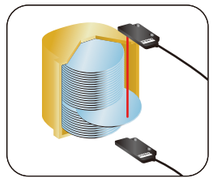
# E series

- Super Side-sense Type projects the beam from the 5mm (0.19 inch) of wide edge of the sensor.
- M8 pig-tail connector types are available for all models.
- Tough mechanics. 100G Shock Resistance and IP67 Water tightness.
- Easily visible indicator LED can be seen even from the back.

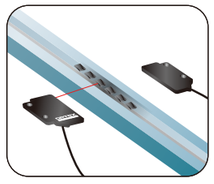
## Applications



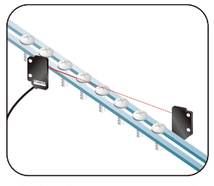

**Detecting presence of FOUP**



**Detection of wafer extending from cassette**

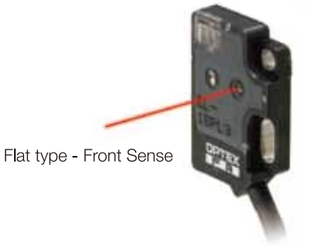


**Detecting parts presence from parts feeder**



**Detecting screws at output of feeder**

## 2 type select




## M8 pig-Tail connector for easy maintenance.

M8 Pig-Tail

## IP67 rating

RoHS compliant

## Operating LED visible in the back

It's convenient. Verifying the operation of the sensor is easy.

Front view

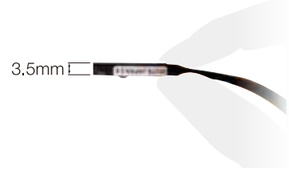
Back view

## Universal mounting holes.

Flexible mounting for easy installation.

## 3.5mm thin dimensions (Flat type)

Leading edge of sensing functions are designed in this thin size. Ideal for space saving.
(Side sense type : 5mm)



# Super Side-Sense type

Unique Side-Sensing Type available in Duffuse,Convergent and Thru-Beam.
M8 Pigtail models in both 3 and 4 pin types.

## EL-S series
**Convergent Type**

15mm (0.6 inch) sensing distance.
Light-On/Dark-On models available.
+/-0.1mm (0.004 inch) repeat accuracy.
2mm (0.07 inch) project spot diameter at 15mm distance.
0.5 msec. response speed.

## ED-S series
**Diffuse Reflective Type**

30mm sensing distance.
Light-On/Dark-On models available.
+/-0.05mm (0.002 inch) repeat accuracy.
30mm sensing distance with 10% Hysteresis.

## ET-S series
**Thru-Beam Type**

500mm (19.7 inch) sensing distance.
Light-On/Dark-On models available.
+/-0.1mm (0.004 inch) repeat accuracy.
0.25 msec. response speed.

# Flat type - Front Sense

Thin and flat design for space saving. Three different models of Convergent models.

## EL - series
**Convergent Type**

3 different sensing distance are available.
30mm (1.18 inch),15mm (0.6 inch), and 8mm (0.31 inch) for close installation.
Compact housing is ideal for space saving.

## ED - series
**Diffuse Reflective Type**

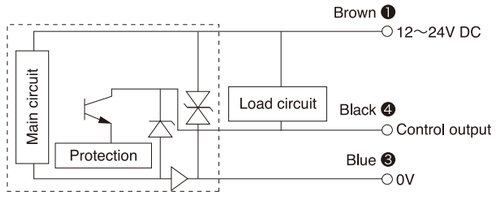
Standard diffuse reflective type with 100mm (3.94 inch) sensing distance.

## ET - series
**Thru-Beam Type**

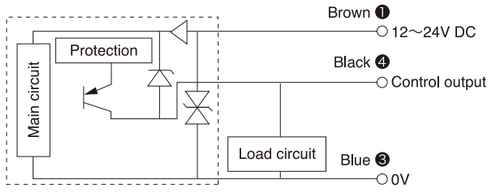
0.5msec responce speed and sharp optical system designed in 12 × 20 × 3.5 mm dimensions.

# Circuit diagram

### NPN output




### PNP output





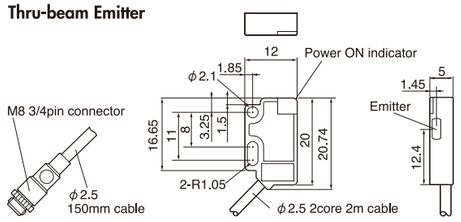




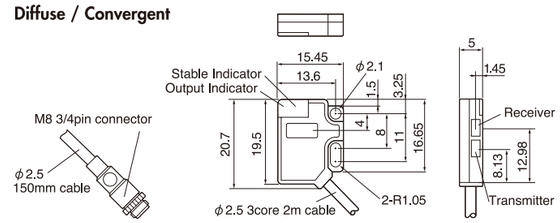

# Dimensions

## Super side - Sensing type

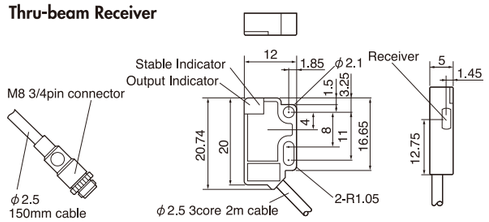
### Thru-beam Emitter




### Diffuse / Convergent




### Thru-beam Receiver

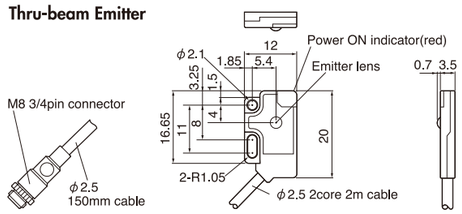



<3 Pin configuration>
① DC12~24V
② Control Output
③ 0V

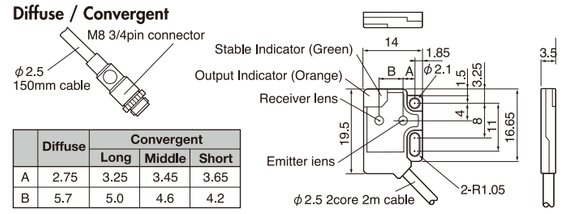
<4 Pin configuration>
① DC12~24V
② –
③ 0V
④ Control Output

## Flat type - Front Sensing

### Thru-beam Emitter

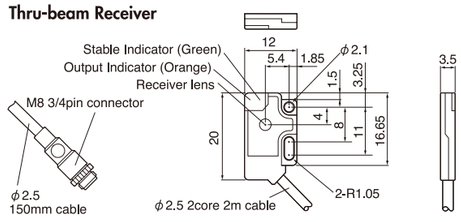



### Diffuse / Convergent




| | Diffuse | Convergent | | |
|---|---|---|---|---|
| | | Long | Middle | Short |
| A | 2.75 | 3.25 | 3.45 | 3.65 |
| B | 5.7 | 5.0 | 4.6 | 4.2 |

### Thru-beam Receiver




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

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

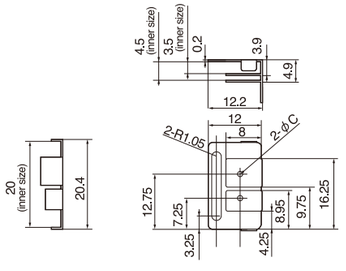
# Options

### Slit mask

**BL-W2F-1(=ϕ1mm)**
**BL-W2F-1.5(=ϕ1.5mm)**

| | BL-W2F-1 | BL-W2F-1.5 |
|---|---|---|
| C | 1 | 1.5 |
| D | 1 | 1.5 |

Material:SUS304 t=0.2




(Unit : mm)

# Specifications

## Super Side - Sensing type

| Model | | | Diffuse 30mm | Convergent 15mm | Thru-beam 500mm |
|---|---|---|---|---|---|
| NPN type | Light ON | 2m cable | ED-S30NL | EL-S15NL | ET-S500NL |
| | | M8 pigtail - 3pin | ED-S30NL3 | EL-S15NL3 | ET-S500NL3 |
| | | M8 pigtail - 4pin | ED-S30NL4 | EL-S15NL4 | ET-S500NL4 |
| | Dark ON | 2m cable | ED-S30ND | EL-S15ND | ET-S500ND |
| | | M8 pigtail - 3pin | ED-S30ND3 | EL-S15ND3 | ET-S500ND3 |
| | | M8 pigtail - 4pin | ED-S30ND4 | EL-S15ND4 | ET-S500ND4 |
| PNP type | Light ON | 2m cable | ED-S30PL | EL-S15PL | ET-S500PL |
| | | M8 pigtail - 3pin | ED-S30PL3 | EL-S15PL3 | ET-S500PL3 |
| | | M8 pigtail - 4pin | ED-S30PL4 | EL-S15PL4 | ET-S500PL4 |
| | Dark ON | 2m cable | ED-S30PD | EL-S15PD | ET-S500PD |
| | | M8 pigtail - 3pin | ED-S30PD3 | EL-S15PD3 | ET-S500PD3 |
| | | M8 pigtail - 4pin | ED-S30PD4 | EL-S15PD4 | ET-S500PD4 |
| Supply voltage | | | DC 12 to 24V ±10% Inc. 10% ripple | | |
| Power consumption | | | 20mA Max | | 30mA Max |
| Sensing distance | | | 30mm | 2 - 15mm | 500mm |
| Spot size | | | ϕ3mm @ 30mm | ϕ2mm @ 15mm | ϕ60mm @ 500mm |
| Objects | | | Not restricted | | opaque object |
| Repeat accuracy | | | +/-0.05mm Max | +/-0.1mm Max | |
| Response time | | | 0.25msec(ET), 0.5msec(ED,EL) | | |
| Light souce | | | Red LED | | |
| Hysteresis | | | 10% | | — |
| Control output | | | NPN or PNP Open collector, 1.8V -50mA<br>50mA/DC24V Max | | |
| Environmental illuminance | | Sunlight | 10,000 lx Max | | |
| | | Incandescent lamp | 3,000 lx Max | | |
| Operating temp / humidity | | | –25 up to 55 °C / 35 up to 85% | | |
| Storage conditions | | | –40 up to 70 °C / 35 up to 95% | | |
| Noise resistance | | | EN60947-5-2:1998 (Immunity) EN60947-5-2:1998 (radiation) | | |
| Vibration resistance | | | 10 to 55Hz, 1.5mm, X-Y-Z each for 2 hours | | |
| Shock resistance | | | 1000m/S², X-Y-Z each for 3 times | | |
| Protection category | | | IP67 | | |
| Warm-up time | | | 100ms | | |
| LED Indicator | | | Green (stable), Orenge (output), Red (Power of emitter : ET type) | | |
| Connector and cable | | | 2m cable, ϕ2.5mm 3 cores (2 cores for emitter) / M8 Pigtail 150 mm | | |
| Circuit protection | | | Over Current, Reverse Polarity, Short Circuit | | |
| Material | | | PC | | |
| Conformity | | | CE | | |

## Flat type - Front Sensing

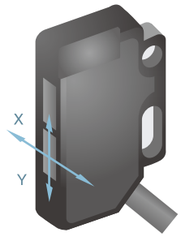
| Model | | | Diffuse 100mm | Convergent 8/15/30mm | | | Thru-beam 500mm |
|---|---|---|---|---|---|---|---|
| NPN type | Light ON | 2m cable | ED-100NL | EL-30NL | EL-15NL | EL-08NL | ET-500NL |
| | | M8 pigtail - 3pin | ED-100NL3 | EL-30NL3 | EL-15NL3 | EL-08NL3 | ET-500NL3 |
| | | M8 pigtail - 4pin | ED-100NL4 | EL-30NL4 | EL-15NL4 | EL-08NL4 | ET-500NL4 |
| | Dark ON | 2m cable | ED-100ND | EL-30ND | EL-15ND | EL-08ND | ET-500ND |
| | | M8 pigtail - 3pin | ED-100ND3 | EL-30ND3 | EL-15ND3 | EL-08ND3 | ET-500ND3 |
| | | M8 pigtail - 4pin | ED-100ND4 | EL-30ND4 | EL-15ND4 | EL-08ND4 | ET-500ND4 |
| PNP type | Light ON | 2m cable | ED-100PL | EL-30PL | EL-15PL | EL-08PL | ET-500PL |
| | | M8 pigtail - 3pin | ED-100PL3 | EL-30PL3 | EL-15PL3 | EL-08PL3 | ET-500PL3 |
| | | M8 pigtail - 4pin | ED-100PL4 | EL-30PL4 | EL-15PL4 | EL-08PL4 | ET-500PL4 |
| | Dark ON | 2m cable | ED-100PD | EL-30PD | EL-15PD | EL-08PD | ET-500PD |
| | | M8 pigtail - 3pin | ED-100PD3 | EL-30PD3 | EL-15PD3 | EL-08PD3 | ET-500PD3 |
| | | M8 pigtail - 4pin | ED-100PD4 | EL-30PD4 | EL-15PD4 | EL-08PD4 | ET-500PD4 |
| Supply voltage | | | DC 12 to 24V ±10% Inc. 10% ripple | | | | |
| Power consumption | | | 20mA Max | | | | 30mA Max |
| Sensing distance | | | 100mm | 5 - 30mm | 2 - 15mm | 3 - 8mm | 500mm |
| Spot size | | | ϕ60mm @ 100mm | ϕ20mm @ 30mm | ϕ10mm @ 15mm | ϕ10mm @ 8mm | ϕ140mm @ 500mm |
| Objects | | | Not restricted | | | | opaque object |
| Response time | | | 0.5msec Max | | | | |
| Hysteresis | | | White Paper : 10% (EL-08 and EL-15),15%(EL-30 and EL-100) | | | | — |
| Control output | | | NPN or PNP Open collector, 50mA Max / 24V DC | | | | |
| Environmental illuminance | | | Sun light:10,000 lux Max,Incandescent lamp:3,000 lux Max | | | | — |
| Operating temp / humidity | | | –25 up to 55 °C / 35 up to 85% | | | | |
| Storage temp / humidity | | | –40 up to 70 °C / 35 up to 95% | | | | |
| Noise resistance | | | EN60947-5-2:1998 (Immunity) EN60947-5-2:1998 (radiation) | | | | |
| Vibration resistance | | | 10 to 55Hz, 1.5mm, X-Y-Z each for 2 hours | | | | |
| Shock resistance | | | 1000m/S², X-Y-Z each for 3 times | | | | |
| Protection category | | | IP67 | | | | |
| Warm-up time | | | 15msec | | | | |
| LED Indicator | | | Green (stable), Orenge (output), Red (Power of emitter : ET type) | | | | |
| Operating mode | | | Light ON / Dark ON selectable | | | | |
| Connector and cable | | | 2m cable, ϕ2.5mm 3 conductors (2 conductors for emitter) / M8 Pigtail 150 mm | | | | |
| Circuit protection | | | Over Current, Reverse Polarity, Short Circuit | | | | |
| Material | | | PC | | | | |
| Conformity | | | CE | | | | |







# Reference (typical)

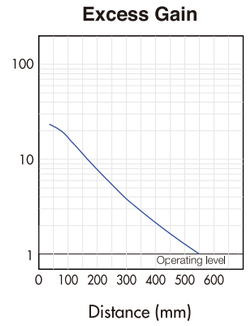


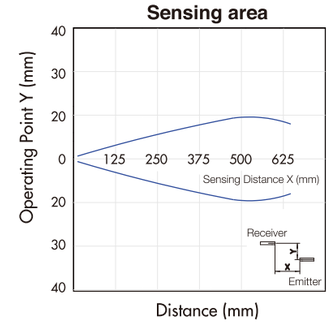

## Repeat Accuracy

| ET-S500 | | ED-S30 | | EL-S15 | |
|---|---|---|---|---|---|
| X | Y | X | Y | X | Y |
| 0.1 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 |

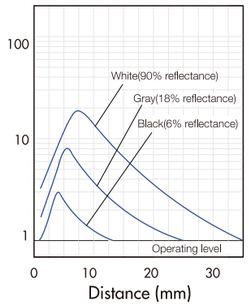
(Unit : mm)

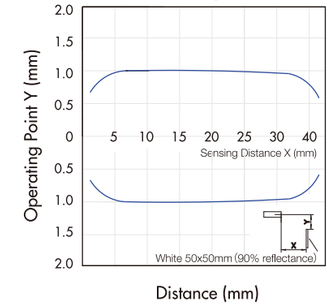
**ET-S500**



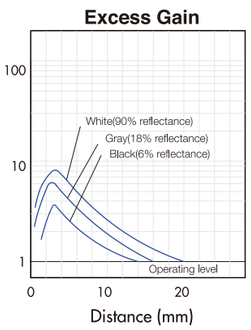



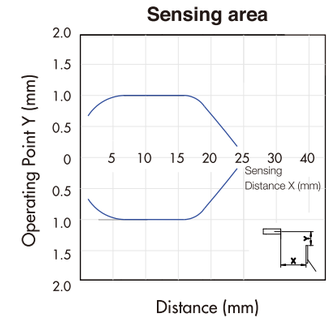

**ED-S30**



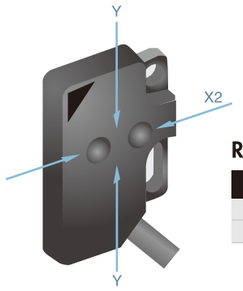




**EL-S15**



## Reference (typical)

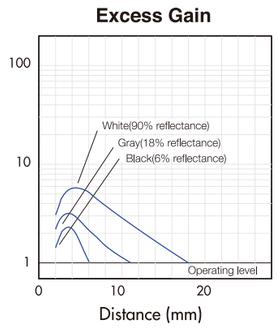


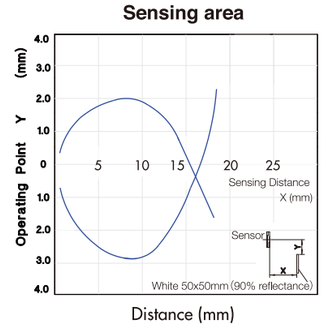

**Repeat Accuracy**

| EL-30 | | | EL-15 | | | EL-08 | | |
|---|---|---|---|---|---|---|---|---|
| X1 | X2 | Y | X1 | X2 | Y | X1 | X2 | Y |
| 0.8 | 0.8 | 0.8 | 0.3 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 |

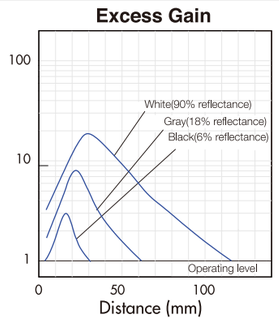
(Unit : mm)

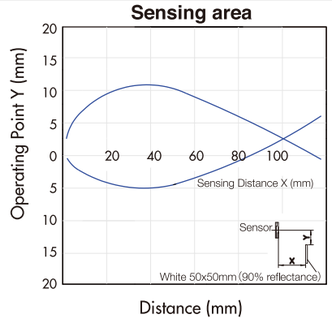
### EL-15



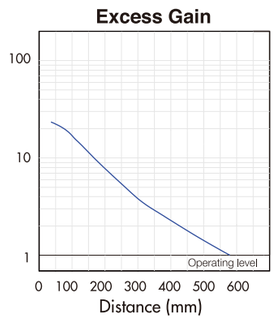



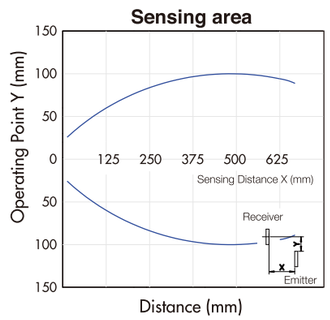

### ED-100




### ET-500

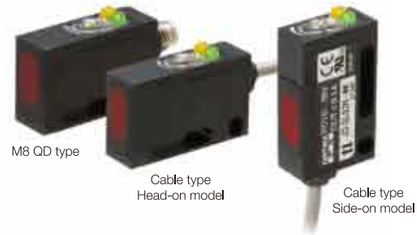




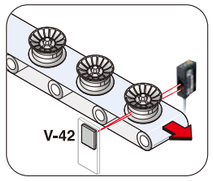

Photoelectric Sensor

# J series




- Epoxy filled sensor housing provides IP67G rating for complete protection against water.
- 100G of shock resistance.
- M8 QD types are available for over all types.

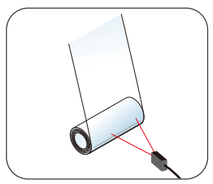
## Applications




**Counting wheels (JR-S300)**



**Monitoring cookie paste (JT-S1000)**

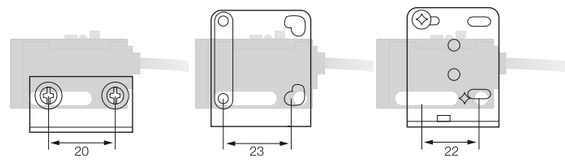


**Roll of transparent film (JD-HW08)**

## Epoxy filled housing provides complete protection against water.

## Slotted mounting holes for added flexibility. ( Applicable for both M3 and M4 )

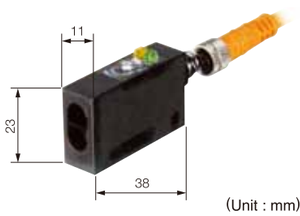
The slotted mounting hole (25.4 mm pitch) allows the sensor to be used with various types of mounting brackets.




(Unit : mm)

## M8 QD for easy maintenance

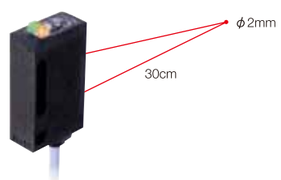
The M8 QD connector types are small enough to be installed in areas where mounting space is limited.




(Unit : mm)

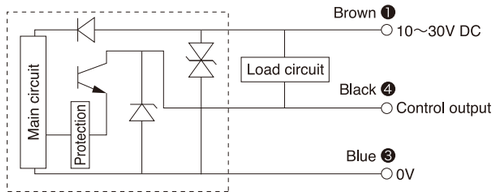
## Visible red spot

Visible red LED spot for easy alignment of the sensor. The projected spot is approx. 2 mm dia. at 30 cm distance from the sensor.

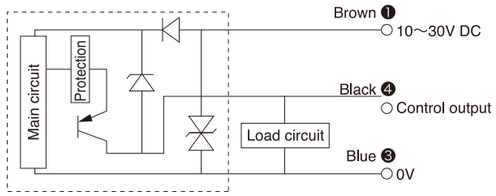


# Circuit diagram

### NPN output

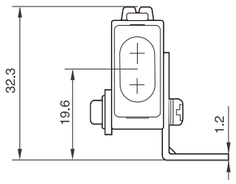


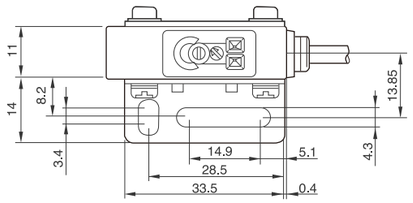

### PNP output

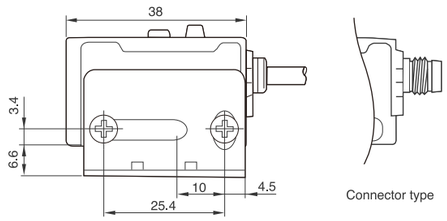



# Dimensions

### Head ON type



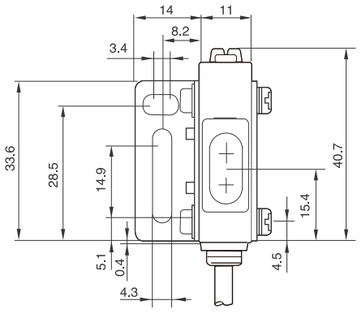



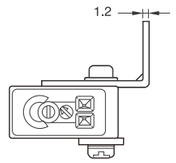



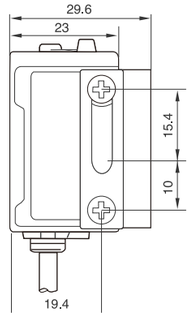


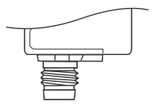

Connector type

### Side ON type



Connector type

<4 Pin configuration>

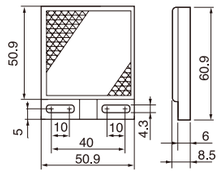
① DC10～30V
② –
③ 0V
④ Control Output

(Unit : mm)

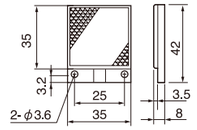




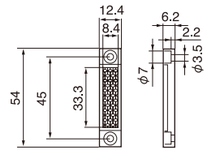
### Standard reflector V-61



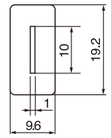

### Small reflector V-42




### Tiny reflector P45A




### SJ-01 Slit mask for JT types




# Specifications

| Model | | Thru-beam | Retro-Reflection | Diffuse Reflection | Limited range (convergent) | Wide angle (divergent) |
|---|---|---|---|---|---|---|
| Cable type | NPN | JT-H(S)1000N(R) | JR-H(S)300N | JD-H(S)R80N | JD-H(S)L03N | JD-H(S)W08N |
| | PNP | JT-H(S)1000P(R) | JR-H(S)300P | JD-H(S)R80P | JD-H(S)L03P | JD-H(S)W08P |
| Connector type | NPN | JT-H(S)1000CN(R) | JR-H(S)300CN | JD-H(S)R80CN | JD-H(S)L03CN | JD-H(S)W08CN |
| | PNP | JT-H(S)1000CP(R) | JR-H(S)300CP | JD-H(S)R80CP | JD-H(S)L03CP | JD-H(S)W08CP |
| Sensing distance | | 10m | 3m | 80cm | 2-5cm | 8cm |
| Response time | | 0.5msec Max | | | | |
| Operating mode | | Light on / Dark on selectable | | | | |
| Hysteresis | | NIL | | 20% Max | | |
| Light source | | Red LED / Infrared | Red LED | | | Red LED |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | |
| Supply voltage | | DC 10 to 30V including 10% of ripple | | | | |
| Conformity | | JIS / C4525, CE, UL | | | | |
| Power consumption | | Emitter : 20mA, Receiver 15mA | 20mA Max | | | |
| Sensitivity adjustment | | 2-turn Potentiometer | | | | |
| Indicator | | 2 indicator, Output (Orange), Stable (Green) | | | | |
| Protection category | | IEC 144 IP67, JEM IP67g | | | | |
| Shock resistance | | 100G (1,000m/S$^2$), X-Y-Z axis 3 times | | | | |
| Environmental illuminance | | Sunlight : 10,000 lux Max, Incandescent lamp : 3,000 lux Max. | | | | |
| Material | | PBT (Case), PC (Lens) | | | | |

# Options

**Standard reflector V-61**

**Small reflector V-42**

**Tiny reflector P45A**

**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

**Protective mounting brackets (For Head-on types)**

**LJ-H01：Protector**

**LJ-H02：Protector**

**Protective mounting brackets (For Side-on types)**

**LJ-S01：Protector**

**LJ-S02：Protector**

**SJ-01 Slit mask for JT types**

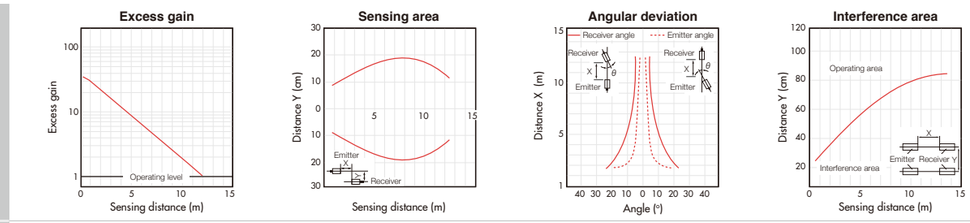
| Slit size | Installation | Minimum | Maximum distance |
|---|---|---|---|
| 1×10mm | Both of emitter / receiver | 0.6mm | 1m |

**Sensor stand**
**PLN-1**

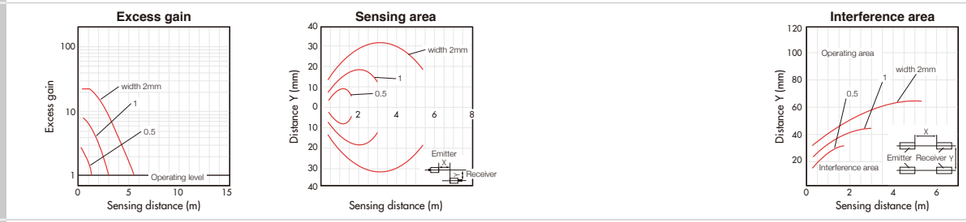
**Fixture of Reflector**
**PLN-1M**

# Reference (typical)

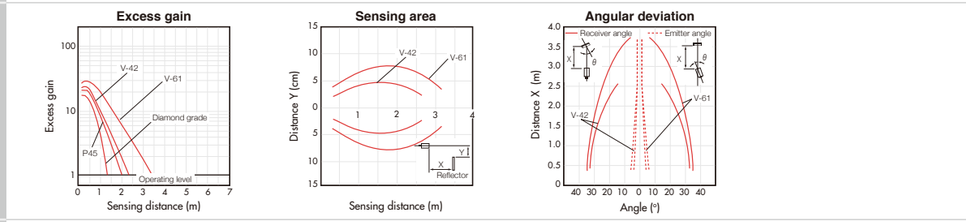
**JT-H1000N**
**JT-S1000N**



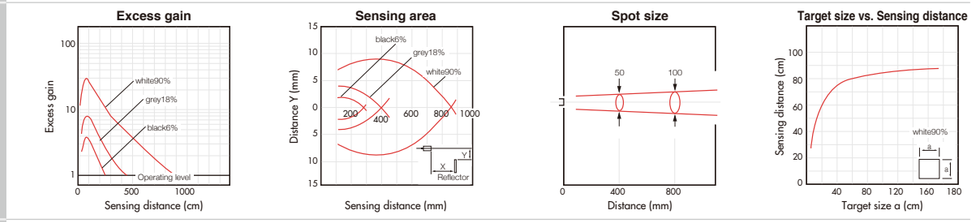

**JT-H1000N**
**JT-S1000N**
**& SLIT**



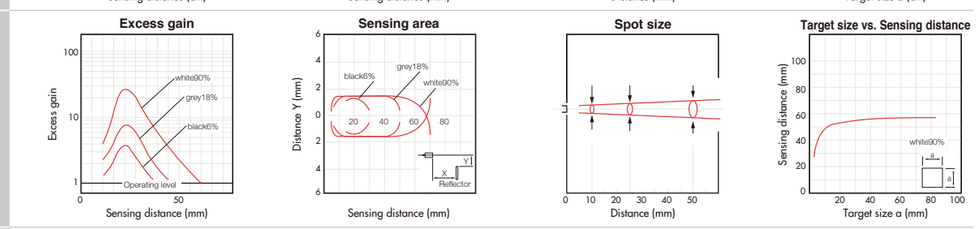

**JR-H300N**
**JR-S300N**



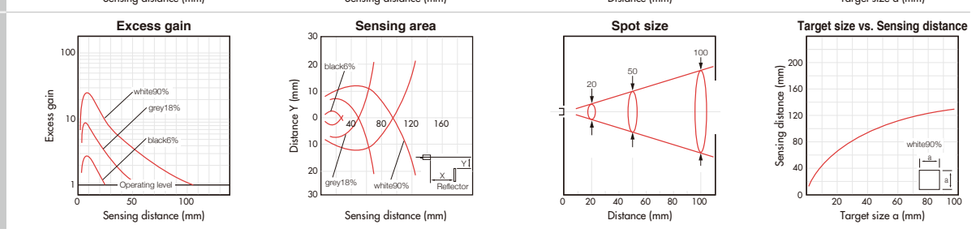

**JD-HR80N**
**JD-SR80N**




**JD-HL03N**
**JD-SL03N**




**JD-HW08N**
**JD-SW08N**

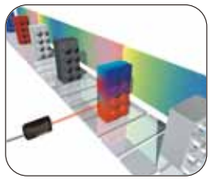


Photoelectric Sensor

# J2 series

- Epoxy filled sensor housing provides IP67 rating for complete protection against water and 100G of shock resistance.
- Narrow view optics project a 1.5 mm spot (Diffuse Reflective type J2D).
- 1 meter sensing distance - Diffuse Reflective type (J2D).

## Applications



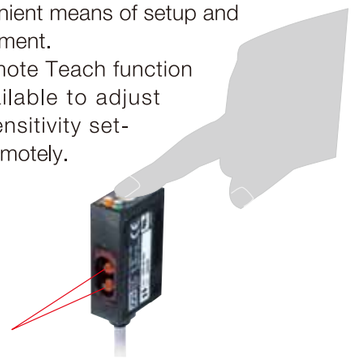
**BGS function for colorful object detection (BGS type)**

## Completely waterproof

Fully epoxy injected inside the body. (IP67)
Protection category 100G means tough and rigid mechanics.

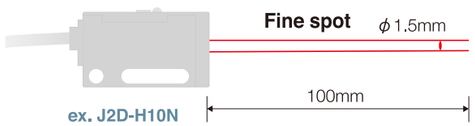
## Single Button Teaching

Built-in microcomputer offers a convenient means of setup and adjustment.
A Remote Teach function is available to adjust the sensitivity setting remotely.



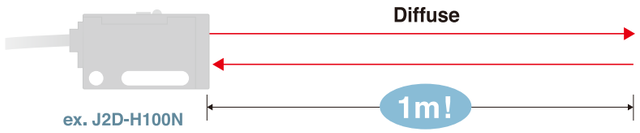
## Narrow View Diffuse.

The Narrow view diffuse model projects a 1.5 mm diameter spot at 100 mm distance. The sharp angle of view is ideal for detecting a target through a small opening.




## 1 meter Diffuse.

1 meter sensing distance in diffuse reflection mode.

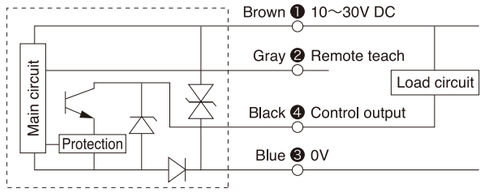




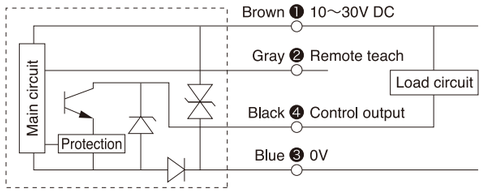



## Circuit diagram

**NPN output**



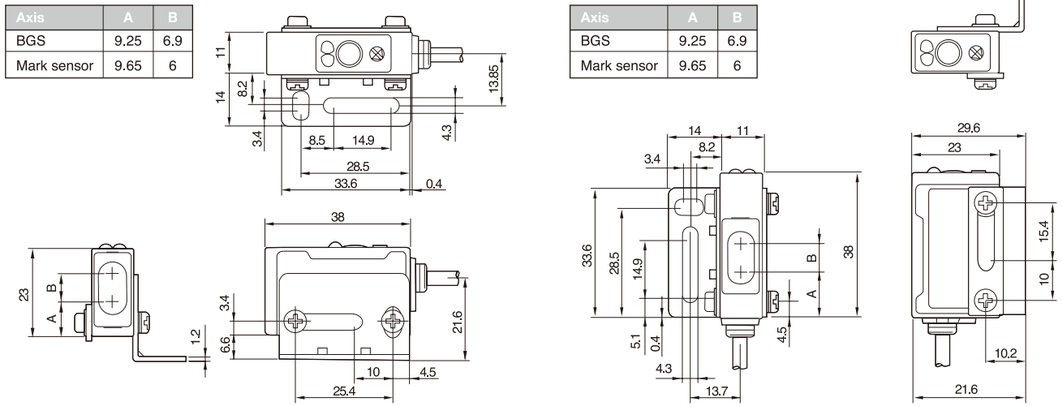

**PNP output**




## Dimensions

**Head ON type**

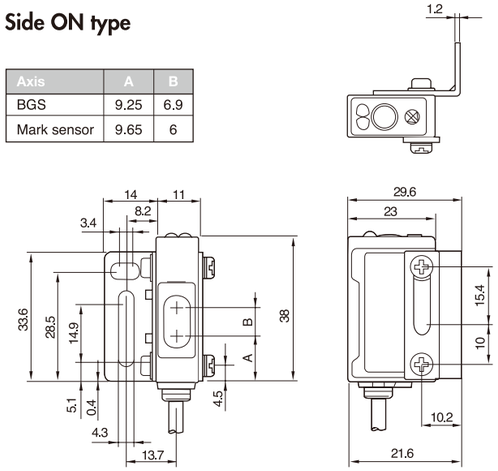
| Axis | A | B |
|---|---|---|
| BGS | 9.25 | 6.9 |
| Mark sensor | 9.65 | 6 |



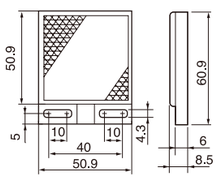

<4 Pin configuration>
① DC10~30V
② –
③ 0V
④ Control Output

**Side ON type**

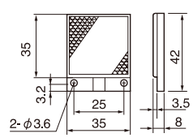
| Axis | A | B |
|---|---|---|
| BGS | 9.25 | 6.9 |
| Mark sensor | 9.65 | 6 |



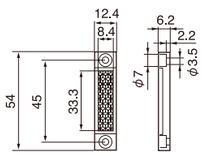

**Standard reflector V-61**




**Small reflector V-42**




**Tiny reflector P45A**




(Unit : mm)

# Specifications

| Model | | Narrow View | Diffuse Reflective (IR) | Diffuse Reflective (Red) | BGS |
|---|---|---|---|---|---|
| Cable type | NPN | J2D-H(S)10N | J2D-H(S)100N | J2D-H(S)70N | BGS-H(S)15N |
| | PNP | J2D-H(S)10P | J2D-H(S)100P | J2D-H(S)70P | BGS-H(S)15P |
| Connector type | NPN | J2D-H(S)10CN | J2D-H(S)100CN | J2D-H(S)70CN | BGS-H(S)15CN |
| | PNP | J2D-H(S)10CP | J2D-H(S)100CP | J2D-H(S)70CP | BGS-H(S)15CP |
| (Remark) | | "H = Head-on, S = Side-on | | | |
| Sensing distance | | 100mm | 1000mm | 700mm | 50-150mm |
| Power consumption | | 10mA Max | | | 45mA Max |
| Response time | | 0.5m sec | | | 2.5 msec Max |
| Hysteresis | | 15% | | | 8% @ 100mm |
| Spot size | | ϕ1.5mm@100mm | ϕ85mm@1000mm | ϕ50mm@600mm | ϕ10mm@150mm |
| Light source | | Red | Infrared | Red | |
| Supply voltage | | DC 10 to 30V including 10% of ripple | | | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | |
| Sensitivity adjustment | | Teach-in (Available Remote Teach-in) | | | |
| Shock resistance | | 100G (1,000m/S$^2$), X-Y-Z axis 3 times | | | |
| Remarks | | Connector is M8, 3 and 4 pin connectors are available | | | |
| Operating mode | | Light on / Dark on selectable | | | |
| Operating temp | | –25 up to 55 °C | | | |
| Operating humidity | | 35 up to 95% RH | | | |
| Storage temp / humidity | | –40 up to 70 °C, 35 - 95% RH | | | |
| Environmental illuminance | | Sunlight : 10,000 lux Max, Incandescent lamp : 3,000 lux Max. | | | |
| Insulation resistance | | Min. 20 M Ohm / DC500V | | | |
| Conformity | | JIS, CE, CRU | | | |
| (JIS C4525) | | 1 sec, 300V | | | |
| Feilen test | | Level 3 | | | |
| VDE protection | | Class 3 | | | |
| Vibration resistance | | 10 to 55 hz amplitude 1.5mm, X-Y-Z for 2 hours | | | |
| Protection category | | IP67 | | | |
| Material | | Case : PBT, Lens : PMMA | | | |

# Options

**Standard reflector V-61**

**Small reflector V-42**

**Tiny reflector P45A**

**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

**Sensor stand**
**PLN-1**

**Fixture of Reflector**
**PLN-1M**

**Protective mounting brackets (For Head-on types)**

**LJ-H01**

**LJ-H02**

**Protective mounting brackets (For Side-on types)**

**LJ-S01**

**LJ-S02**

Photoelectric Sensor

# J3 series

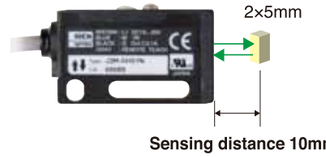
- J3M Mark sensor with Pushbutton Teach.
- Narrow view optics project a 3.0 mm spot (Retro-reflective type J3R-100).
- 1.5 mm projected spot for BGS types.
- Epoxy filled sensor housing provides protection against vibration.

## IP67

In addition to vibration resistance, the epoxy filled housing results in an IP67 rating.

## Fast Response 200 micro sec, 10±2mm sensing distance (Mark sensor J3M type)

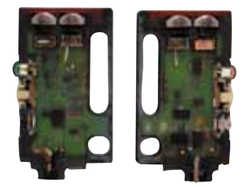
A latest Green LED with physical composition of GlanN2.
It's best for mark sensing.




**Sensing distance 10mm**

## Completely waterproof

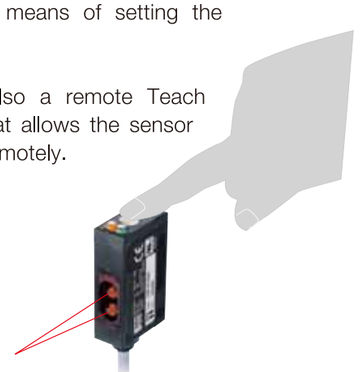
An IP67 rating is guaranteed by filling the sensor body with epoxy.
The 100G shock resistance rating protects the sensor against mechanical vibration.



## One-push Teaching.

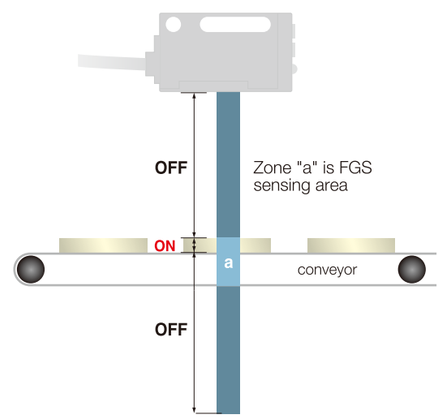
The built-in microcomputer provides a convenient means of setting the sensor.

There is also a remote Teach function that allows the sensor to be set remotely.

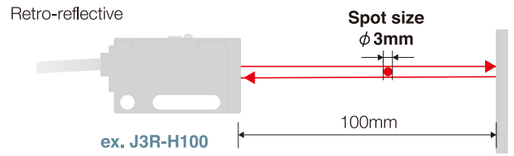


## BGS-S/H15 : Built-in FGS function

The BGS-S15 and BGS-H15 sensors are able to operate as FGS (foreground suppression) sensors. The FGS function senses the surface of the conveyor and uses this as a reflector, the sensor will detect thin and/or flat objects positioned on the conveyor.
A standard diffuse reflective sensor could be used in this application but adjusting the sensitivity is sometimes difficult, the FGS function is easily adjusted and will operate in a manner similar to a retro-reflective sensor without the reflector.

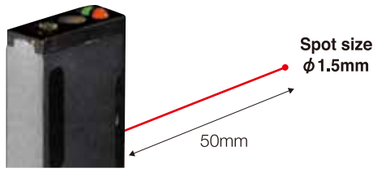


## Ideal for detection of small objects



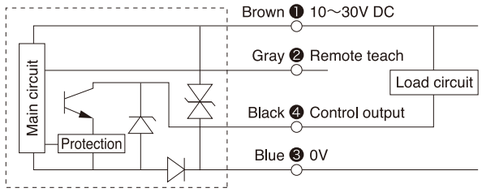

## ϕ1.5mm of small spot size (BGS-3JH05)

Small spot in a BGS sensing system.

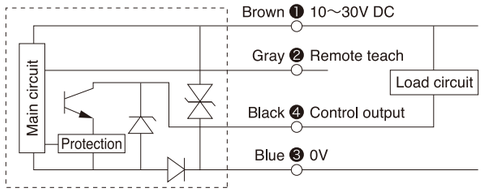



## Circuit diagram

### NPN output



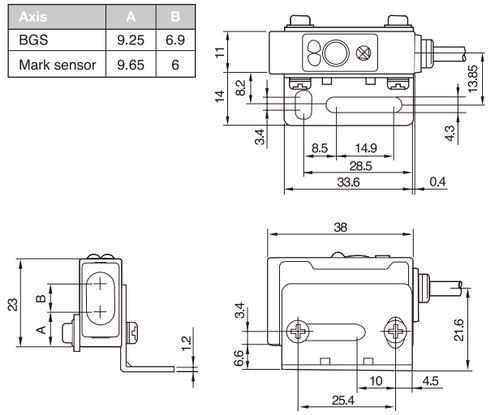

### PNP output



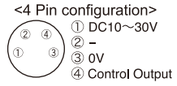

## Dimensions

### Head ON type

| Axis | A | B |
|---|---|---|
| BGS | 9.25 | 6.9 |
| Mark sensor | 9.65 | 6 |



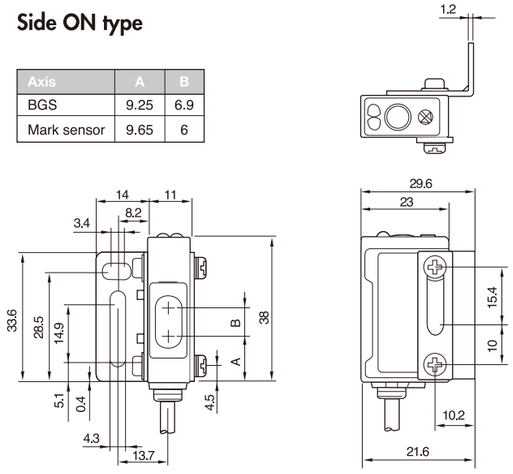

<4 Pin configuration>



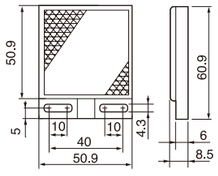
① DC10~30V
② –
③ 0V
④ Control Output

### Side ON type

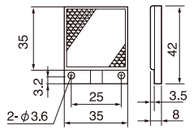
| Axis | A | B |
|---|---|---|
| BGS | 9.25 | 6.9 |
| Mark sensor | 9.65 | 6 |



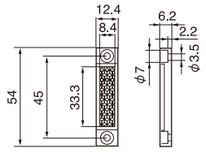

### Standard reflector V-61




### Small reflector V-42




### Tiny reflector P45A










## Specifications

| Model | | Mark Sensor | Retro-reflective Narrow View | BGS |
|---|---|---|---|---|
| Cable type | NPN | J3M-GH(S)01N | J3R-H(S)100N | BGS-3JH(S)05N |
| | PNP | J3M-GH(S)01P | J3R-H(S)100P | BGS-3JH(S)05P |
| Connector type | NPN | J3M-GH(S)01CN | J3R-H(S)100CN | BGS-3JH(S)05CN |
| | PNP | J3M-GH(S)01CP | J3R-H(S)100CP | BGS-3JH(S)05CP |
| (Remark) | | *H = Head-on, S = Side-on | | |
| Sensing distance | | 10 +/- 2m | 0.05 - 1m | 15 - 50mm/18% |
| Power consumption | | 40mA Max | | |
| Response time | | 0.2m sec | | 0.7 msec |
| Hysteresis | | N/A | | 5% |
| Min detectable object | | Appr 2 x 5mm @ 10mm | 1mm @ 100mm | 0.5mm round@150mm |
| Light source | | Green | Red LED with special focusing lens | Red |
| Off delay | | 40 msec fixed | | |
| Supply voltage | | DC 10 to 30V including 10% of ripple | | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | |
| Sensitivity adjustment | | Teach-in | | |
| Remote teach-in | | Available | | |
| Shock resistance | | 100G (1,000m/S$^2$), X-Y-Z axis 3 times | | |
| Remarks | | Light on / Dark on selectable | | |
| Operating temp | | –25 up to 55 °C | | |
| Operating humidity | | 35 up to 95% RH | | |
| Storage conditions | | –40 up to 70 °C, 35 - 95% RH | | |
| Environmental illuminance | | Sunlight : 10,000lux Max, Incandescent lamp : 3,000 lux Max. | | |
| Insulation resistance | | Min. 20 M Ohm / DC500V | | |
| Conformity | | JIS, CE, CRU | | |
| (JIS C4525) | | 1μsec, 300V | | |
| Feilen test | | Level 3 | | |
| VDE protection | | Class 3 | | |
| Vibration resistance | | 10 to 55 hz amplitude 1.5mm, X-Y-Z for 2 hours | | |
| Protection category | | IP67 | | |
| Material | | Case : PBT, Lens : PMMA | | |

# Options

**Standard reflector V-61**

**Small reflector V-42**

**Tiny reflector P45A**

**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

**Protective mounting brackets (For Head-on types)**

**LJ-H01 : Protector**

**LJ-H02 : Protector**

**Protective mounting brackets (For Side-on types)**

**LJ-S01 : Protector**

**LJ-S02 : Protector**

**Sensor stand**
**PLN-1**

**Fixture of Reflector**
**PLN-1M**

Photoelectric Sensor

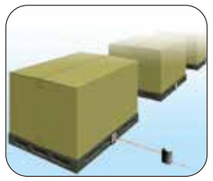
# V series

- Universal voltage photoelectric sensor 12～240 VDC / 24～240 VAC. M12 QD types are available.
- Relay contact (AC/DC models) and Transistor output (DC models).
- Rugged duty sensor housing.
- BGS-V2000, long sensing distance (2m) with BGS operation.

## Applications

**Rubber / plastic industry**

**Transportation industry**



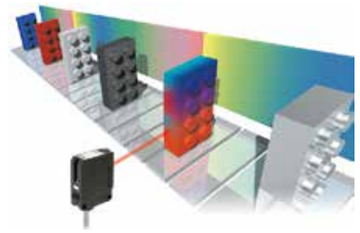
**Material handling**

## High power light source

The strong LED light source assures stable sensing even in misty or dirty conditions.

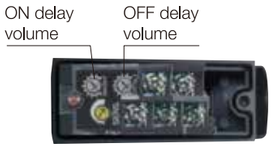
## Long sensing BGS-V2000 (2m) BGS type

BGS-V2000 , 2m sensing BGS sensor.



## Timer Function

Adjustable ON delay, OFF delay and ON+OFF delay time by individual delay trimmer.
From 0.1 to 10 sec.

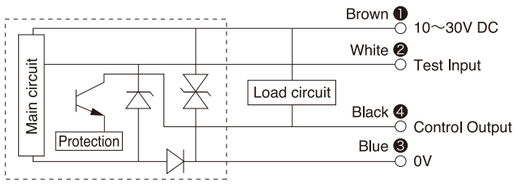



## Applicable for use world-wide

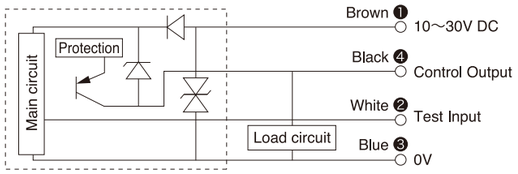
24 to 240V AC
12 to 240V DC.

# Circuit diagram

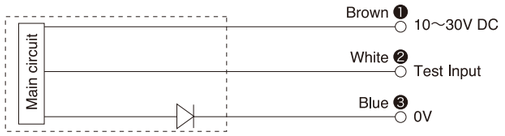
### NPN output




### PNP output

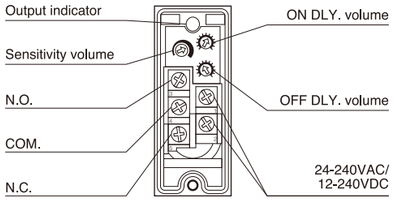



### Emitter

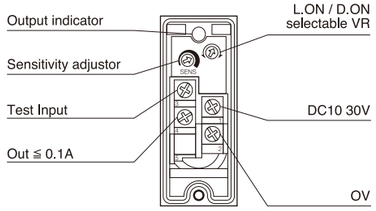



# Connections

### Relay type




### NPN / PNP type

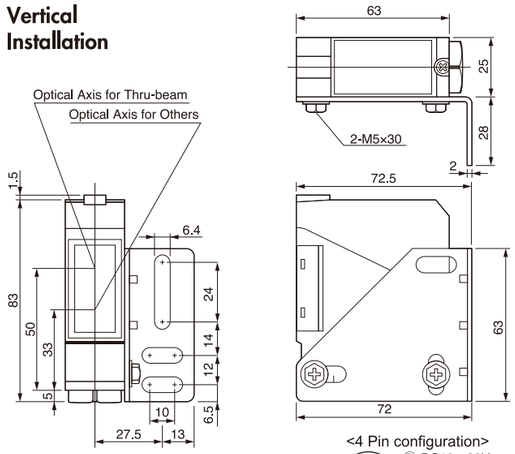



# Dimensions

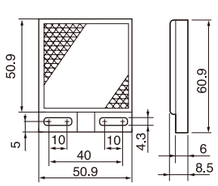
### Horizontal Installation



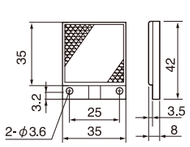

### Vertical Installation



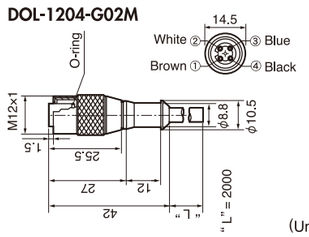

### Standard reflector V-61




### Small reflector V-42




### M12 connector cable DOL-1204-G02M




(Unit : mm)





# Specifications

| Model | | Thru-beam | Retro-Reflection | Diffused-Reflection Red LED | Diffused-Reflection IR LED | BGS type |
|---|---|---|---|---|---|---|
| Relay output type | | VT-4000 | VR-1000 | VD-130 | VD-300 | BGS-V2000 |
| | Timer | VT-4000T | VR-1000T | VD-130T | VD-300T | BGS-V2000T |
| Transistor output type | NPN/PNP | VT-3000N / 3000P | VR-800N / 800P | VD-100N / 100P | VD-250N / 250P | BGS-V2000N / 2000P |
| | Connector | VT-3000CN / 3000CP | VR-800CN / 800CP | VD-100CN / 100CP | VD-250CN / 250CP | BGS-V2000CN / 2000CP |
| Sensing distance | Relay type | 40 meter | 10 meter | 1.3 meter | 3 meter | 0.5~2 meter |
| | Transistor type | 30 meter | 8 meter | 1 meter | 2.5 meter | 0.5~2 meter |
| Response time | Relay type | 20msec | | | | |
| | Transistor type | 1.5msec | | | 5msec | |
| Operating mode | | Relay type = Light On fixed, NPN / PNP type = Light On / Dark On switchover | | | | |
| Hysteresis | | NIL | | 20% Max | | 15% Max |
| Light source | | Red | | | Infrared | |
| Control output | | NO / NC AC240V / DC30V,3A | | | | NO / NC AC240V / DC30V,3A |
| | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | |
| Supply voltage | | AC24-240V, DC12-240V +/–10% ripple | | | | |
| | | DC10-30V incl. 10% ripple | | | | |
| Conformity | | JIS / C4525, CE, UL | | | | |
| Power consumption | | 8.5VA | 5VA | | | |
| | | 35mA | | | 5mA | |
| Cable connection | | Terminal chamber, applicable cable ϕ6 to ϕ10 | | | | |
| Test input | | Available in Transistor output types | | | | |
| Operating temp | | –25~+55°C | | | | |
| Operating humidity | | 35~85% RH | | | | |
| Sensitivity adjustment | | Single turn trimmer | | | | TEACH-IN |
| Protection | | IEC 144, IP67 | | | | |
| Shock resistance | | 50G, XYZ 3-ways | | | | |
| Materials | | Glassfiber reinforced ABS(Case), PMMA(Lens) | | | | ABS(Case), PC(Lens), PMMA(Cover) |

# Options

**Standard reflector V-61**

**Small reflector V-42**

**Connector cable DOL-1204-G02M**

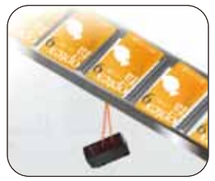
Photoelectric Sensor

# V2 series

- BGS types with a rugged duty housing.
- Up to 100 cm sensing distance (BGS-2V100).
- The large lenses assure stable sensing.
- IP67, QD types are available.

## Applications

**Gate control (V2T-7000)**



**Magazines on roller conveyor (BGS-2V50)**

**Parking control (V2T-7000)**

**Tire counting (V2R-1200)**

A large projecting and receiving lens results in a strong projected beam. Ideal for use in tough conditions like a foggy atmosphere.

## Only 1cm of dead area (Retro-reflective types)

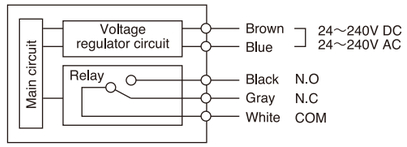
**V2R-1200**

## Connector can be rotated for added flexibility when mounting. (DC Power type)

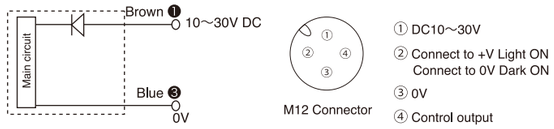
The connector rotates 90 degrees for added flexibility when mounting.
IP67 is maintained even with the connector.

## Circuit diagram

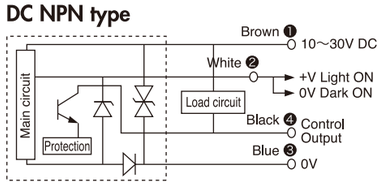
### AC/DC type



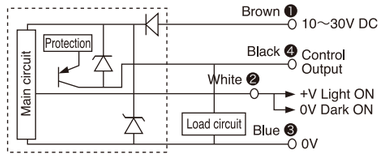

### DC Emitter




### DC NPN type

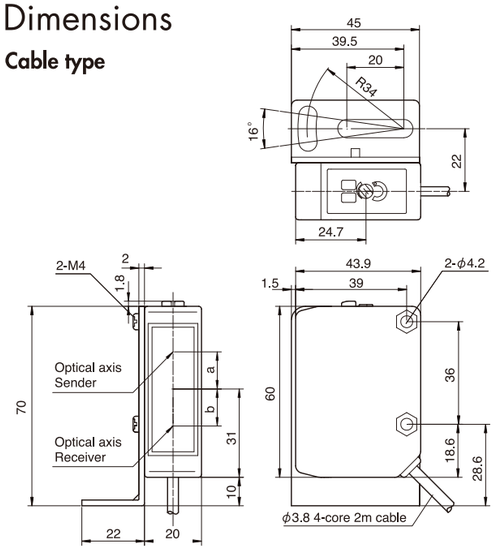



### DC PNP type



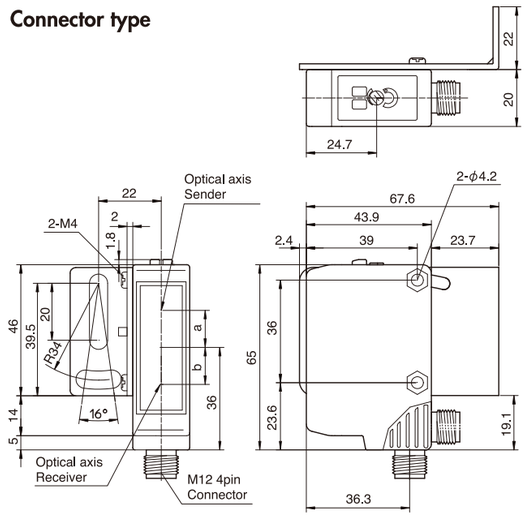

## Dimensions

### Cable type




| | BGS-2V | V2R-1200 | V2T-7000 |
|---|---|---|---|
| a | 13 | 16.8 | 44 |
| b | BGS Short 12.6 / mid 13 / long 13.6 | 19 | - |

### Connector type




| | BGS-2V | V2R-1200 | V2T-7000 |
|---|---|---|---|
| a | 13 | 16.8 | 49 |
| b | BGS Short 12.6 / mid 13 / long 13.6 | 24 | - |

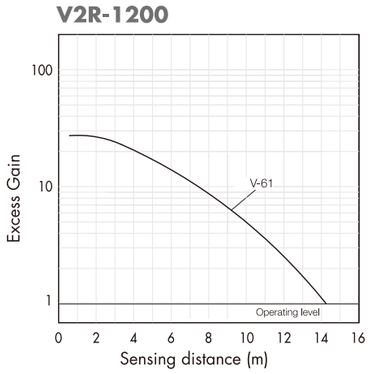
## Specifications

| Model | V2 series AC/DC type | | | | | V2 series DC type | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Thru-beam | Retro-reflective (polarized filter) | BGS Long range | BGS Middle range | BGS Short range | Thru-beam | Retro-reflective (polarized filter) | BGS Long range | BGS Middle range | BGS Short range |
| Cable type | V2T-7000 | V2R-1200 | BGS-2V100 | BGS-2V50 | BGS-2V30 | V2T-7000D(N,P) | V2R-1200D(N,P) | BGS-2V100(N,P) | BGS-2V50(N,P) | BGS-2V30(N,P) |
| Connector type | — | — | — | — | — | V2T-7000CD(N,P) | V2R-1200CD(N,P) | BGS-2V100C(N,P) | BGS-2V50C(N,P) | BGS2V30C(N,P) |
| Detecting distance | 70m | 0.01～12m*1 | 25～100cm | 15～50cm | 10～30cm | 70m | 0.01～12m*1 | 25～100cm | 15～50cm | 10～30cm |
| Light source | Red LED | | | | | | | | | |
| Supply voltage | DC24～240V±10% AC24～240V±10% 50/60Hz | | | | | DC10～30V Including ripple (P-P)10% | | | | |
| Current consumption | 3VA max.(class A) 2VA max. (class A)<br>4VA max.(class B) 2.5VA max.(class B) | | | | | 35mA max. | | | | |
| Response time | 15ms max. | | | | | 0.5ms max. | | 3ms max. | | 2ms max. |
| Hysteresis | — | | 20% Max | 5% Max | | — | | 15% max. | | 5% max. |
| Control output | Relay 1C DC30V 2A / AC250V 3A max. | | | | | NPN/PNP open collector DC30V 100mA max. (Residual voltage 1.8V max) | | | | |
| Operation mode | Light ON | | | | | Light ON / Dark ON selectable by wiring | | | | |
| Sensitivity adjustment | 2 rotation volume | | | | | | | | | |
| Indicator | Output indicator (orange LED) / Stable indicator (green LED) | | | | | | | | | |
| Ambient temp./humidity | -25～55°C / 35～85%RH (No condensation of freezing) | | | | | | | | | |
| Storage temp./humidity | -40～70°C / 35～95%RH | | | | | | | | | |
| Environmental illuminance | Sun light:10000 lx max. Incandescent light:3000 lx max. | | | | | | | | | |
| Protection category/material | IP67 (IEC 144)/Case: ABS (Glass fiber include) Front cover : PC (PMMA for retro-ref.type) | | | | | | | | | |

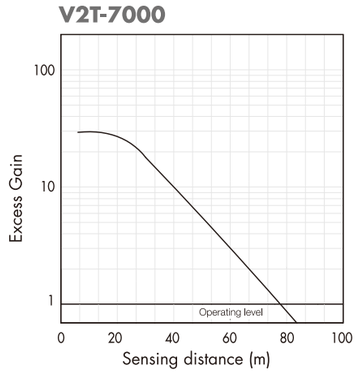
*1 **Reflector V-61**

## EXCESS GAIN

**V2R-1200**

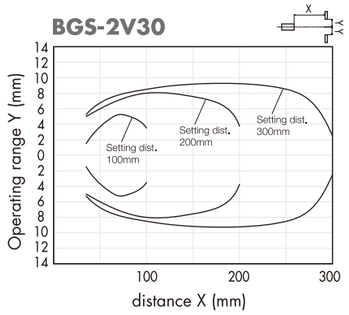



**V2T-7000**

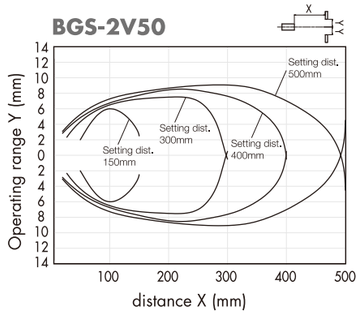



## SENSING AREA

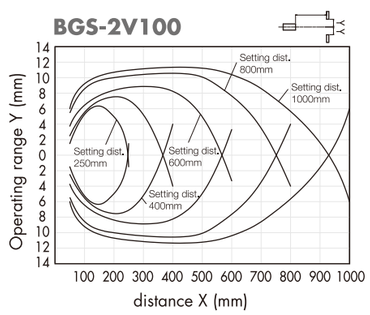
**BGS-2V30**



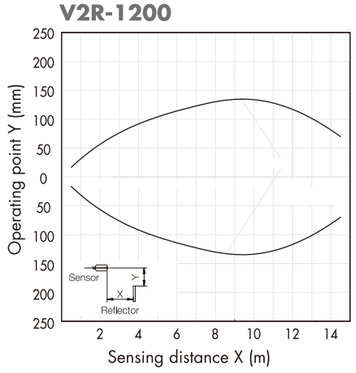

**BGS-2V50**



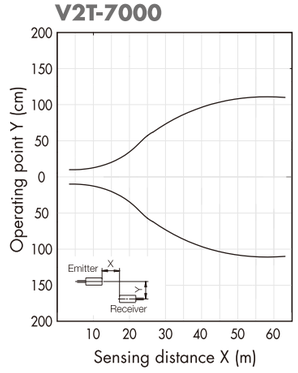

**BGS-2V100**




**V2R-1200**




**V2T-7000**

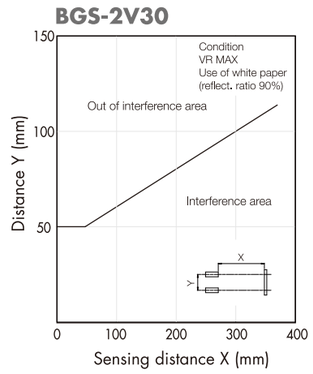




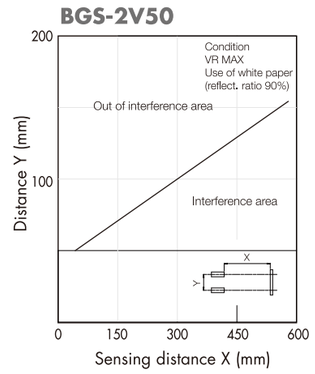



## INTERFERENCE AREA

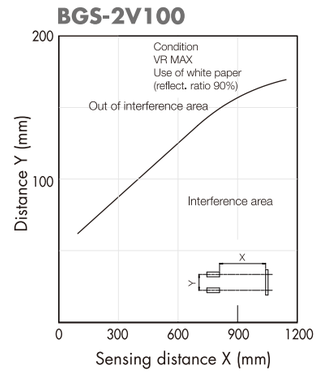
**BGS-2V30**




**BGS-2V50**

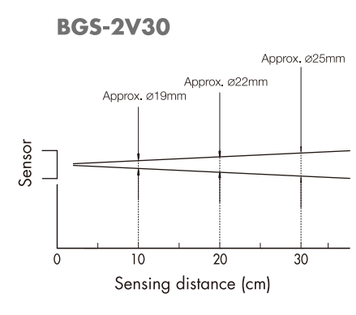



**BGS-2V100**

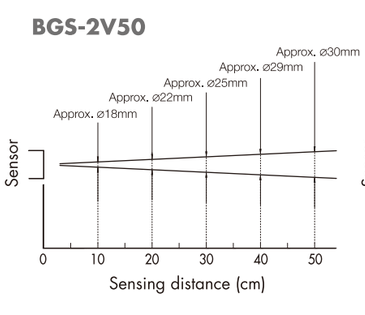



## SPOT SIZE

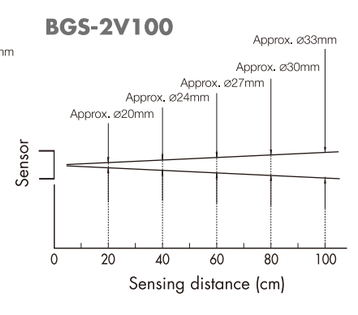
**BGS-2V30**



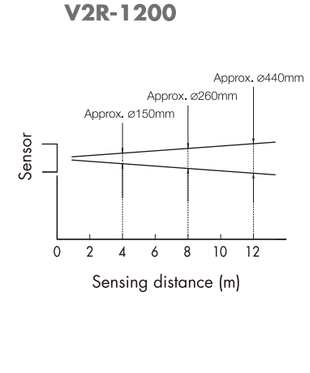

**BGS-2V50**



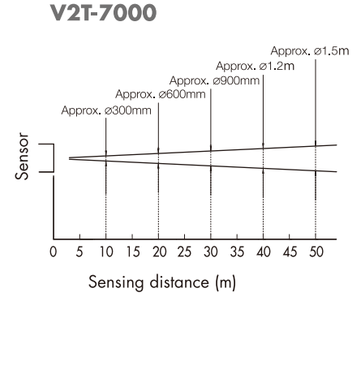

**BGS-2V100**



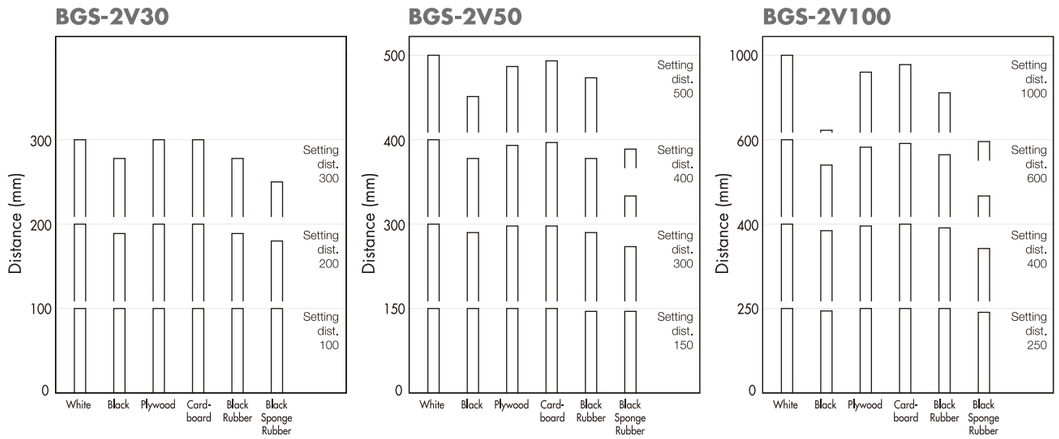

**V2R-1200**



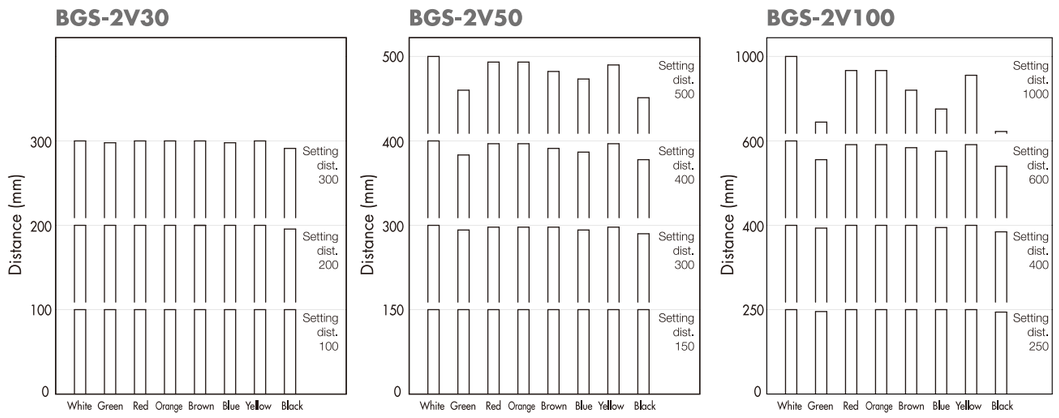

**V2T-7000**



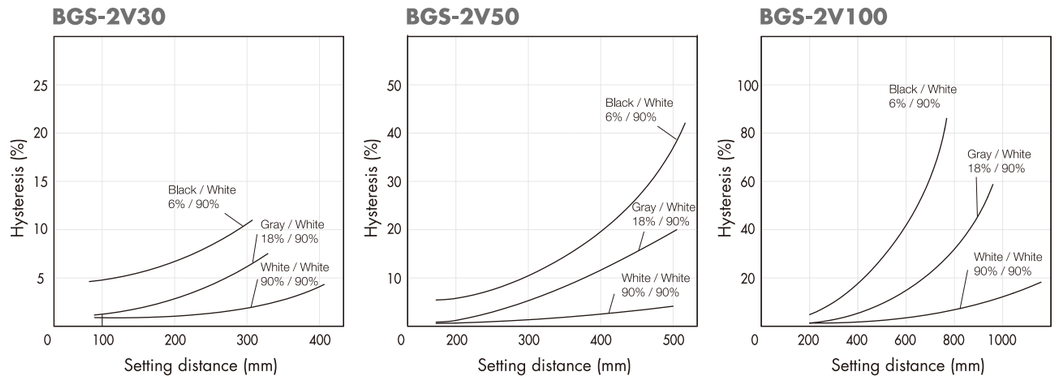
# MATERIAL CHARACTERISTICS




# COLOR CHARACTERISTICS

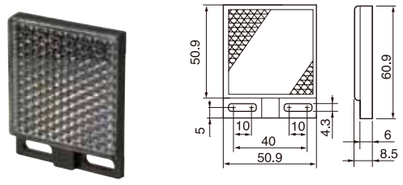



# HYSTERESIS

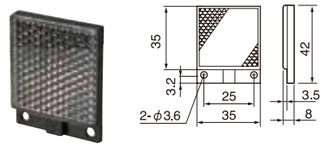



# Options

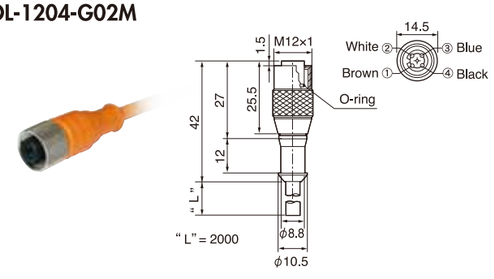
**Standard reflector V-61**




**Small reflector V-42**




**M12 connector cable**
**DOL-1204-G02M**




(Unit : mm)

Photoelectric Sensor

# V3 / V4 series

V4 series
AC Terminal chamber type

V3 series
Cable type

- Easy and quick disconnection for quick maintenance.
  Simply remove the main body from the base to replace the sensor.
- Long sensing distance - 70 meters thru-beam.
- Terminal connection (AC types - V4 series).

## Applications

**Access control**

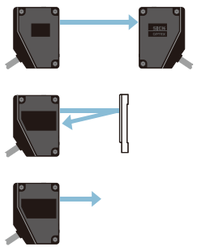
## Easy replacement

New style of QD!
Simply replace the main body leaving the base and cable in place.

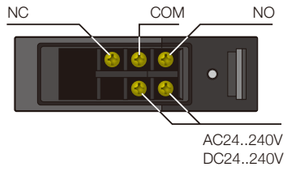
## Strong light source! Ideal for dusty/dirty conditions.

## Class B types, applicable to household use. Severely controled to self-emission noise.

## Long Scanning Range break through even in a foggy condition.




## Terminal layout for easy connection (V4 series).



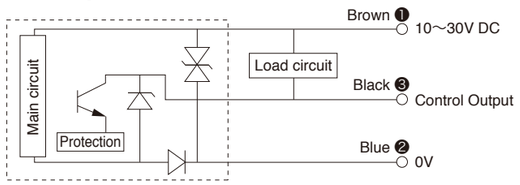




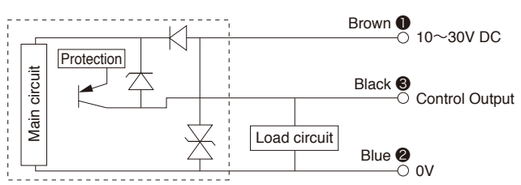



## Circuit diagram (Transistor Output type)

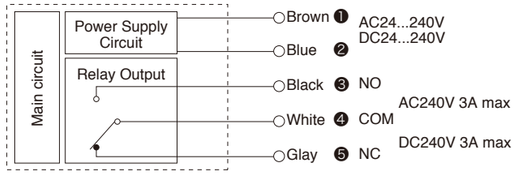
**NPN output**




**PNP output**



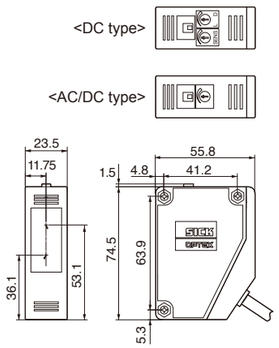

**AC/DC type**



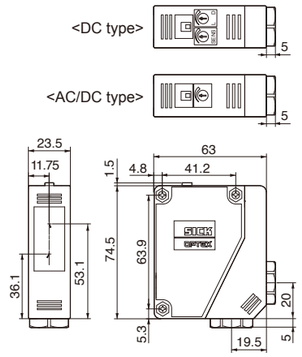

**Emitter**

## Dimensions

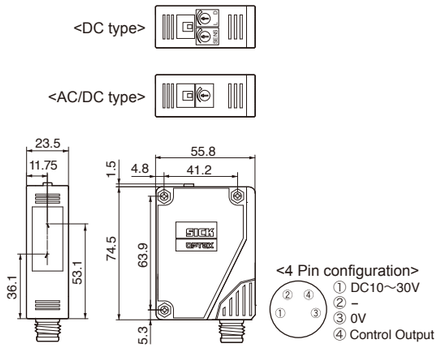
**Cable type**



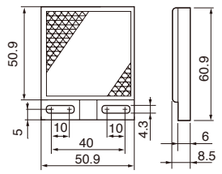

**Terminal chamber type**



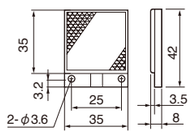

**M12 Connector type**



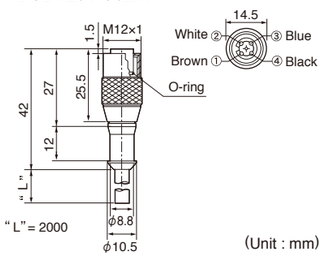

**Standard reflector V-61**




**Small reflector V-42**



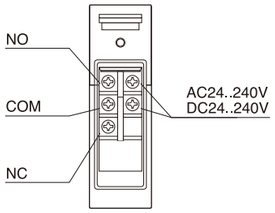

**M12 connector cable DOL-1204-G02M**



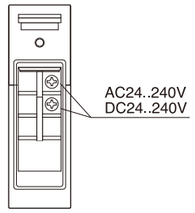

(Unit : mm)

## Connections

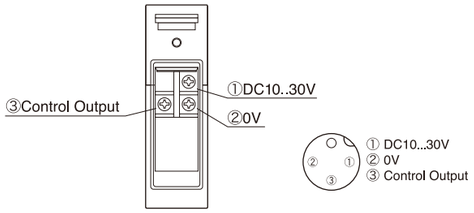
**Relay type**




**Emitter**




**Transistor Output type**




## Specifications

| Model | Relay output type | | | Transistor output type | | |
|---|---|---|---|---|---|---|
| | Thru-beam | Retro-reflective | Diffuse reflective | Thru-beam | Retro-reflective | Diffuse reflective |
| V3 series (cable / QD type) | V3T-7000A (ClassA)<br>V3T-7000 (ClassB) | V3R-1200A (ClassA)<br>V3R-1200 (ClassB) | V3D-200A (ClassA)<br>V3D-200 (ClassB) | V3T-7000N, P, CN, CP | V3R-1200N, P, CN, CP | V3D-200N, P, CN, CP |
| V4 series (Terminal type) | V4T-7000A (ClassA)<br>V4T-7000 (ClassB) | V4R-1200A (ClassA)<br>V4R-1200 (ClassB) | V4D-200A (ClassA)<br>V4D-200 (ClassB) | V4T-7000N, P | V4R-1200N, P | V4D-200N, P |
| Supply voltage | DC24～240V ±10% | AC24～240V ±10% 50/60Hz | | DC10～30V Including ripple (P-P) 10% | | |
| Current Consumption | 3VA max. (Class A),<br>4VA max. (Class B) | 2VA max. (Class A), 2.5VA max. (Class B) | | 35mA max. | | |
| Light source | Red LED (635nm) | | | Red LED (635nm) | | |
| Sensing distance | 70m | 12m/ Reflector V-61 | 2m | 70m | 12m/ Reflector V-61 | 2m |
| Hysteresis | - | | 20% max. | - | | 20% max. |
| Sensitivity adjustment | One turn potentiometer | | | One turn potentiometer | | |
| Response time | 15ms | | | 0.5ms max. | | |
| Indicator | Output indicator (Orange LED) / Stable indicator (Green LED) | | | Output indicator (Orange LED)/ Stable indicator (Green LED) | | |
| Operating mode | Light ON | | | Light ON/ Dark ON, selectable by potentiometer | | |
| Control output | Relay output 1 Form C AC 240V / DC 30V, 3A max (Resistive) | | | NPN/ PNP open collector DC30V, 100mA max. (Residual voltage 1.8V max.) | | |
| Relay lifetime | Mechanical: $5x10^7$ times / Electrical: $10^5$ times | | | NIL | | |
| Environmental illuminance | (Sunlight) 10,000lx (Incandescent Light) 3,000lx | | | (Sunlight) 10,000lx (Incandescent Light) 3,000lx | | |
| Ambient Temperature | -25～55°C | | | -25～55°C | | |
| Ambient Humidity | 35～85%/RH | | | 35～85%/RH | | |
| Storage Temp./ Humidity | -40～70°C/ 35～95% RH | | | -40～70°C/ 35～95% RH | | |
| Vibration Resistance | 10～55Hz amplitude 1.5mm X, Y, Z each 2h | | | 10～55Hz amplitude 1.5mm X, Y, Z each 2h | | |
| Shock resistance | 500m/s² X, Y, Z each 3 times | | | 500m/s² X, Y, Z each 3 times | | |
| Protection category | IEC 144 IP67 | | | IEC 144 IP67 | | |
| UL | UL Recognition (ClassA model only) | | | UL Recognition | | |

## Options

**Standard reflector V-61**

**Small reflector V-42**

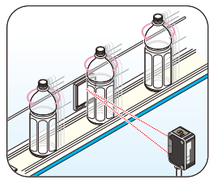
**Connector cable DOL-1204-G02M**

Photoelectric Sensor

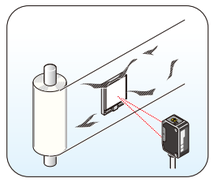
# SR-Q series

- Ideal for sensing transparent objects.
- 100G of shock resistance rating.
- P45A small reflector, good for space saving.
- M8 QD types are available.

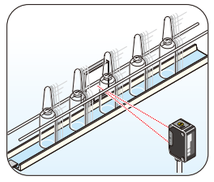
## Applications



**Beverage industry**



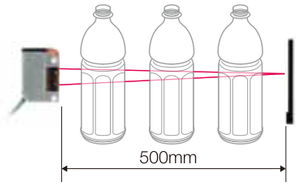
**Packaging industry**



**Pharmaceutical industry**

## Stable detection of transparent objects.

PET bottles with any design / configuration are easily detected. The material of the bottle does not matter. Glass plates for flat panel display can be detected also.




## High durability to ambient noise

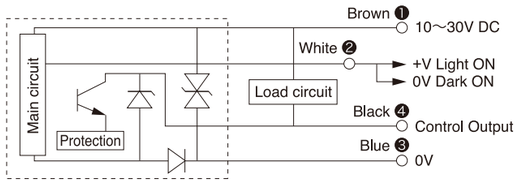
The sensor is designed to be resistant to electrical noise from relay contacts, inverters, electromagnetic fields, static,etc. The In-house testing (Failen Test) exceeds the IEC standard.

## Rigid mechanics

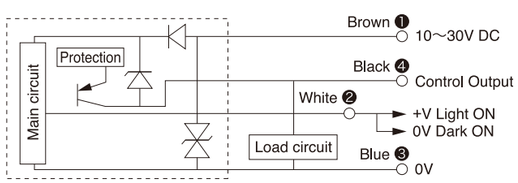
100G standard, tough enough to resist mechanical shock and vibration.

# Circuit diagram

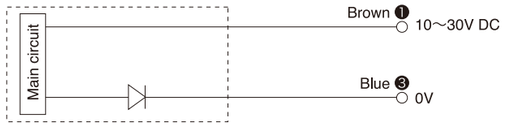
## NPN output



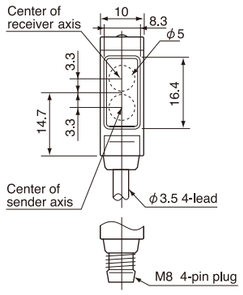

## PNP output

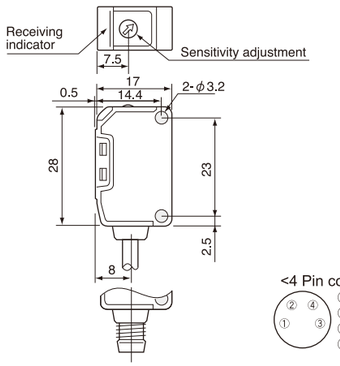


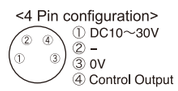

## Emitter



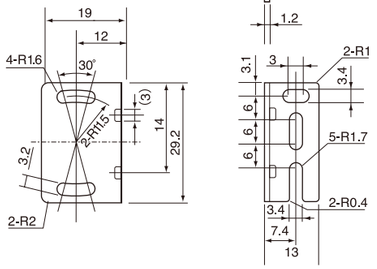

# Dimensions



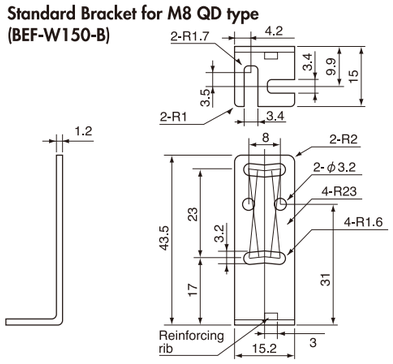



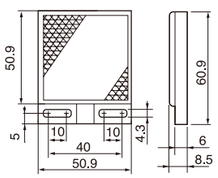

## Standard Bracket for cable type (BEF-W150-A)



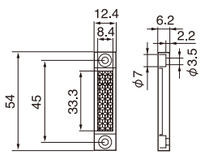

## Standard Bracket for M8 QD type (BEF-W150-B)




## Standard reflector V-61




## Tiny reflector P45A




(Unit : mm)







# Specifications

| Model | | Cable type | Connector type |
|---|---|---|---|
| NPN output | | SR-Q50NW | SR-Q50CNW |
| PNP output | | SR-Q50PW | SR-Q50CPW |
| Sensing distance | | 500mm (With V-61) | |
| Light source | | Red LED (660nm) | |
| Response time | | 0.5ms | |
| Sensitivity adjustment | | Sensitivity volume adjustment (270 degrees) | |
| Control output | | NPN/PNP open collector, max. 100mA/30VDC | |
| Connection | | 4-lead cable, 2m | M8 4-pin |
| Insulation resistance | | 20MΩ Max. (500VDC) | |
| Supply voltage | | 10 to 30VDC including 10% of ripple | |
| Power consumption | | 30mA max. | |
| Noise resistance | JIS Standard | C4525 500V | |
| | IEC Standard | IEC801-2,3,4 Level 3 | |
| Operating | Temp/humidity | –25 to 55°C/35 to 85%RH | |
| | Enviromental illuminance | Sunlight 10,000 lux max. /Incandescent light 3,000 lux max. | |
| | Vibration resistance | 10 to 55Hz, Amplitude 1.5mm, X/Y/Z axis 2 hours | |
| | Shock resistance | Approx.100G (1000m/S$^2$). X/Y/Z axis 3 times on each | |
| | Protection category | IP67 | |
| Material | | PSF+PBT | |
| Weight | | Approx. 5g (Without cable) | |

# Options

**Standard reflector V-61**

**Tiny reflector P45A**

**Sensor stand PLN-1**

**Fixture of Reflector PLN-1M**

**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

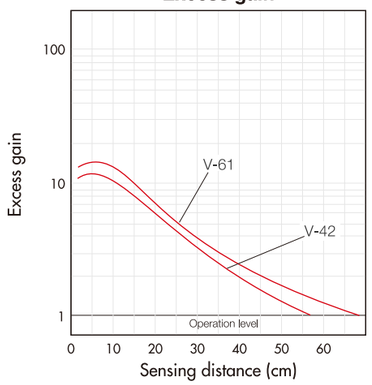
**Protective mounting brackets LS-S01**

**LS-S02**

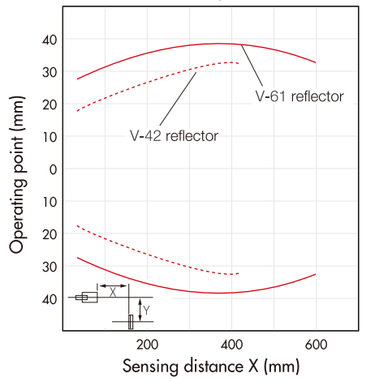
# Reference (typical)

SR-Q50NW

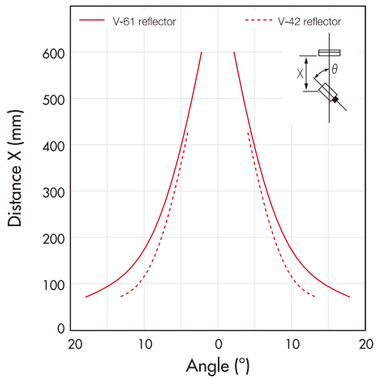
**Excess gain**



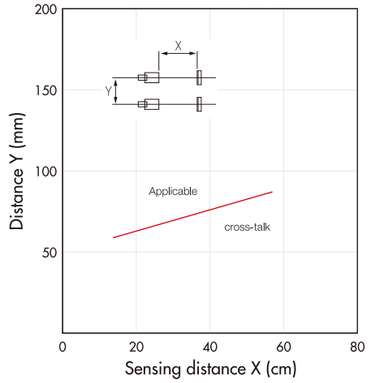

**Sensing area**



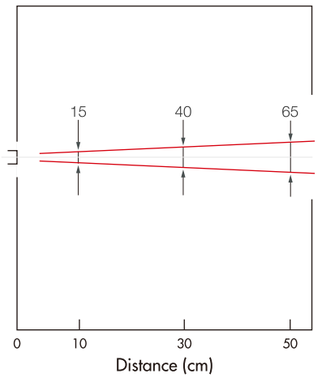

**Angular deviation**




**Interference area**




**Spot size**





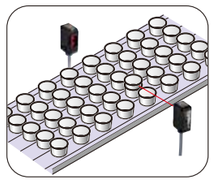



Photoelectric Sensor

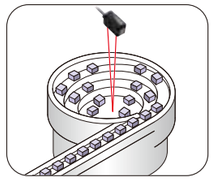
# S series

- BGS functionality built into a small package!
- Built-in polarizing filter (Retro-reflective) type.
- 100G shock resistance rating.
- M8 QD for all types.

## Applications

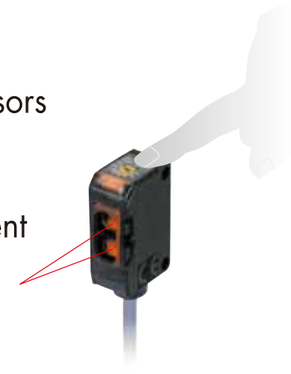


**Double feeding of ice cream cup (ST-400)**



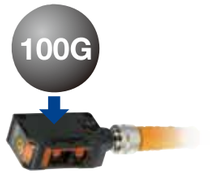
**Parts feeder (BGS-S08)**

Extremely small BGS type sensors (BGS-S08 and S03) are only 17×10×20 mm.
Ideal for use in OEM equipment such as Printed Circuit Board processing machines.



## High rigidity for 100G shock resistance / IP67

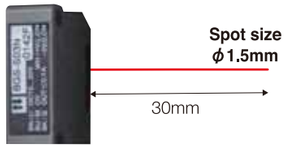
Rigid design for high resistance to mechanical shock such as contact or collision.




## 0.5ms high speed response

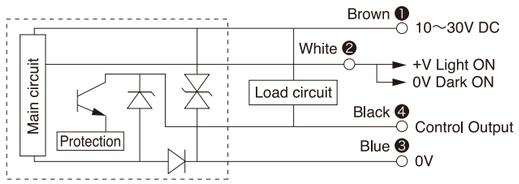
High speed response even with transparent targets.

## BGS-S03, with 1.5φ spot at 30mm distance

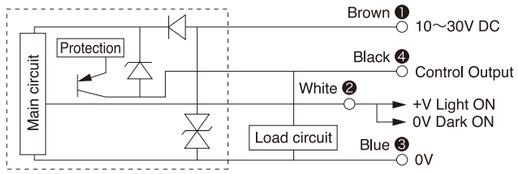


# Circuit diagram

## NPN output




## PNP output

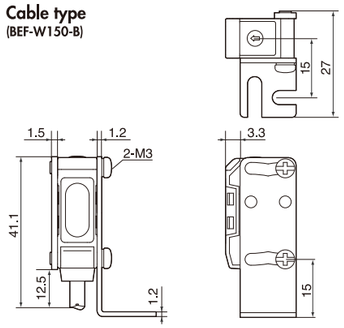



## Emitter

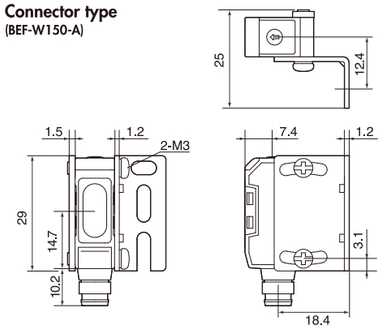
# Dimensions

## S series

### Cable type
(BEF-W150-B)

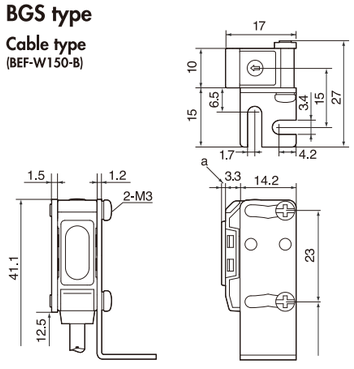



### Connector type
(BEF-W150-A)

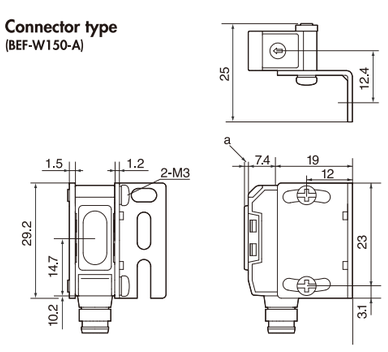



## BGS type

### Cable type
(BEF-W150-B)

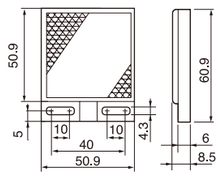



### Connector type
(BEF-W150-A)

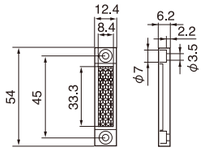



<4 Pin configuration>
① DC10～30V
② –
③ 0V
④ Control Output

### Standard reflector V-61




### Tiny reflector P45A




(Unit : mm)







# Specifications

| Model | | Thru-beam | Retro-reflective with polarizing Filter | Diffuse reflective | BGS | |
|---|---|---|---|---|---|---|
| Cable type | NPN | ST-400N | SR-150N | SD-20N | BGS-S08N | BGS-S03N |
| | PNP | ST-400P | SR-150P | SD-20P | BGS-S08P | BGS-S03P |
| Connector type | NPN | ST-400CN | SR-150CN | SD-20CN | BGS-S08CN | BGS-S03CN |
| | PNP | ST-400CP | SR-150CP | SD-20CP | BGS-S08CP | BGS-S03CP |
| Sensing distance | | 4 m | 1.5 m | 200 mm | 10 to 80 mm | 10 to 30 mm |
| Supply voltage | | 10 to 30V DC including 10% of ripple | | | | |
| Power consumption | | 30mA | 20mA Max | | | |
| Hysteresis | | — | | 20% MAX | 10% MAX | |
| Minimum detectable object | | ϕ6 opaque object | □45mm opaque object | — | | |
| Response time | | 0.5msec Max | | | | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | |
| Operating mode | | Light ON / Dark ON selectable | | | | |
| Sensitivity adjustment | | 1-turn potentiometer | | | 5-turn potentiometer | |
| LED Indicator | | Red | | | | |
| Operating temp / humidity | | –25 to +55°C / 35 to 85%RH | | | | |
| Protection category | | IP67 | | | | |
| Environmental illuminance | | Sun Light:10,000 lux max. Incandescent lamp:3,000 lux max. | | | | |
| Shock resistance | | 100G (1,000m/S$^2$) X,Y,Z, axis 3 times | | | | |
| Vibration resistance | | 10 to 55 Hz amplitude 1.5mm, X-Y-Z for 2 hours | | | | |
| Connection | | "Cable type: Cable length 2m ϕ3.5mm (Longer cable type of 5m is available as option) Connector type: M8 × 4-pin connector" | | | | |

# Options

**Standard reflector V-61**

**Tiny reflector P45A**

**Sensor stand**
**PLN-1**

**Fixture of Reflector**
**PLN-1M**

**JCN-S** : **M8 Straight type**

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

**JCN-L** : **M8 L-shape type**

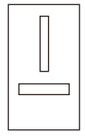
JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

**Protective mounting brackets.**

**L-shape type**
**LS-S01**

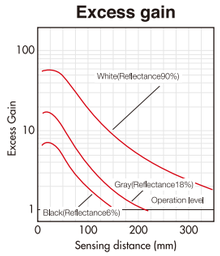
**Straight type**
**LS-S02**

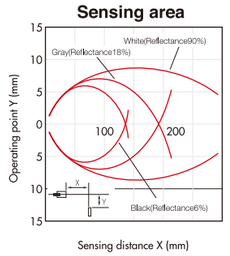
**BL-150-10**
**Slit mask for ST-400**

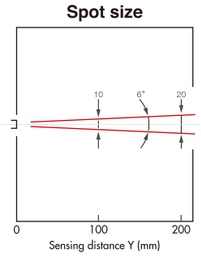


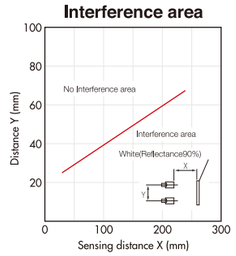
# Reference (typical)

## SD-20N

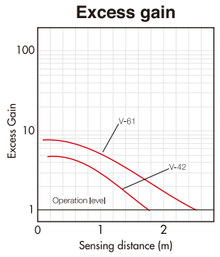


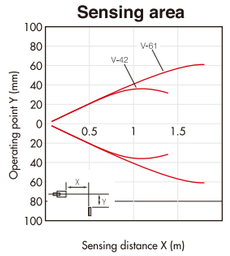



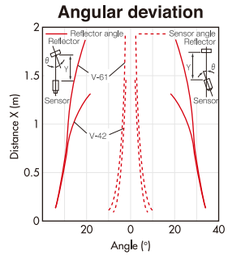



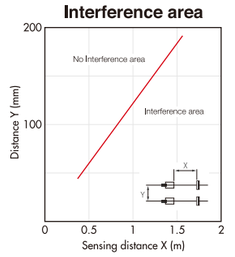




## SR-150N

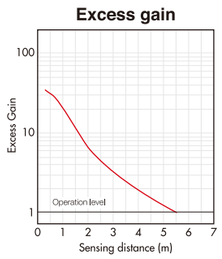


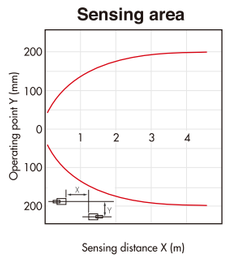



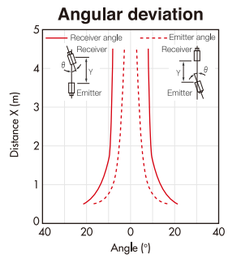



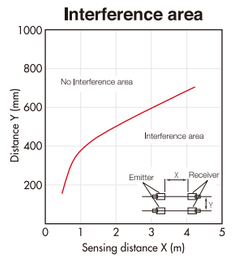




## ST-400N

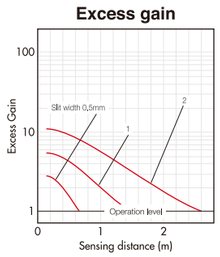


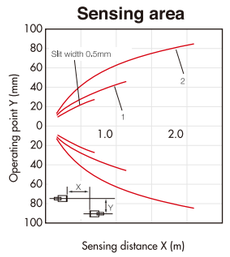



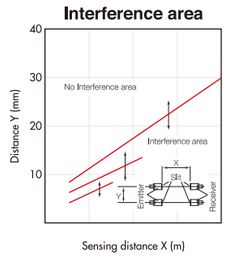




## ST-400N & SLIT BL-150-10





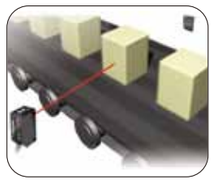



Photoelectric Sensor

# Z / BGS-Z series

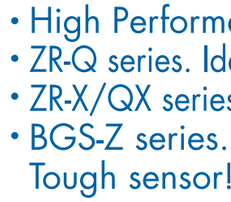
- High Performance, Low Cost! All models offer cost and space savings.
- ZR-Q series. Ideal for detection of transparent objects! Plastic bottles, film, etc.
- ZR-X/QX series, Coaxial beam. Sensing through narrow opening is possible!
- BGS-Z series. High performance in small package!!
  Tough sensor! 100G shock resistance and IP67 ratings.

## Applications



**For material handling (ZR-350)**

**Beverage industry (ZR-QX200)**



**Car on the production line (ZT-1200)**



**PCB (BGS-Z10N)**

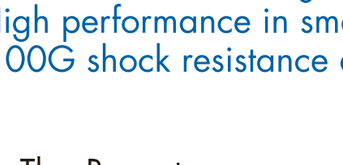
## Thru-Beam type

ZT-1200N／ZT-1200P
ZT-1200CN／ZT-1200CP

## Retro Reflective type

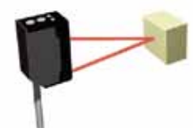
ZR-350N／ZR-350P
ZR-350CN／ZR-350CP

## BGS type



BGS-Z30N／BGS-Z30P
BGS-Z30CN／BGS-Z30CP
BGS-Z10N／BGS-Z10P
BGS-Z10CN／BGS-Z10CP

## Convergent type



ZD-L09N／ZD-L09P
ZD-L09CN／ZD-L09CP

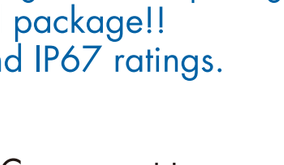
## Diffuse type (incl,divergent type)



**Diffuse**
ZD-70N／ZD-70P
ZD-70CN／ZD-70CP

**Divergent**
ZD-W20N／ZD-W20P
ZD-W20CN／ZD-W20CP

## Coaxial LED type



**General use**
ZR-X250N／ZR-X250P
ZR-X250CN／ZR-X250CP

**Transparent objects**
ZR-QX200N／ZR-QX200P
ZR-QX200CN／ZR-QX200CP

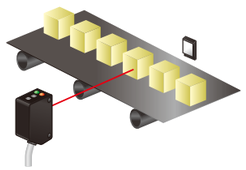
# General Purpose

- ***100G shock resistance, IP67 ratings. Tough sensor !***
- ***ZR-Q series, ideal for detection of PET bottles, transparent objects, etc.***
- ***Standard models for cost saving.***

## Features

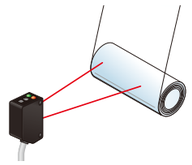
### 500$\mu$sec response

Good for fast moving objects.



### ZD-W20 wide angle applications

The Divergent type ZD-W20 provides a wide angle beam that can be used to detect transparent film by collecting the reflected light from the material surface.

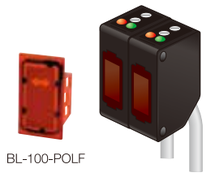


### Rugged 100G shock rating

Rigid design for high resistance to mechanical shock

### Cross-talk prevention

With built-in cross-talk prevention, it is possible to mount two sensors side-by-side without mutual interference.
(Use part number BL-100-POLF for thru-beam type sensors.)




### IP67 rating

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

### Threaded mounting holes

Prevents sensor from being damaged when it's mounted.

## Specifications

| Model | | Thru-beam | Polarized Retro-reflective | Diffuse-reflective | Convergent | Divergent | Glass detection |
|---|---|---|---|---|---|---|---|
| Cable type | NPN | ZT-1200N | ZR-350N | ZD-70N | ZD-L09N | ZD-W20N | ZR-Q200N |
| | PNP | ZT-1200P | ZR-350P | ZD-70P | ZD-L09P | ZD-W20P | ZR-Q200P |
| M8 Connector type | NPN | ZT-1200CN | ZR-350CN | ZD-70CN | ZD-L09CN | ZD-W20CN | ZR-Q200CN |
| | PNP | ZT-1200CP | ZR-350CP | ZD-70CP | ZD-L09CP | ZD-W20CP | ZR-Q200CP |
| Sensing distance | | 12 m | 3.5m (V-61 reflector) | 70cm | 1-9 cm | 1-200 mm | 2 m (V-61 reflector) |
| Response time | | 0.5 msec | | | | | |
| Spot size | | 1.5m @ 12 meter | 350mm @ 3.5 meter | 100mm @ 700mm | 12mm @ 90mm | 30mm @ 50mm | 300mm @ 2 meter |
| Operating mode | | Light On/Dark On selectable | | | | | |
| Hysteresis | | NIL | | 20% Max | 10% Max | 20% Max | NIL |
| Light source | | Red LED | | | | | |
| Sensitivity adjustment | | 1-turn trimmer (240 degree) | | | | | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | | |
| Supply voltage | | DC 10 - 30V incl. 10% ripple | | | | | |
| Power consumption | | 20mA Max | | | | | |
| LED Indicator | | Dual Indicator (Output : orange, Stable : green) | | | | | |
| Protection category | | IP67 | | | | | |
| Shock resistance | | 100G (1,000m/S$^2$) | | | | | |
| Environmental illuminance | | Sunlight : 10,000 lux Max., Incandescent lamp : 3,000 lux max. | | | | | |
| Operating temp/humidity | | –25 to 55°C / 35 to 85%RH | | | | | |
| Materials | | ABS with glass fiber (Case), PMMA (Lens) | | | | | |





# Retro-Reflective with Coaxial LED

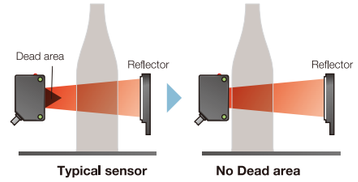
**The best for transparent Plastic / Glass detection**

- ***Coaxial LED source gives extremely tight alignment to the target.***
- ***Alignment of sensor is easy thanks to bright projected LED spot.***
- ***250 $\mu$sec fast response (ZR-X, coaxial beam type)***
- ***World's standard model ZR-Q (general type) and ZR-QX (coaxial beam type) for Plastic and Glass applications.***

## Features

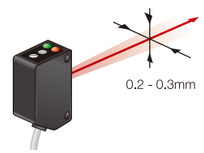
### Zero dead area!

The sensor has no dead area in the sensing field.
This makes it ideal for use on conveyors where the position of the target changes.




### Repeat Accuracy

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

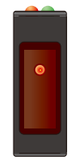



### Good selection of sensors for various types of bottles.

Glass and plastic bottles come in various shapes / sizes and with many different contours which require testing in the field to determine the best sensor for the application.
The Z series is offered with both Co-axial and Conventional LED light sources to provide a solution for the detection of any bottle type.

### Coaxial LED

Coaxial LED light source provides extremely tight alignment to the target, Alignment of sensor is very easy thanks to bright projected LED spot.



## Specifications

| Model | | Retro Reflective for Transparent | | | | Polarized Retro-reflective (Coaxial Beam) | |
|---|---|---|---|---|---|---|---|
| | | General Use | | Coaxial Beam | | | |
| | | 2m Cable | M8QD 4pin | 2m Cable | M8QD 4pin | 2m Cable | M8QD 4pin |
| Type | NPN | ZR-Q200N | ZR-Q200CN | ZR-QX200N | ZR-QX200CN4 | ZR-X250N | ZR-X250CN4 |
| | PNP | ZR-Q200P | ZR-Q200CP | ZR-QX200P | ZR-QX200CP4 | ZR-X250P | ZR-X250CP4 |
| Sensing distance | | 0.01 - 2 meter (V-61 reflector) | | 0 - 2 meter (P250F reflector) | | 0 - 2.5 meter (V-61 reflector) | |
| Response time | | 0.5 msec | | | | 250µs | |
| Spot size | | $\phi$300mm / at 2m | | $\phi$60mm / at 2m | | $\phi$60mm / at 2m | |
| Operating mode | | Light On / Dark On selectable | | | | | |
| LED Indicator | | Output : orange, Stable : green | | Output : orange | | Output : orange, Stable : green | |
| Light source | | Red LED | | | | | |
| Sensitivity adjustment | | 1-turn pot. | | | | | |
| Control output | | NPN or PNP open collector, 100mA max / DC30V | | | | | |
| Supply voltage | | DC 10 - 30V, including 10% ripple | | | | | |
| Power consumption | | 20mA max | | | | | |
| Protection category | | IP 67 | | | | | |
| Shock resistance | | 100G (1,000m/S$^2$) | | | | | |
| Environmental illuminance | | Sunlight : 10,000 lux max., Incandescent lamp : 3,000 lux max | | | | | |
| Operating temp/humidity | | –25 to 55°C/ 35 to 85% RH | | | | | |
| Materials | | ABS(Case), PMMA(Lens) | | | | | |

"M8-QD in 3 pins for European machines " are available with extention code of -CN(P)3, for instance, "ZR-QX200CN3".

# BGS - LED Type

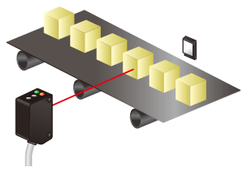
**General purpose applications**

- ***BGS (Background Suppression Type) Sensors are not influenced by the background, available with conventional LED light source.***

## Features

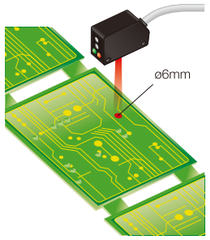
### 500$\mu$sec response

Good for fast moving objects.



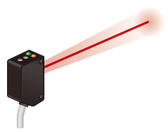
### Large projected spot size

The LED version of the BGS sensors projects a large 6 mm spot that will not be affected by small holes in a PC board.
For PC boards that may have larger holes, the BGS-Z30 has an 18 mm projected spot size.




### High power narrow beam LED

LED beam spot can be seen easily even in bright environment that helps installation.



### 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.

## Specifications

| Model | | long distance | | short distance | |
|---|---|---|---|---|---|
| | | 2m Cable | M8QD 4pin | 2m Cable | M8QD 4pin |
| Type | NPN | BGS-Z30N | BGS-Z30CN | BGS-Z10N | BGS-Z10CN |
| | PNP | BGS-Z30P | BGS-Z30CP | BGS-Z10P | BGS-Z10CP |
| Adjustable distance | | 50 - 300 mm (*1) | | 20 -100 mm (*1) | |
| Sensing distance | | 10 - 300 mm (*1) | | 5 -100 mm (*1) | |
| Response time | | 500$\mu$s | | | |
| Spot size | | $\phi$30mm / 300mm | | $\phi$10mm / 100mm | |
| Hysteresis (white to white) | | 5% | | 3% | |
| Operating mode | | Light On / Dark On selectable | | | |
| LED Indicator | | Output : orange, Stable : green | | | |
| Light source | | Red LED | | | |
| Sensitivity adjustment | | 4-turn, endless pot. | | | |
| Control output | | NPN or PNP open collector, 100mA max / DC30V | | | |
| Supply voltage | | DC 10 - 30V, including 10% ripple | | | |
| Power consumption | | 30mA max | | | |
| Protection category | | IP 67 | | | |
| Shock resistance | | 100G (1,000m/S$^2$) | | | |
| Environmental illuminance | | Sunlight : 10,000 lux max., Incandescent lamp : 3,000 lux max | | | |
| Operating temp / humidity | | –25 to 55oC / 35 to 85% RH | | | |
| Materials | | ABS(Case), PMMA(Lens) | | | |

"M8-QD in 3 pins for European machines " are available with extention code of -CN(P)3, for instance, "ZR-QX200CN3".

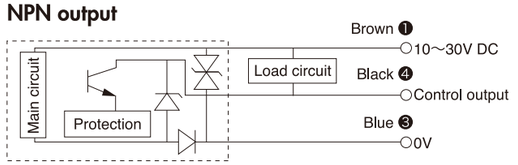
*1 white paper 100 X 100mm



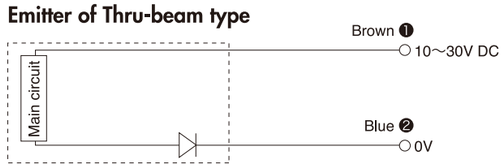


## Circuit diagram

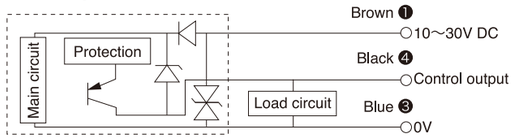
**NPN output**




**Emitter of Thru-beam type**

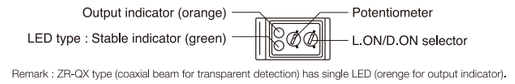



**PNP output**

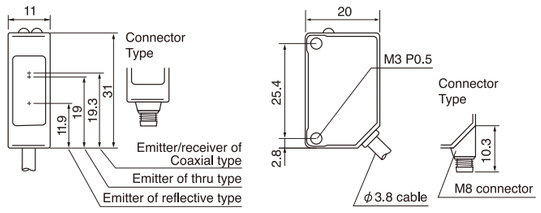



## Dimensions

**General Use Type except BGS**

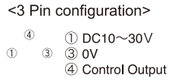



Remark : ZR-QX type (coaxial beam for transparent detection) has single LED (orenge for output indicator).




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

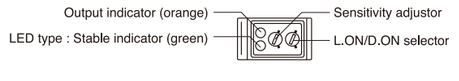
<3 Pin configuration>

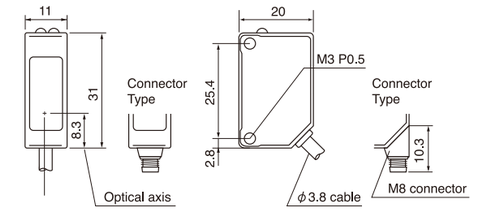



<4 Pin configuration>

① DC10~30V
② Laser OFF (Laser type only)
(NPN connect to GND / PNP connect to DC10~30V)
③ 0V
④ Control Output

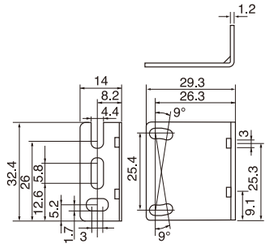
**BGS Type**



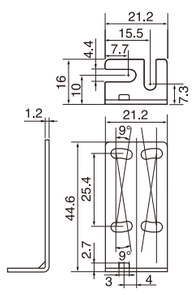

**Standard bracket BEF-W100-A**

Accessory for M8 QD type sensors

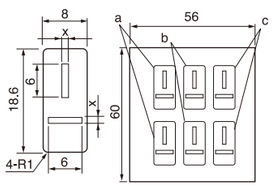



**Standard bracket BEF-W100-B**

Accessory for cabled type sensors

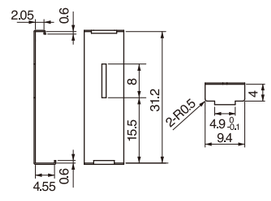



**Slit mask BL-160-SK (for Thru-beam type)**




| 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 |

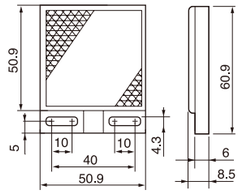
**Metal (SUS) Slit mask BL-100-M1 (for Thru-Beam Type)**



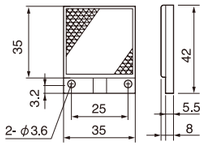

(Unit : mm)

## Reflectors for LED Type

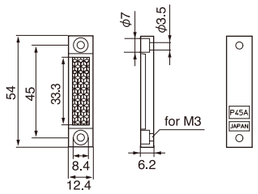
**Standard reflector V-61 (Standard, LED type)**




**Small reflector V-42 (Optional, LED type)**

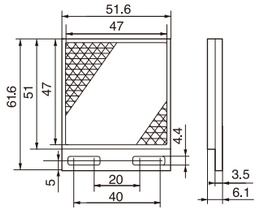



**Tiny reflector P45A (Optional, LED type)**

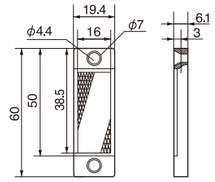



## Reflectors for Coaxial LED Type

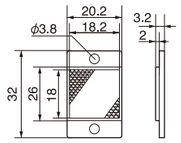
**P250F (Standard,ZR-QX200)**




**PL20F (Optional)**




**PL10F (Optional)**




**Detection distance by reflectors**

| | P250F | PL20F | PL10F |
|---|---|---|---|
| ZR-QX | 4.0 | 2.8 | 1.0 |

(Unit : mater)

# Options

**Standard reflector V-61 (Except ZR-QX200)**

**Small reflector V-42**

**Tiny reflector P45A**

**P250F (ZR-QX200,standard)**

**PL20F (Optional)**

**PL10F (Optional)**

**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**

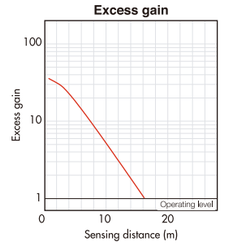
**LK-S01**

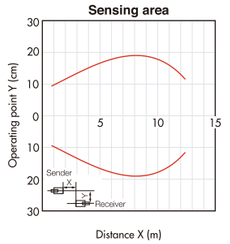
**LK-S02**

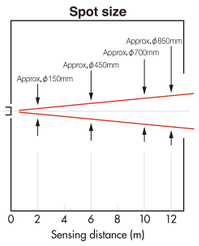
**BL-100-POLF: Cross-talk prevention filter for ZT-1200**

# Reference (typical)

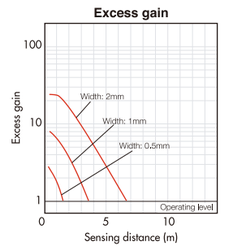
## ZT-1200

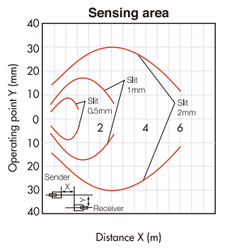


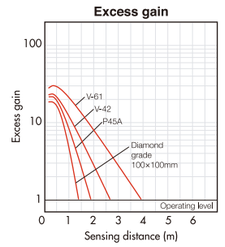



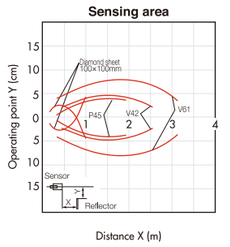

## ZT-1200 & SLIT

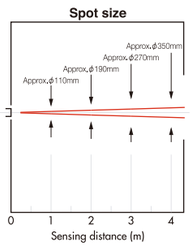


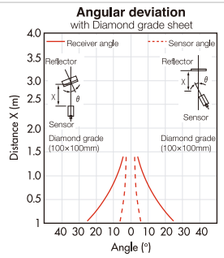



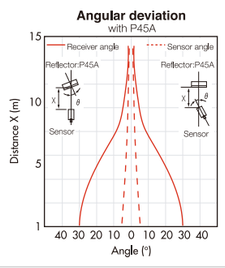

## ZR-350

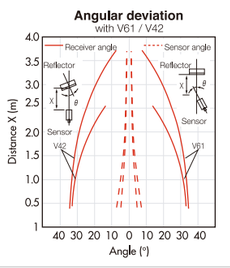


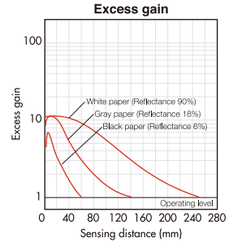



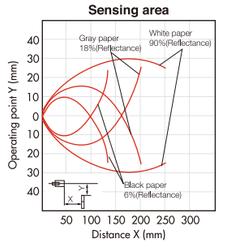



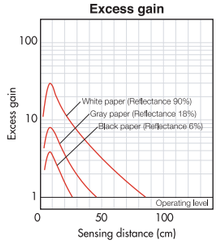

## ZD-20W

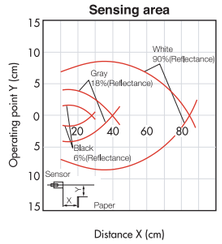


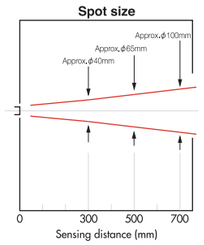



# Reference (typical)

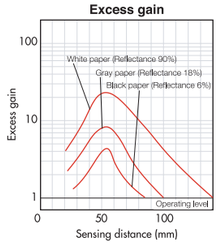
## ZD-70

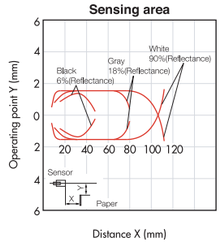


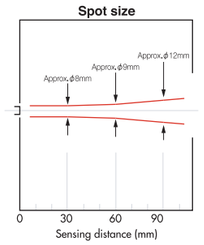



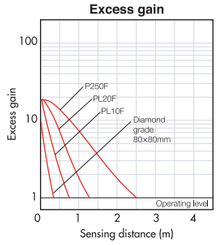

## ZD-L09

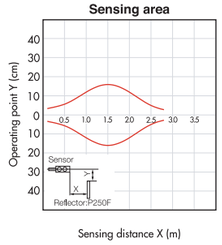


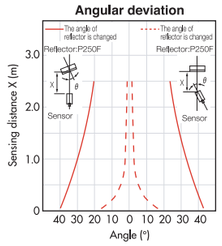



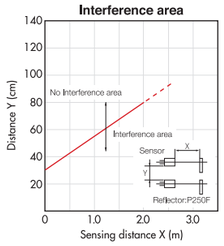




## ZR-QX200

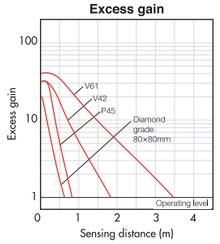


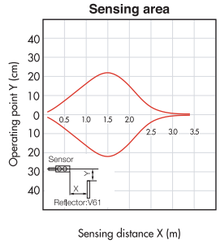



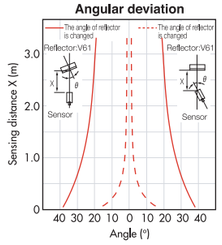



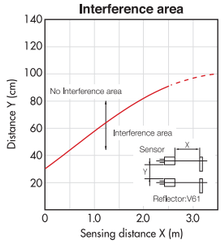




## ZR-X250

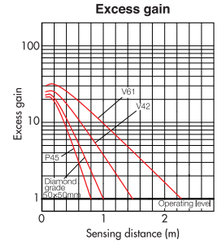


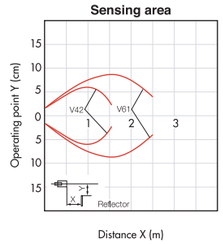



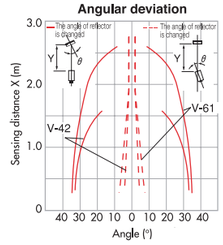



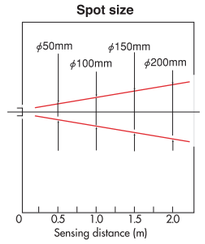




## ZR-Q200



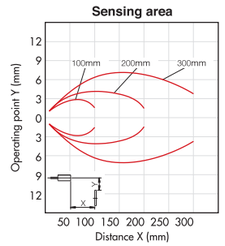



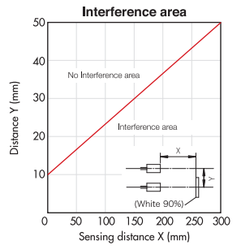


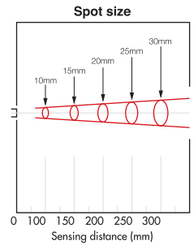


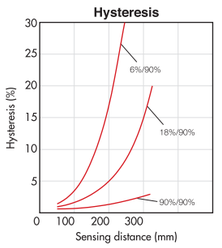

# Reference (typical)

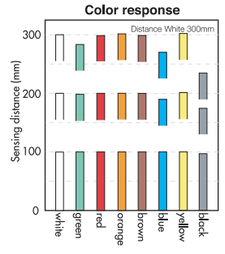
## BGS-Z30

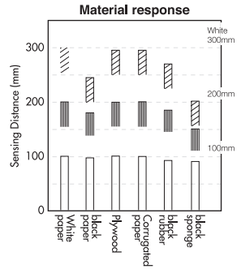


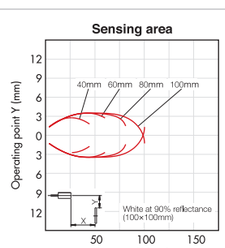



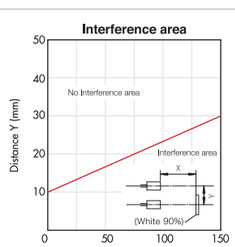



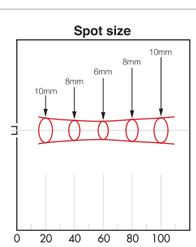



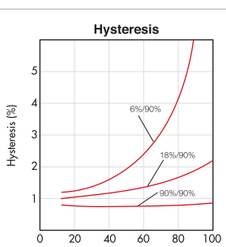



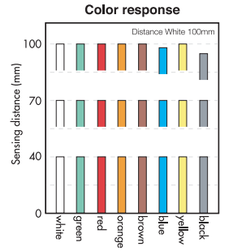

## BGS-Z10

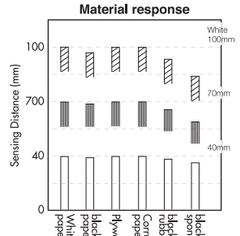


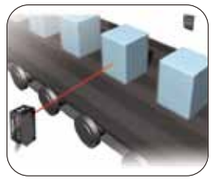



Photoelectric Sensor

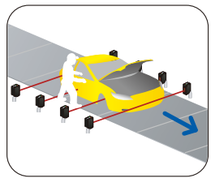
# Z2 series

- Best-in-class Photosensors realized by high power LED.
- 3 basic types with detecting distance of 20 meter (thru-beam)

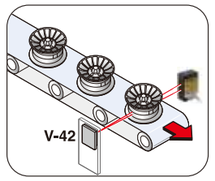
## Applications



**For material handling (Z2R-400)**



**Car on the production line (Z2T-2000)**




**Counting wheels (Z2R-400)**

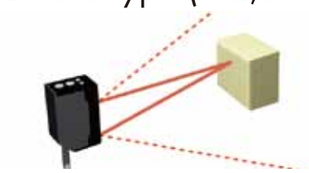
## Thru-Beam type

Z2T-2000N／Z2T-2000P
Z2T-2000N4／Z2T-2000P4

## Retro Reflective type

Z2R-400N／Z2R-400P
Z2R-400N4／Z2R-400P4

## Diffuse type (incl,divergent type)



Z2D-80N／Z2D-80P
Z2D-80N4／Z2D-80P4

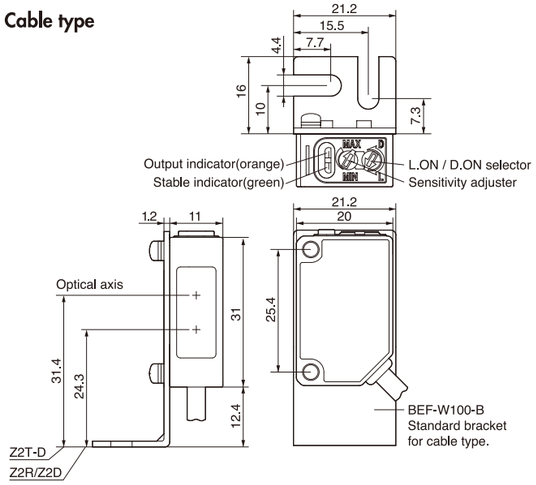




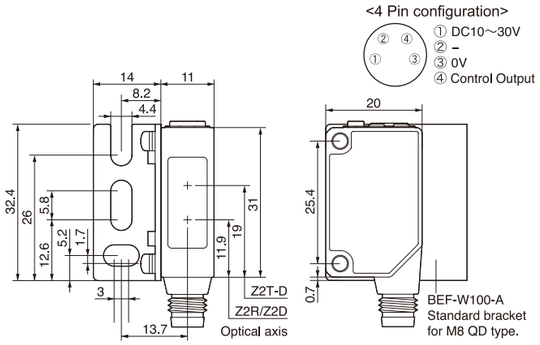


## Dimensions (mm)

**Cable type**

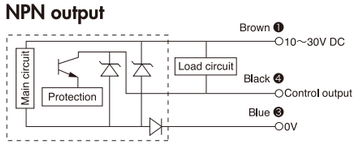



**M8 QD type**

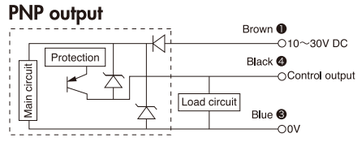



## Circuit diagram

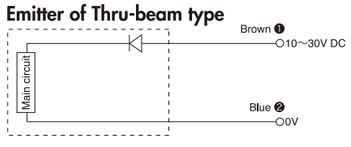
**NPN output**




**PNP output**

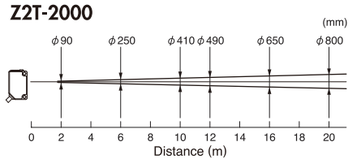



**Emitter of Thru-beam type**

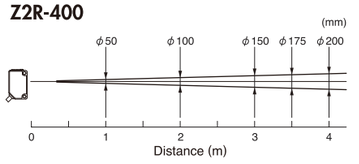



## Spot size

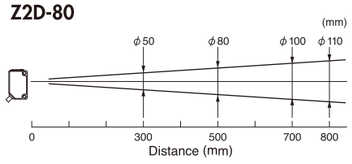
**Z2T-2000**




**Z2R-400**




**Z2D-80**



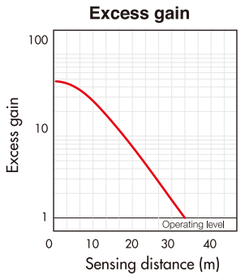
# Specifications

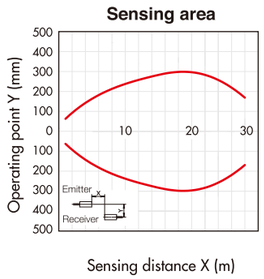
| Model | Thru-beam | Retro-reflective | Diffuse-reflective |
|---|---|---|---|
| Cable type | Z2T-2000(N,P) | Z2R-400(N,P) | Z2D-80(N,P) |
| M8 QD type | Z2T-2000C(N4,P4) | Z2R-400C(N4,P4) | Z2D-80C(N4,P4) |
| Sensing distance | 20m | 0.01～4m ※1 | 0～80cm ※2 |
| Response time | 500μs max. | | |
| Spot size | ϕ800mm @ 20m | ϕ200mm @ 4m | ϕ110mm @ 80cm |
| Operating mode | Light ON / Dark ON selectable | | |
| LED Indicator | Output : orange, Stable : green | | |
| Light source | Red LED | | |
| Sensitivity adjustment | 1-turn volume | | |
| Control output | NPN or PNP Open collector, 100mA Max. DC30V Max. (Residual voltage 1.8V Max.) | | |
| Supply voltage | DC10-30V Including 10% ripple(P-P) | | |
| Power consumption | Emitter : 20mA Max. | 20mA Max. | |
| | Receiver : 15mA Max. | | |
| Protection category | IP67 | | |
| Shock Resistance | 100G | | |
| Vibration Resistance | 10-55Hz, 15mm X,Y,Z, each. 2 hours | | |
| Ambient temp. / humidity | –25～+55°C / 35～85% RH (No condensation or freezing) | | |
| Storage temp. / humidity | –40～+70°C / 35～95% RH (No condensation or freezing) | | |
| Material | Case : ABS (glass included) Front Cover , Lens : PMMA | | |

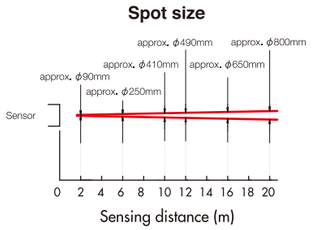
※1. Reflector V-61
※2. White 90% 100mm×100mm

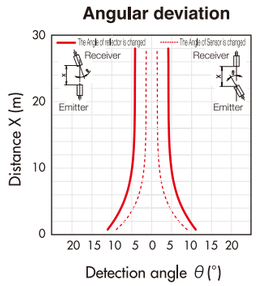
# Reference (typical)

## Z2T-2000



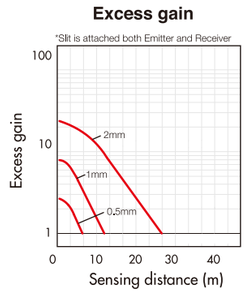



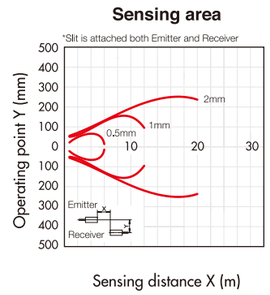



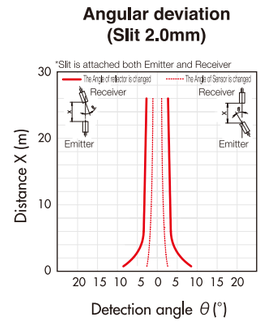


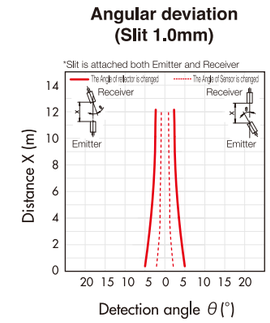

# Reference (typical)

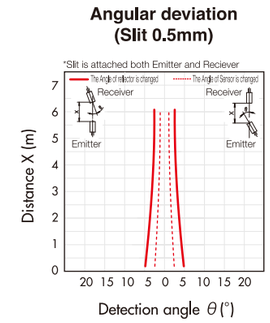
## Z2T-2000 + Slit



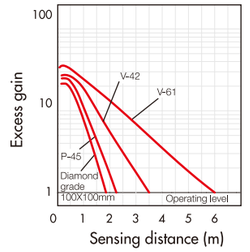



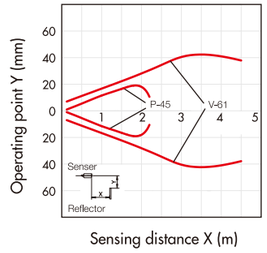



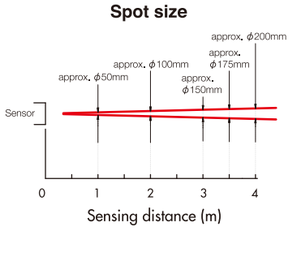



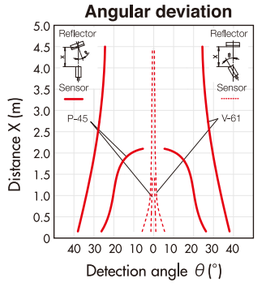




## Z2R-400

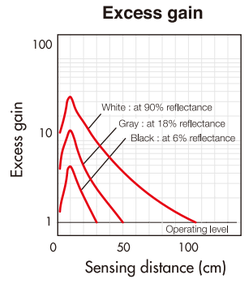


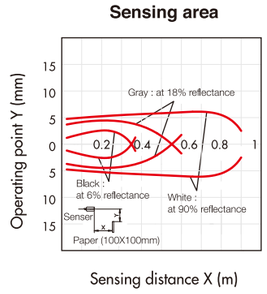



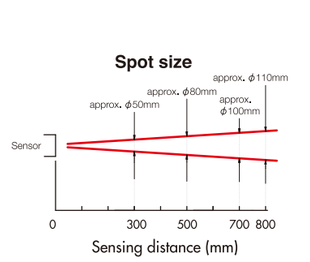




## Z2D-80



Stainless steel housing type

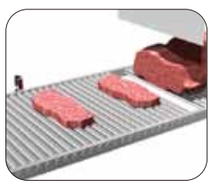
# Z-M / BGS-ZM series

- IP69K: Highly water resistant
- Tough structure for food processing line needs washing with high temperature and high pressure water.
- Achieves long sensing distance.
- 8 turn sensitivity adjustment potentiometer (BGS type)

## Applications

**For production line needs washing**

**For production line with detergent splash**



**For meat and fresh food processing line**

## Product Types

| Cable / QD | Output | Diffuse |
|---|---|---|
| Distance | | 0 - 800mm *1 |
| Cable | NPN | ZD-M80N |
| | PNP | ZD-M80P |
| M8-QD | NPN | ZD-M80CN |
| | PNP | ZD-M80CP |

| Cable / QD | Output | Retro reflective |
|---|---|---|
| Distance | | 0.01 - 5.5m *2 |
| Cable | NPN | ZR-M550N |
| | PNP | ZR-M550P |
| M8-QD | NPN | ZR-M550CN |
| | PNP | ZR-M550CP |

| Cable / QD | Output | Through beam |
|---|---|---|
| Distance | | 30m |
| Cable | NPN | ZT-M3000N |
| | PNP | ZT-M3000P |
| M8-QD | NPN | ZT-M3000CN |
| | PNP | ZT-M3000CP |

| Cable / QD | Output | BGS | |
|---|---|---|---|
| Distance | | 10 - 100mm *3 | 10 - 300mm *3 |
| Cable | NPN | BGS-ZM10N | BGS-ZM30N |
| | PNP | BGS-ZM10P | BGS-ZM30P |
| M8-QD | NPN | BGS-ZM10CN | BGS-ZM30CN |
| | PNP | BGS-ZM10CP | BGS-ZM30CP |

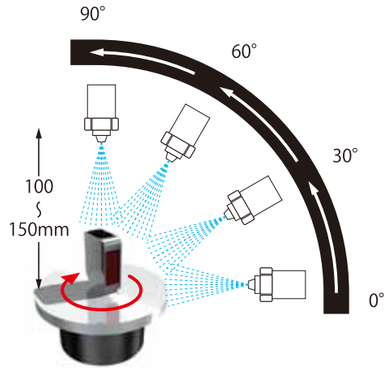
* 1 With 200mm x 200mm white paper
* 2 With V-61
* 3 With 100mm x 100mm white paper





## IP69K protection

IP69K is an rating of German standard DIN 40050-9 extends the IEC 60529 rating system for high-pressure, hightemperature wash-down applications.




Test condition:
A sensor on the turn table that rotates 5 times per minutes.

Pressure: 80~100bar
Flow rate: 14~16 litre/minute
Temperature: +80°C / -5°C
Distance from nozzle: 100~150mm
Nozzle angle: 0°, 30°, 60°, 90°
Testing period: 30sec per every angle

* IP69K doesn't mean to guarantee that the sensor works under the test condition above. The sensor won't work correctly when the lens gets wet and the light is refracted.

## High-pressure, high-temperature, detergent wash-down resistant Tough structure

**Top cover : Poly Ether Sulphone (PES)**
Oil, detergent, high-temperature resistant.
Top level protection in transparent plastic.

**SW, Pot: Poly Ether Etherketone (PEEK)**
Shock, scratch, stress, heat resistant.
Highly resistant to chemical except concentrated sulfuric acid.

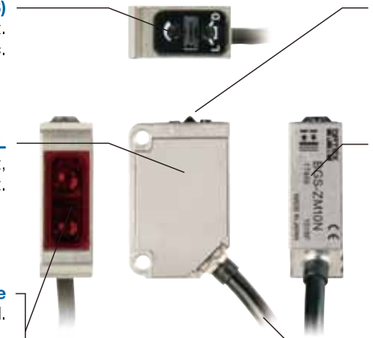
**Housing : SUS316L**
Highly corrosion-resistant. Detergent, bactericide resistant.

**Printing by laser marking**
There is no label attached so you don't have to care about interfusion into foods of the label unsticked.

**Lens PPSU for thru-beam, diffuse type**
Chemical, heat resistant. Very stable material.

**Lens PMMA with SiO coating for retro reflective type**
Oil, scratch resistant.
Water repellent and anti-static.

**Gasket (FKM), cable (PVC)**
Chemical, oil resistant and flexible.



## Longest sensing distance in the class

High brightness LED by 4 element enables longest sensing distance in the class.

**4 element LED (A InGaP-LED)**

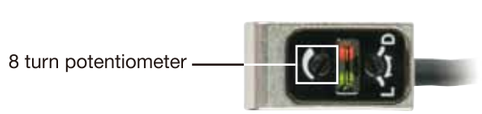
Through beam type
Sensing distance: 30m

Retro reflective type
Sensing distance: 5.5m

Diffuse type
Sensing distance: 80mm

## 8 turn sensitivity adjustment (BGS Type)

8 turn sensitivity adjustment potentiometer helps easy mounting and easy position adjustment.



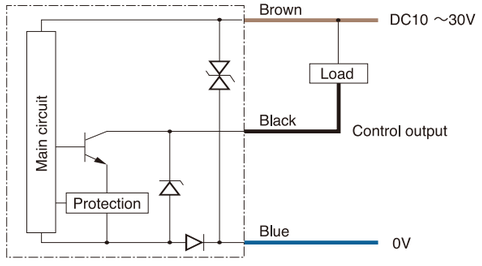
# Specifications

| Model | | Through beam | Retro reflective | Diffuse | BGS | |
|---|---|---|---|---|---|---|
| Cable type | NPN | ZT-M3000N | ZR-M550N | ZD-M80N | BGS-ZM30N | BGS-ZM10N |
| | PNP | ZT-M3000P | ZR-M550P | ZD-M80P | BGS-ZM30P | BGS-ZM10P |
| M8 | NPN | ZT-M3000CN4 | ZR-M550CN4 | ZD-M80CN4 | BGS-ZM30CN4 | BGS-ZM10CN4 |
| connector type | PNP | ZT-M3000CP4 | ZR-M550CP4 | ZD-M80CP4 | BGS-ZM30CP4 | BGS-ZM10CP4 |
| M8 (3-pin) | NPN | ZT-M3000CN3 | ZR-M550CN3 | ZD-M80CN3 | BGS-ZM30CN3 | BGS-ZM10CN3 |
| connector type | PNP | ZT-M3000CP3 | ZR-M550CP3 | ZD-M80CP3 | BGS-ZM30CP3 | BGS-ZM10CP3 |
| M12 | NPN | ZT-M3000N-M12 | ZR-M550N-M12 | ZD-M80N-M12 | BGS-ZM30N-M12 | BGS-ZM10N-M12 |
| connector type | PNP | ZT-M3000P-M12 | ZR-M550P-M12 | ZD-M80P-M12 | BGS-ZM30P-M12 | BGS-ZM10P-M12 |
| Supply voltage | | DC10～30V Inc. 10% ripple | | | | |
| Power consumption | | Emittor : 15mA max.<br>Receiver : 15mA max. | 18mA max. | | 28mA max. | |
| Sensing distance | | 30m | 0.01 - 5.5m (*1) | 0 - 800mm (*2) | 10 - 300mm (*3) | 10 - 100mm (*3) |
| Adjustable distance | | – | | | 20 - 300mm (*3) | 20 - 100mm (*3) |
| Spot size | | ϕ1200mm at 30m | ϕ300mm at 5.5m | ϕ40mm at 800mm | ϕ19mm at 250mm | ϕ6mm at 80mm |
| Response time | | 500μs | | | | |
| Hysteresis | | – | | 20% Max | 5% Max | 3% Max |
| Operating temp | | −25 to +55°C | | | | |
| Operating humidity | | 35 to 85% | | | | |
| Vibration resistance | | 10～55Hz double amplitude1.5mm X,Y,Z 2hours | | | | |
| Shock resistance | | 100G（1000m/s²) X,Y,Z 3times | | | | |
| Protection category | | IEC：IP67 DIN：IP69K | IEC：IP67 DIN：IP69K<br>Reflector is IP67 | IEC：IP67 DIN：IP69K | | |
| Light source | | 4 element red LED | | | | |
| Indicator | | Red LED: output, Green LED: stable,<br>Emitter of thru-beam type doesn't have in dicator | | | Orange LED: output, Green LED: stable | |
| Sensitivity adjustment | | 1 turn potentio meter | | | 8 turn potentiometer | |
| Operating mode | | Light ON/Dark ON selectable by switch | | | | |
| Control output | | NPN (PNP) Open collector, Max.100mA/DC30V | | | | |
| Cable | | Cable length: 2m, ϕ4 | | | | |
| Conformity | | CE Feilen Level 3 | | | | |
| Environmental illuminance | | Sunlight: 10,000 lux max. Incandescent lamp: 3,000 lux max. | | | | |
| Material | | Housing: SUS316L<br>Top cover: PES<br>Lens: PPSU<br>Switch, Pot: PEEK<br>Cable: PVC<br>Gasket: FKM | Housing: SUS316L<br>Top cover: PES<br>Lens: PMMA<br>Switch, Pot: PEEK<br>Cable: PVC<br>Gasket: FKM | Housing: SUS316L<br>Top cover: PES<br>Lens: PPSU<br>Switch, Pot: PEEK<br>Cable: PVC<br>Gasket: FKM | | |
| Accessory | | Mounting bracket:BEF-W100B | Mounting bracket:BEF-W100B<br>Reflector: V-61 | Mounting bracket:BEF-W100B | | |

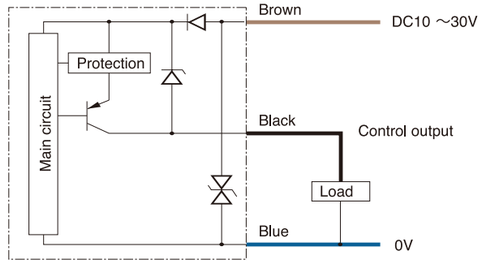
(*1) With V-61
(*2) With 200mm x 200mm white paper
(*3) With 100mm x 100mm white paper

# Circuit diagram

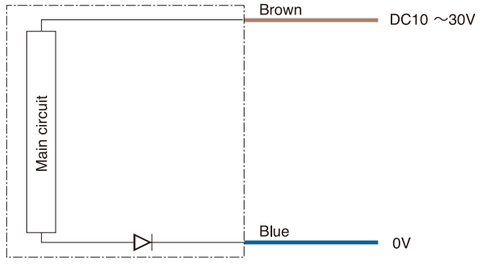
## NPN output




## PNP output




## Through beam emitter




### Notes

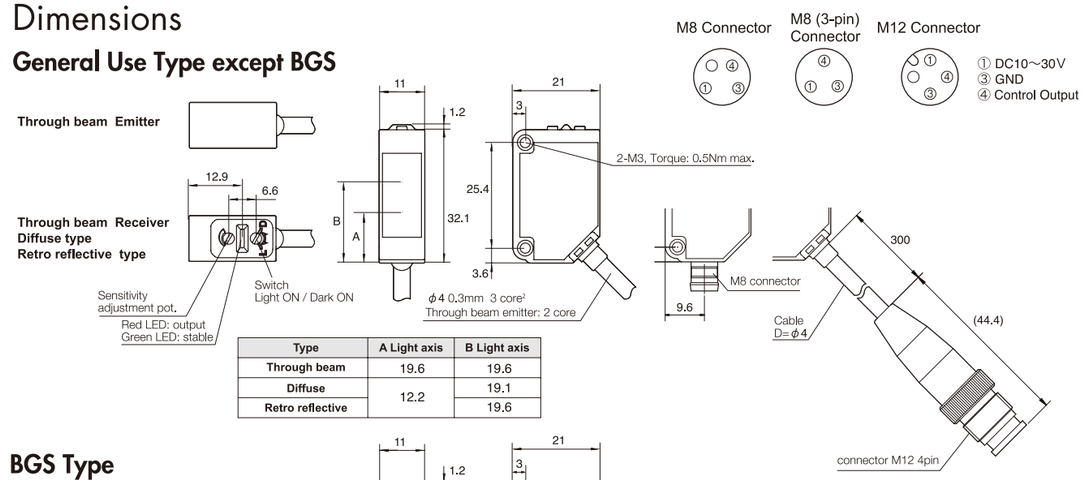
- When using switching regulator for power supply, please connect frame ground to earth ground.
- Wiring close to high voltage or power line to motors may cause malfunction because of inductive noise. Please wire separated from those lines.
- Please wait around 100msec before use sensor output after power up.





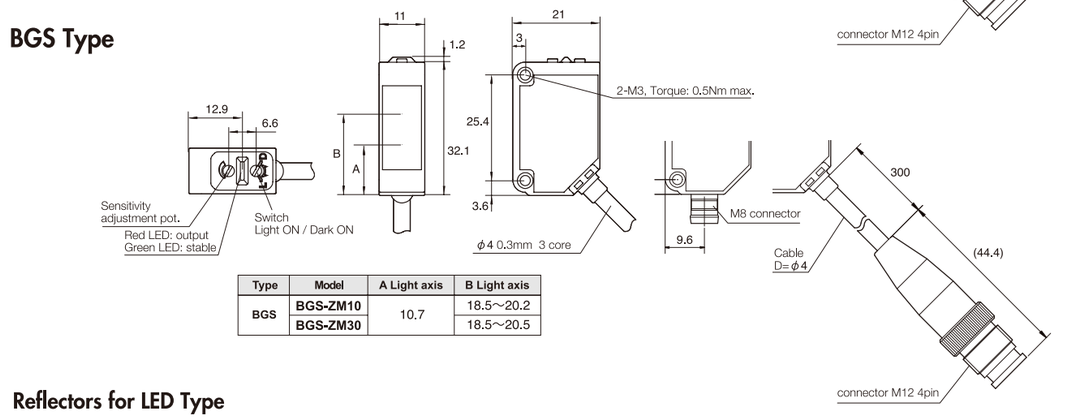
# Dimensions

## General Use Type except BGS




| Type | A Light axis | B Light axis |
|---|---|---|
| Through beam | 19.6 | 19.6 |
| Diffuse | 12.2 | 19.1 |
| Retro reflective | | 19.6 |

## BGS Type

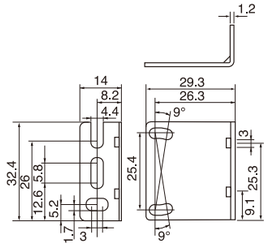



| Type | Model | A Light axis | B Light axis |
|---|---|---|---|
| BGS | BGS-ZM10 | 10.7 | 18.5～20.2 |
| | BGS-ZM30 | | 18.5～20.5 |

## Reflectors for LED Type

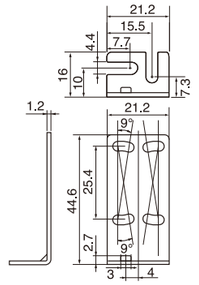
### Standard bracket BEF-W100-A

Accessory for M8 QD type sensors

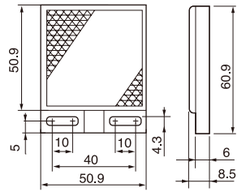



### Standard bracket BEF-W100-B

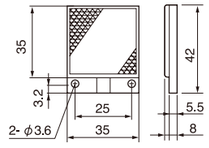
Accessory for cabled type sensors



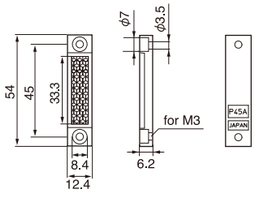

### Standard reflector V-61 (Standard, LED type)




### Small reflector V-42 (Optional, LED type)

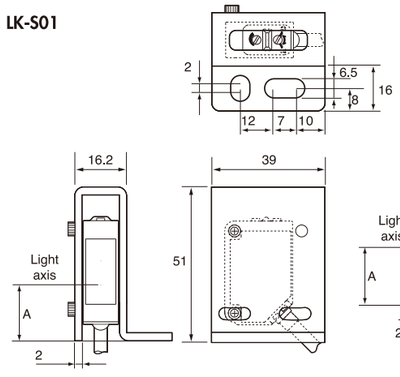



### Tiny reflector P45A (Optional, LED type)

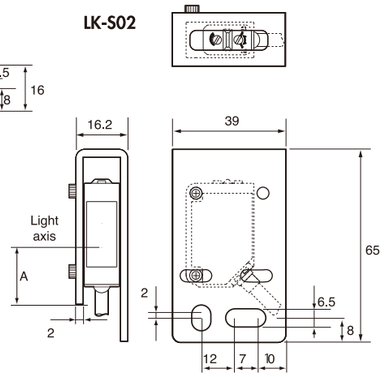



## Protective mounting bracket

### LK-S01




### LK-S02




| Type | A Light axis |
|---|---|
| Through beam | 26.6 |
| Diffuse<br>Retro reflective | 19.2 |
| BGS | 17.7 |

(Unit : mm)

# Options

**Standard reflector V-61 (Except ZR-QX200)**

**Small reflector V-42**

**Tiny reflector P45A**

**Protective mounting brackets**

**LK-S01**

**LK-S02**

**JCN-S：M8 Straight type**

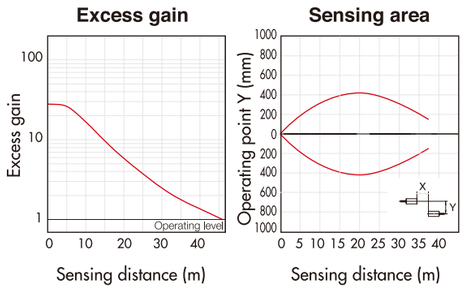
JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

**JCN-L：L-shape M8 type**

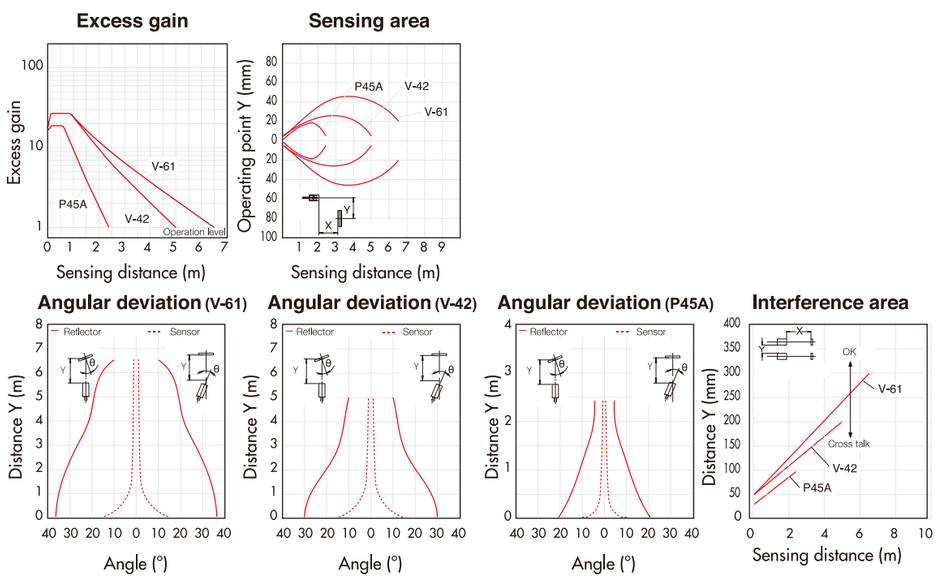
JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

# Reference (typical)

## ZT-M3000N




## ZR-M550N



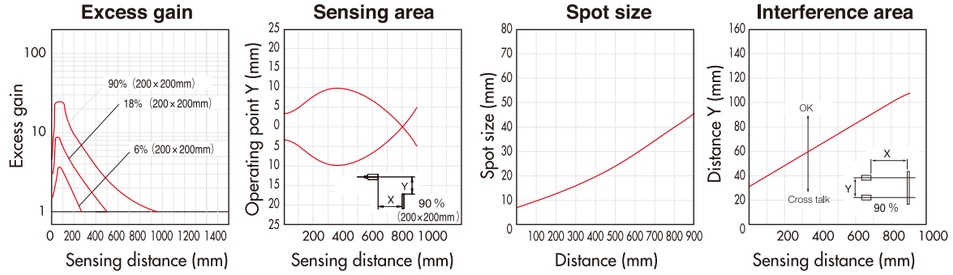






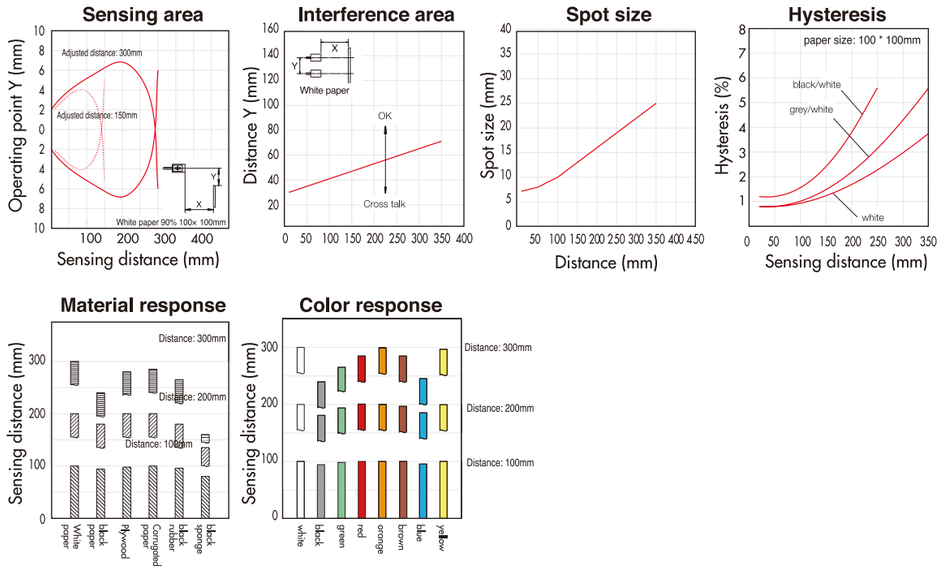

# Reference (typical)

## ZD-M80N

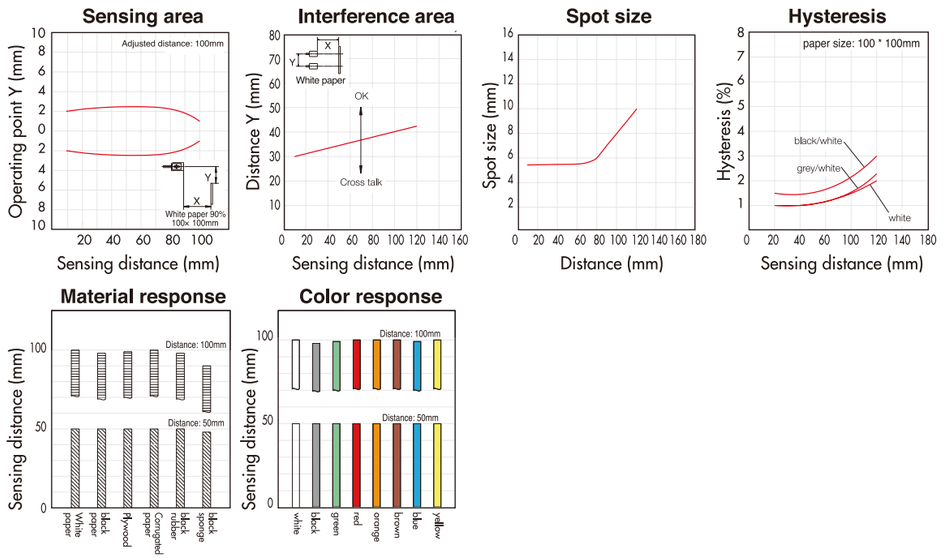



**90%: White paper**
**18%: Gray paper**
**6%: Black paper**

## BGS-ZM30N




## BGS-ZM10N



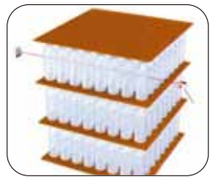
Photoelectric Sensor

# K series

- Ideal for the detection of Glass/PET products. (KR-Q50 / KR-Q150 / KR-Q300)
- Test input to verify operation.(KT-700 Thru-beam type)
- IP67 rating, rugged design.

## Applications

**PET bottles moving on a conveyor**



**Pallet of PET bottles**

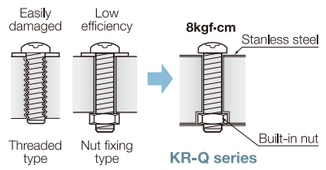
**Counting PET bottles**

**Sensing PET bottles through a narrow opening**

## Stainless steel housing. Built-in mounting nuts.

The stainless steel housing helps to protect the sensor against mechanical damage if it is struck by passing objects.

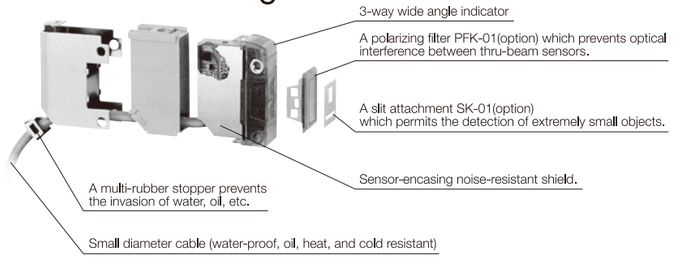
The built-in mounting nuts make installation easy and efficient, the problem of damaged threads due to over-tightening has been eliminated.




## Surpasses the VDE standard for electrical noise immunity.

The noise resistant internal circuitry is designed in accordance with the strict VDE standard.
Further, in-house Feilen Noise testing assures high reliability and compliance with international standards.

## Case and housing

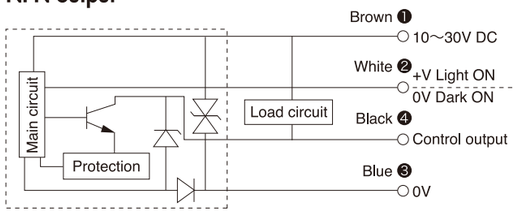




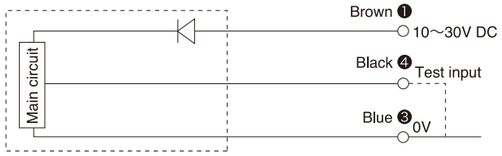



## Circuit diagram

**NPN output**

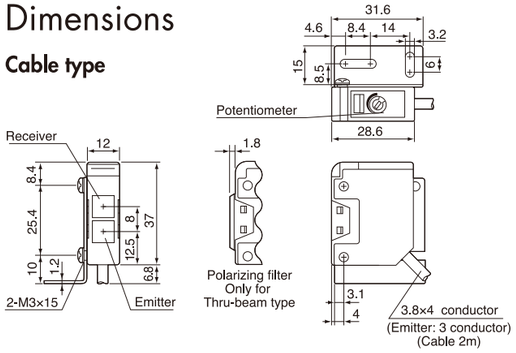



**Emitter of Thru-beam type**

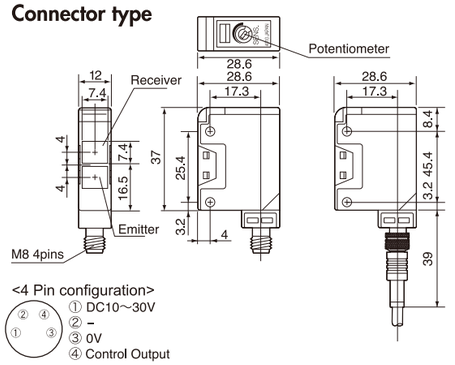



## Dimensions

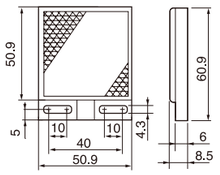
**Cable type**



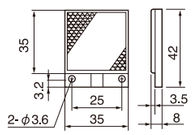

**Connector type**



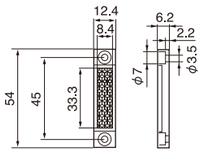

**Standard reflector V-61**



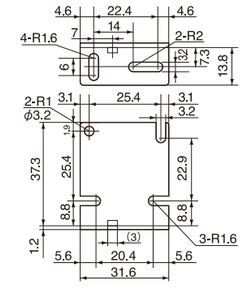

**Small reflector V-42**



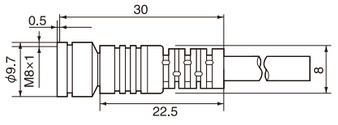

**Tiny reflector P45A**



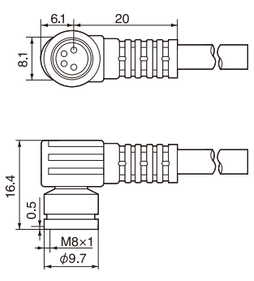

**BEF-W170**




**JCN-S : M8 Straight type**




**JCN-L : M8 L-shape type**




(Unit : mm)

# Specifications

| Model | | Thru-beam | Retro-reflective with polarizing Filter | Diffuse reflective | Convergent | Glass sensing | | |
|---|---|---|---|---|---|---|---|---|
| Cable type | NPN | KT-700N | KR-250N | KD-40N | KD-L09N | KR-Q50NW | KR-Q150NW | KR-Q300NW |
| | PNP | KT-700P | KR-250P | KD-40P | KD-L09P | KR-Q50PW | KR-Q150PW | KR-Q300PW |
| Connector type | NPN | KT-700CN | KR-250CN | KD-40CN | KD-L09CN | KR-Q50CNW | KR-Q150CNW | KR-Q300CNW |
| | PNP | KT-700CP | KR-250CP | KD-40CP | KD-L09CP | KR-Q50CPW | KR-Q150CPW | KR-Q300CPW |
| Sensing distance | | 7 m | 2.5 m | 40 cm | 1 - 9 cm | 50 cm | 1.5 m | 3 m |
| Light source | | Red | | | | | | |
| Min detectable object | | $\phi$7mm | — | $\phi$40mm | — | $\phi$2.5mm (steel wire) | | |
| Response time | | 1msec Max | 0.7msec Max | | | | | |
| Hysteresis | | NIL | | 20% Max | 10% Max | NIL | | |
| Sensitivity adjustment | | Not equipped | | Single turn potentiometer | | | | |
| LED Indicator | | Single Indicator | | | | | | |
| Control output | | NPN or PNP Open collector, 100mA Max / 30V DC | | | | | | |
| Test input | | Equipped | Not equipped | | | | | |
| Operating mode | | Light ON / Dark ON selectable | | | | | | |
| Insulation resistance | | Min. 20 M Ohm / DC500V | | | | | | |
| Supply voltage | | 10 to 30 V DC including 10% of ripple | | | | | | |
| Power consumption | | 35mA Max | 30mA Max | | | | | |
| Conformity | | JIS, UL, CE, VDE | | | | | | |
| Operating temp / humidity | | –25 to +55°C / 35 to 85%RH | | | | | | |
| Environmental illuminance | | Sun Light:20,000 lux max. Incandescent lamp:4,000 lux max. | | | | | | |
| Vibration resistance | | 10 50 55 Hz amplitude 1.5mm, X-Y-Z for 2 hours | | | | | | |
| Protection category | | IEC 144 IP67, VDE Level 3 | | | | | | |
| Material | | ABS (Case), PC (Lens), SUS304 (Cover) | | | | | | |
| Weight (Net) | | 25g (20g for emitter of thru-beam type) | | | | 25g | | |

# Options

**Standard reflector V-61**

**Small reflector V-42**

**Tiny reflector P45A**

**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**

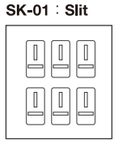
**LK-S01**

**LK-S02**

**Sensor stand**
**PLN-1**

**Fixture of Reflector**
**PLN-1M**

**SK-01 : Slit**



**PKF-01 : Filter**

| | Slit SK-01 (Emitter + reciever) | Pol.filter PFK-01 | Slit + filter |
|---|---|---|---|
| Sensing distance | 1000mm | 1000mm | 500mm |
| Min.dia | $\phi$1mm | $\phi$7mm | $\phi$1mm |

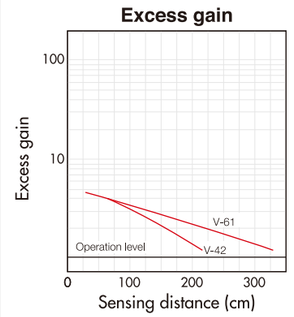
*Just peel the sticker off the backing and apply to the surface of the sensor.

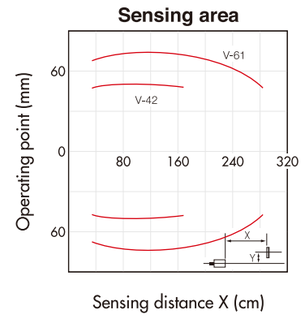


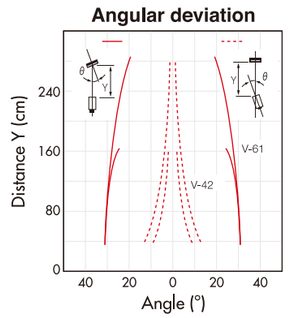


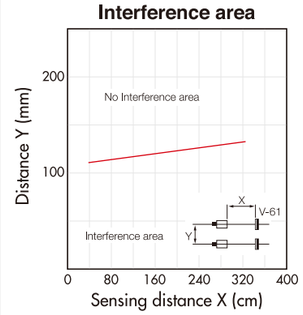
# Reference (typical)

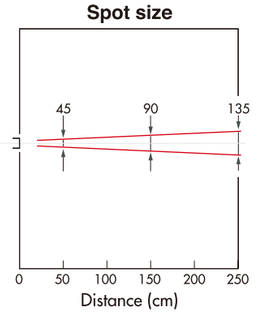
## KR-Q300NW



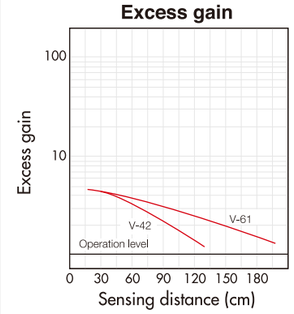



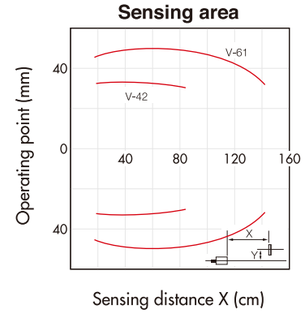



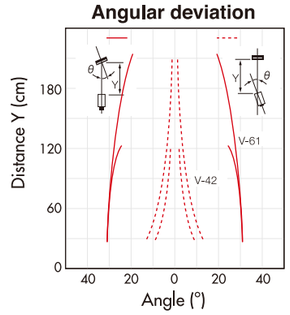



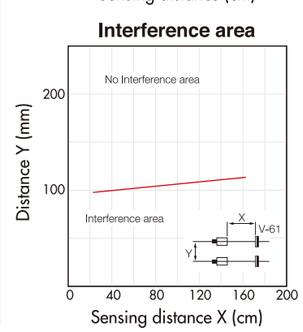



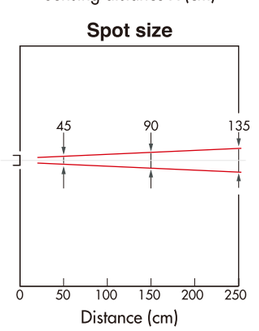

## KR-Q150NW



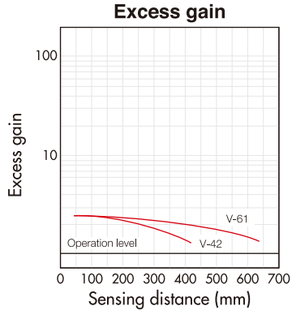



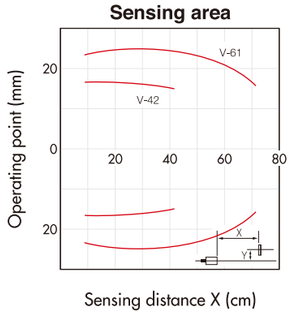
## Reference (typical)

**KR-Q50NW**

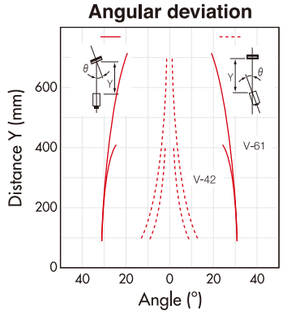
**Excess gain**



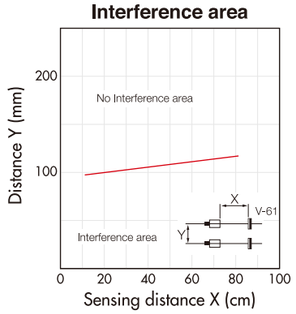

**Sensing area**



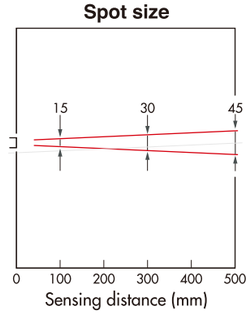

**Angular deviation**




**Interference area**

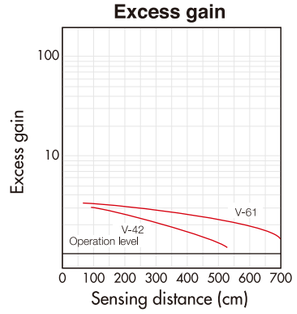



**Spot size**

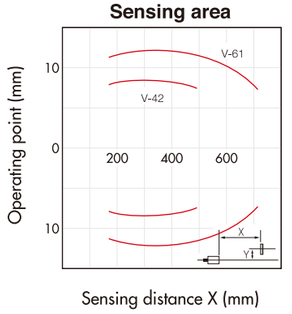



**KR-Q50N**

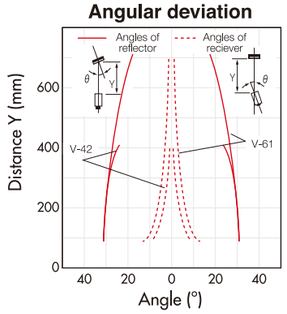
**Excess gain**



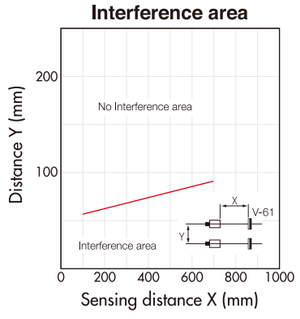

**Sensing area**



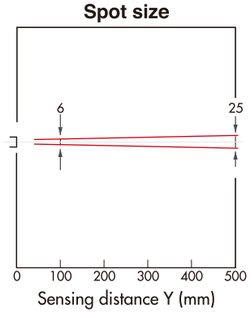

**Angular deviation**




**Interference area**




**Spot size**







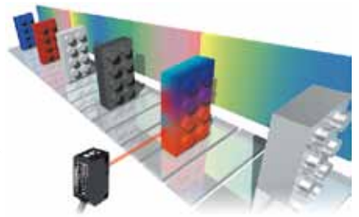

Photoelectric Sensor

# BGS-2S series

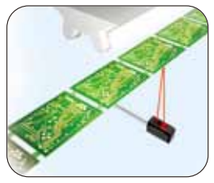
- **BGS-2S25 Series**
  - Specially designed for black PC Boards.
  - M8 QD types are available.
- **BGS-2S15 Series**
  - Noise filter with anti-inverter design. Tolerant to environmental noise.
  - Good for any PC Board except black colored.
  - Standard BGS in Asia/Japan.
- **BGS-2S10 series**
  - For limited area. Good repeatability.

## Applications

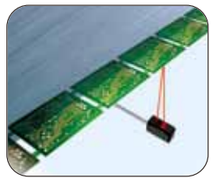
BGS type sensors are designed to detect any target regardless of the color and/or background.



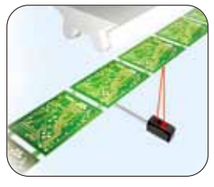
**BGS-2S25N/P for black PC Boards**



**BGS-2S15N/P anti-inverter noise**



**BGS-2S10N/P for limited mounting space**



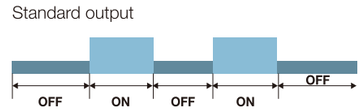
**BGS-2S30NT/PT for longer distance. Timer type (0-100msec)**

## OFF delay timer (BGS-2S30T)

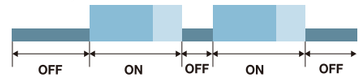
The BGS-2S30NT(PT) has a built-in Off-delay timer, 0 ~ 100 msec.

Timer ▶

Standard output




Off-delay output

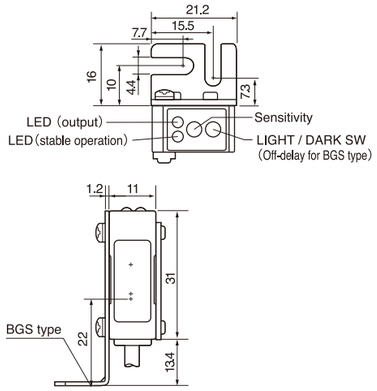



## IP67.

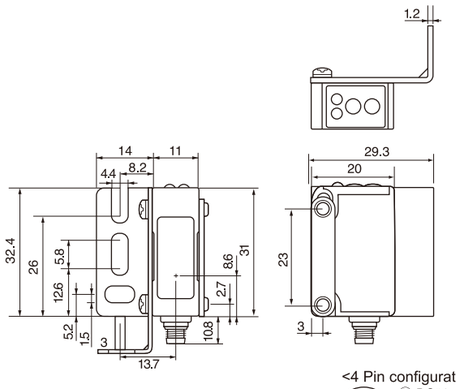
The one-shot molded housing results in an IP67 rating.

# Dimensions (BGS-2S15,BGS-2S10,BGS-2S25,BGS-2S30)

**Cable Type（With Bracket BEF-W140-B）**




**Connector Type（With Bracket BEF-W140-A）**




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

(Unit : mm)

# Specifications

| Cable type | | BGS-2S25N / BGS-2S25P | BGS-2S15N / BGS-2S15P | BGS-2S30N / BGS-2S30P | BGS-2S10N / BGS-2S10P | BGS-2S30NT / BGS-S30PT |
|---|---|---|---|---|---|---|
| Connector type | | BGS-2S25CN / BGS-2S25CP | BGS-2S15CN / BGS-2S15CP | BGS-2S30CN / BGS-2S30CP | BGS-2S10CN / BGS-2S10CP | |
| Sensing distance | white | 1 - 250mm | 25 - 150mm | 5 - 300mm | 40 - 100mm | 5 - 300mm |
| | grey | 2 - 250mm | 25 - 150mm | 10 - 300mm | 40 - 100mm | 10 - 300mm |
| | black | 5 - 200mm | 25 - 80mm | 15 - 200mm | 20 - 70mm | 15 - 200mm |
| Response time | | 0.5m sec Max | | | | |
| Repeatability | parallel | 2.0mm | 1.5mm | 2.5mm | 1.5mm | 2.5mm |
| | vertical | 0.5mm | 0.3mm | 0.6mm | 0.3mm | 0.6mm |
| Operating mode | | Light On, Dark On selectable | | | | |
| Hysteresis | | 10% Max | | | | |
| LED Indicator | | Two - way, Green（Stable）, Yellow（output） | | | | |
| Light source | | Red LED | | | | |
| Supply voltage | | DC10 - 30V incl. 10% ripple | | | | |
| Conformity | | JIS / C4525, CE, UL | | | | |
| Power consumption | | 30mA Max | | | | |
| Sensitivity adjustment | | 6 - turn trimmer | | | | |
| Protection category | | IEC, IP67 | | | | |
| Shock resistance | | 50G, XYZ directions | | | | |
| Materials | | PBT with glass（Case）, PC(Lens) | | | | |
| Timer | | N / A | | Available as option | N / A | |

# 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

**Protective mounting brackets**
**LS2-S01**

**Sensor stand**
**PLN-1**

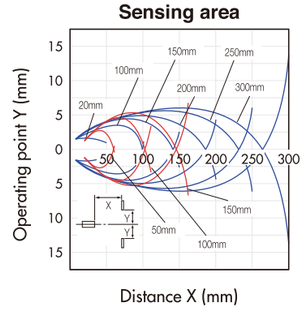
**Fixture of Reflector**
**PLN-1M**

# Reference (typical)

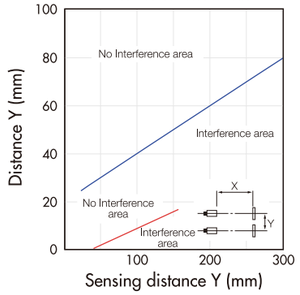
**BGS-2S15N**
**BGS-2S30NT**

BGS-2S15N
BGS-2S30NT

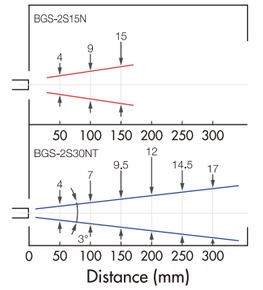
**Sensing area**



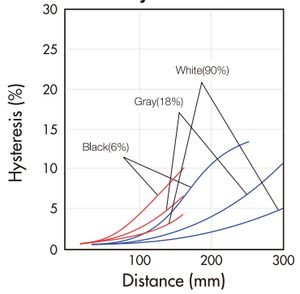

**Interference area**



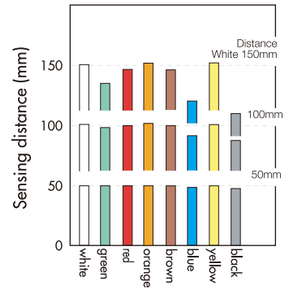

**Spot size**



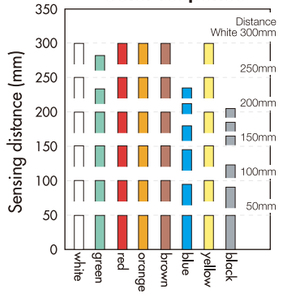

**Hysteresis**



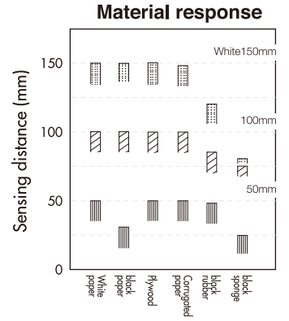

**Color response**



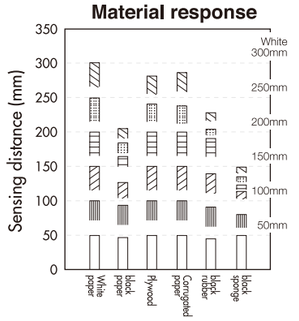

**Color response**




**Material response**




**Material response**

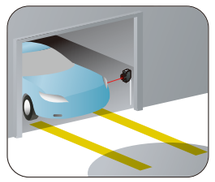


Photoelectric Sensor

# Y series

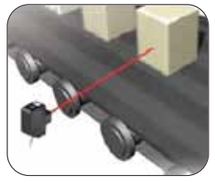
- Complete selection of sensing types including BGS and Transparent Object Detection.
- M18 Threaded Front Mounting.
- Stable Sensing Even For Plastic/Glass.

## Applications

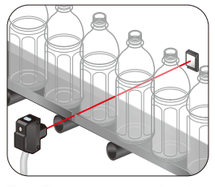


**Verifying car position**

**For Detecting PWB**



**For Conveyor**



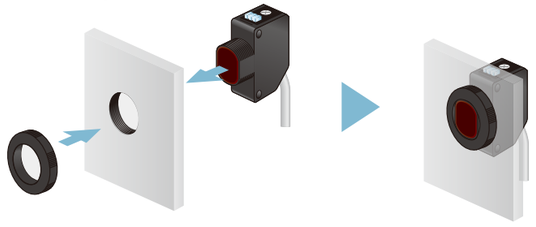
**For Beverage industry**

## Wide Selection

The Y series is offered with seven different models. Thru-beam, Diffuse, Retro-reflective, Transparent object detection, Convergent Beam (two types) and BGS (Background suppression). There is a model for use in almost any application.

## M18 Threaded Front Mounting

The sensor can be easily mounted by inserting into an 18 mm opening. There are also conventional mounting holes in the sensor body for added flexibility.



## Pig-tail Connector

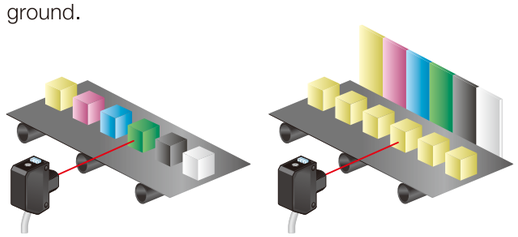
M12 pig-tail type are available for easy maintenance.

## Rugged Waterproof Construction

The sensor has an IP67 rating. It is ideal for use in applications where it may be exposed to water spray.

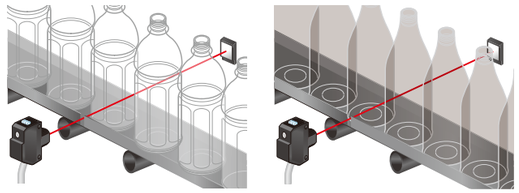
## BGS Sensing

BGS (Background Suppression) sensors are not influenced by the color or texture of the target, the sensor is also able to ignore changes in the back-ground.



## Stable Sensing Even For Plastic/Glass

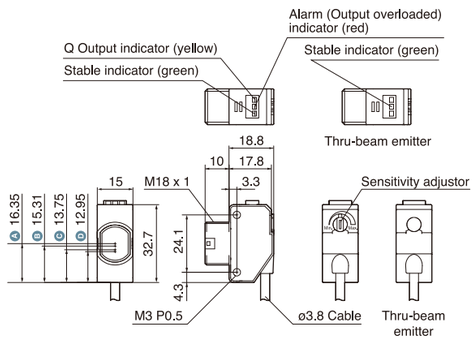
The YR-Q series was designed for the detection of transparent targets.These are ideally suited for clear plastic and glass bottle applications.



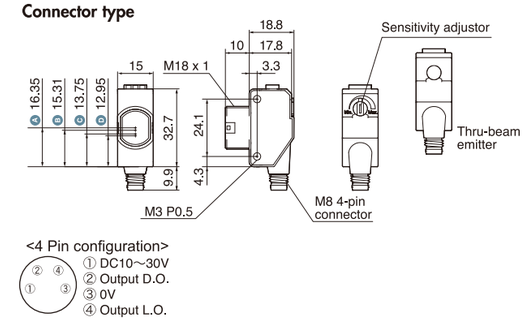
## Dimensions

### General Use Types except BGS

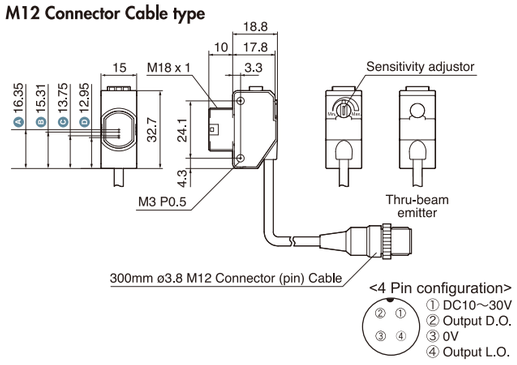
**Cable type**




**Connector type**




**M12 Connector Cable type**



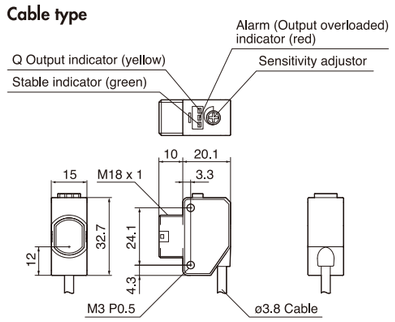

A Thru-beam type
B Convergent Beam short range type
C Convergent Beam standard range type
D Retro-reflective / Diffuse reflective type

(Unit : mm)

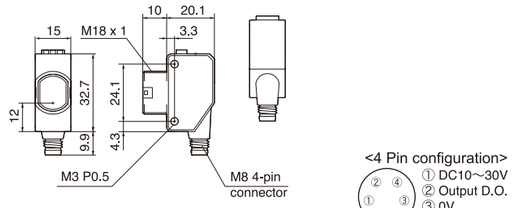
# Dimensions

## BGS Types

### Cable type

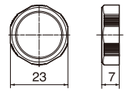



### Connector type

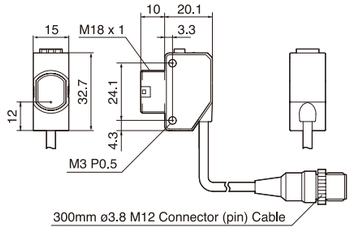



<4 Pin configuration>
① DC10~30V
② Output D.O.
③ 0V
④ Output L.O.

### M18 x 1 Nut

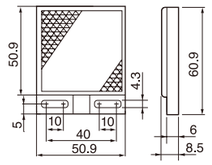



### M12 Connector Cable type

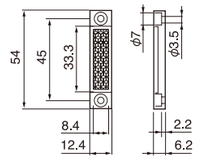



<4 Pin configuration>
① DC10~30V
② Output D.O.
③ 0V
④ Output L.O.

### V-61 for YR-140




### P45A for YR-Q39




(Unit : mm)

# Specifications

| Model (NPN / PNP different model) | Thru-Beam | Diffuse reflective | Polarized Retro-reflective | Retro - Glass | Convergent Beam | | BGS |
|---|---|---|---|---|---|---|---|
| | | | | | close focus | regular focus | |
| 2 meter (approx. 78 inch) cable | YT-1180N / P | YD-15N / P | YR-140N / P | YR-Q39N / P | YD-L1N / P | YD-L2N / P | BGS-Y8N / P |
| M8 QD | YT-1180CN / CP | YD-15CN / 15CP | YR-140CN / CP | YR-Q39CN / CP | YD-L1CN / CP | YD-L2CN / CP | BGS-Y8CN / CP |
| M12 pig-tail | YT-1180N-M12 / P-M12 | YD-15N-M12 / P-M12 | YR-140N-M12 / P-M12 | YR-Q39N-M12 / P-M12 | YD-L1N-M12 / P-M12 | YD-L2N-M12 / P-M12 | BGS-Y8N-M12 / P-M12 |
| Sensing distance | 30m (1180 inch) | 0.4m (15.7 inch) | 3.5m (140 inch) V-61 reflector | 1m (39.3 inch) P45A reflector | 16mm (0.6 inch) | 43mm (1.7 inch) | 200mm (7.9 inch) Setting range : 30-200mm |
| Light source | Red LED (visible) | | | | | | |
| Hysteresis | N/A | 20% max. | N/A | N/A | 10% max. | 10% max. | 5% |
| Response time | 0.5msec | | | | | | |
| LED Indicator | 3 Indicators (green indicator only :Emitter of YT-1180) Yellow: output Green: stable Red: alarm - overload | | | | | | |
| Operating mode | Light ON and Dark ON outputs provided | | | | | | |
| Sensitivity adjustment | 1turn potentiometer | | | | | | 4 turn potentiometer |
| Control output | NPN or PNP open collector, 100mA max. / 30VDC | | | | | | |
| Shock resistance | 100G , xyz three directions | | | | | | |
| Environmental illuminance | Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max | | | | | | |
| Operating temp / humidity | –25°C to 55°C / 35 to 85% RH | | | | | | |
| Storage temp / humidity | –40°C to 70°C / 35 to 90 % RH | | | | | | |
| Supply voltage | 10 - 30VDC incl. 10% ripple | | | | | | |
| Power consumption | emitter : 15mA max.30mA max. | | | | | | |
| | receiver : 20mA max. | | | | | | |
| Conformity | CE , JIS/C4525 | | | | | | |
| Circuit protection | Reverse polarity, transient voltages,Output overcurrent | | | | | | |
| Material | ABS with 20% glass (case), PMMA (lens) | | | | | | |
| Protection category | IEC 144, IP67 | | | | | | |







# Options

**V-61 for YR-140**

**P45A for YR-Q39**

**JCN-S : M8 Straight type**

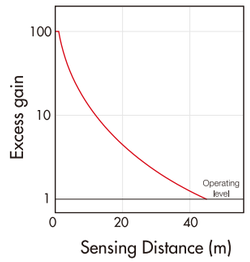
JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

**JCN-L : M8 L-shape type**

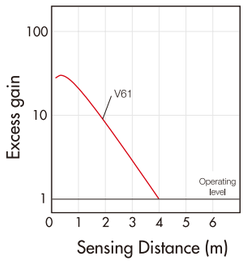
JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

# Reference (typical)

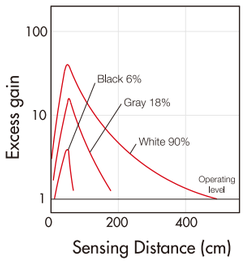
**Thru-beam**



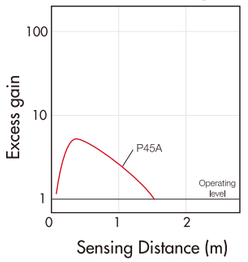

**Retro reflective**



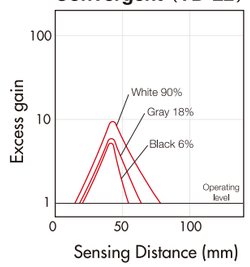

**Diffuse reflective**



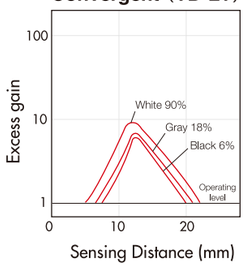

**Glass sensing**



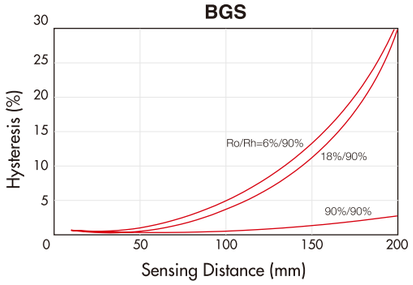

**Convergent (YD-L2)**




**Convergent (YD-L1)**




**BGS**

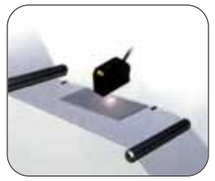


Photoelectric Sensor

# DM-18T series

- DM-18T series, RGB sensor with automatic LED selection control.
- Numerical display for easy setting

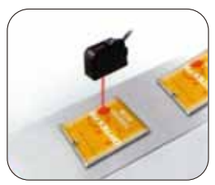
## Applications



**Registration mark on transparent film**

**Synchronizing sensor for vision sensor CVS**

**Color mark on laminate tube**

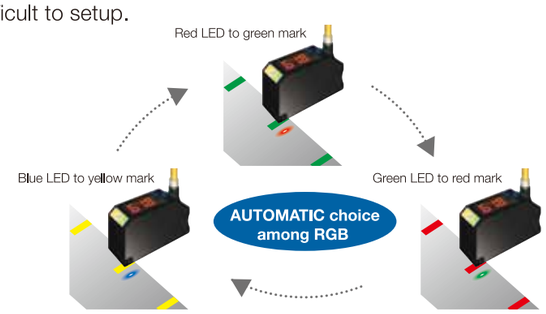


**Mark on multicolored print**

Two modes of operation are available, Mark Detection Mode and RGB Color Detection Mode.
The sensor can store up to 8 complete sets of parameters to reduce the setup time when changing products.

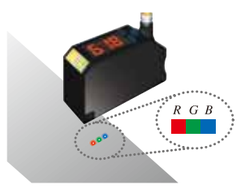
## Automatic Choice of RGB light source - Mark Detection mode

The DM-18T has a Red, Green and Blue LED light source built-in, the microcomputer will select the proper one to use according to the specific target color. When initially setting the sensor there is no need to perform this step.
The sensor monitors the contrast between the background and target, it is capable of sensing the difference between colors that used to be difficult to setup.




## Color Mode

To select a specific color, a three color (RGB) LED element is used. The sensor computes the color ratio between the three colors. The accuracy of the color detection is assured even with products moving on a conveyor.
One sensor is able to operate in two modes, Mark Detection (Mark Mode) or Color Sensing (Color Mode)







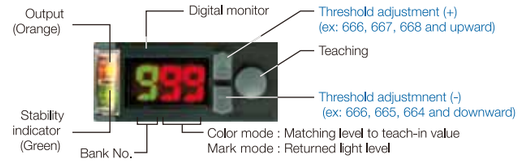

## Store up to 8 sets of parameters Color/Mark Sensor

The DM-18T is able to store 8 complete sets of parameters (banks) for quick product changeover. The desired bank can be selected remotely via the three remote inputs.

| Bank No. | Wire color | | |
|---|---|---|---|
| | Green | Rose | Yellow |
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 |
| 3 | 0 | 1 | 0 |
| 4 | 0 | 1 | 1 |
| 5 | 1 | 0 | 0 |
| 6 | 1 | 0 | 1 |
| 7 | 1 | 1 | 0 |
| 8 | 1 | 1 | 1 |

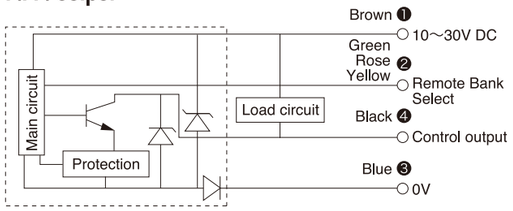
Remarks : 0 = Connect to +V, or leave open
1 = Connect to 0V

## Pushbutton Teach with Fine Adjustment

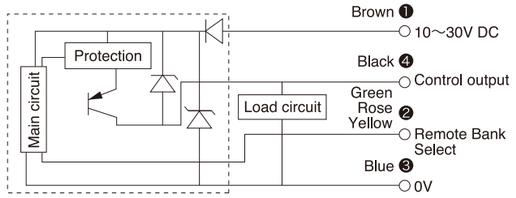



## Circuit diagram

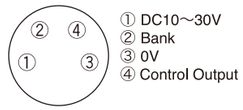
**NPN output**




**PNP output**

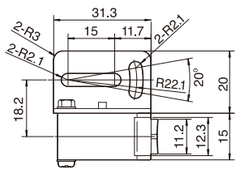


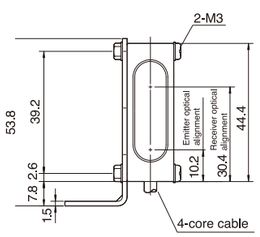

**4 Pin configuration**

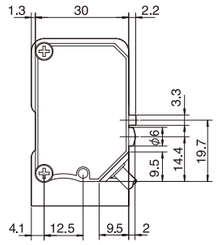



## Dimensions

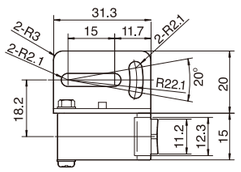
**Cable type sensor with bracket**

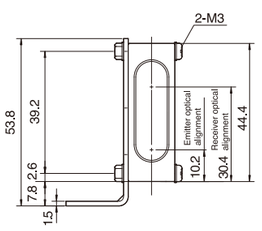


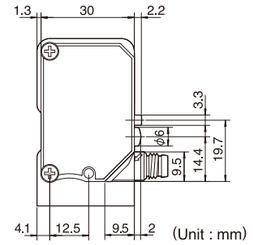




**Connector type sensor with bracket**




(Unit : mm)

# Color response (Color Mode)

Mode : Color mode

:Excellent :Good enough :Good :Impossible

| teach color \ measured color | 33N (purple) | | | | 43N (blue) | | | | 47N (light blue) | | | | 54N (green) | | | | 4N (yellow) | | | | 8N (orange) | | | | 23N (red) | | | | 77N (brown) | | | | 88N (black) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 |
| 33N (purple) 100 | | 88 | 63 | 34 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 30 | 32 | 38 | 31 | 59 | 57 | 57 | 42 | 67 | 69 | 67 | 47 | 55 | 54 | 38 | 21 | 60 | 58 | 42 | 23 |
| 33N (purple) 75 | 90 | | 74 | 44 | 1 | 0 | 2 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 12 | 32 | 33 | 40 | 41 | 60 | 58 | 58 | 54 | 58 | 66 | 69 | 56 | 56 | 57 | 47 | 32 | 61 | 60 | 54 | 32 |
| 33N (purple) 50 | 66 | 77 | | 68 | 26 | 21 | 27 | 36 | 0 | 0 | 0 | 22 | 1 | 8 | 21 | 36 | 43 | 45 | 51 | 61 | 45 | 54 | 70 | 71 | 34 | 42 | 76 | 76 | 69 | 68 | 68 | 54 | 75 | 72 | 71 | 54 |
| 33N (purple) 25 | 37 | 46 | 70 | | 40 | 51 | 55 | 66 | 0 | 0 | 10 | 50 | 22 | 38 | 52 | 66 | 51 | 60 | 65 | 75 | 15 | 25 | 54 | 85 | 4 | 12 | 47 | 88 | 59 | 74 | 84 | 84 | 55 | 67 | 86 | 84 |
| 43N (blue) 100 | 0 | 0 | 0 | 0 | | 90 | 61 | 18 | 43 | 47 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43N (blue) 75 | 0 | 0 | 0 | 0 | 88 | | 68 | 24 | 52 | 54 | 55 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43N (blue) 50 | 0 | 0 | 0 | 0 | 67 | 74 | | 77 | 0 | 4 | 48 | 68 | 16 | 31 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 33 | 0 | 0 | 22 | 26 | 51 | 0 |
| 43N (blue) 25 | 1 | 10 | 34 | 63 | 40 | 49 | 76 | | 0 | 1 | 42 | 85 | 37 | 53 | 69 | 80 | 15 | 26 | 44 | 67 | 0 | 0 | 18 | 54 | 0 | 0 | 10 | 52 | 23 | 37 | 61 | 76 | 18 | 32 | 57 | 77 |
| 47N (light blue) 100 | 0 | 0 | 0 | 0 | 47 | 51 | 56 | 28 | | 88 | 60 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 47N (light blue) 75 | 0 | 0 | 0 | 0 | 51 | 55 | 57 | 40 | 85 | | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 47N (light blue) 50 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 70 | 66 | 79 | | 0 | 39 | 56 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 6 | 30 | 0 |
| 47N (light blue) 25 | 0 | 1 | 24 | 55 | 31 | 42 | 67 | 89 | 0 | 9 | 50 | | 45 | 61 | 76 | 86 | 5 | 17 | 35 | 57 | 0 | 0 | 9 | 45 | 0 | 0 | 1 | 43 | 10 | 28 | 51 | 68 | 12 | 20 | 52 | 62 |
| 54N (green) 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 36 | 42 | 41 | 34 | | 83 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 12 | 0 |
| 54N (green) 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 32 | 46 | 54 | 48 | 85 | | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13 | 0 | 0 | 0 | 1 | 24 | 0 |
| 54N (green) 50 | 0 | 0 | 0 | 9 | 0 | 0 | 1 | 42 | 28 | 41 | 62 | 69 | 62 | 79 | | 78 | 0 | 11 | 38 | 66 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 20 | 0 | 22 | 45 | 54 | 0 | 3 | 35 | 52 |
| 54N (green) 25 | 4 | 13 | 38 | 66 | 18 | 28 | 56 | 80 | 0 | 0 | 38 | 84 | 57 | 69 | 85 | | 17 | 29 | 47 | 70 | 0 | 0 | 22 | 58 | 0 | 0 | 14 | 55 | 23 | 40 | 65 | 80 | 23 | 33 | 56 | 80 |
| 4N (yellow) 100 | 30 | 32 | 43 | 51 | 1 | 0 | 10 | 17 | 0 | 0 | 0 | 4 | 0 | 0 | 5 | 17 | | 87 | 69 | 47 | 64 | 72 | 72 | 60 | 53 | 60 | 62 | 62 | 74 | 74 | 52 | 35 | 68 | 70 | 57 | 35 |
| 4N (yellow) 75 | 31 | 34 | 44 | 59 | 1 | 10 | 19 | 26 | 0 | 0 | 0 | 12 | 0 | 2 | 17 | 30 | 88 | | 80 | 60 | 52 | 61 | 74 | 71 | 39 | 48 | 63 | 67 | 75 | 75 | 64 | 50 | 71 | 71 | 70 | 48 |
| 4N (yellow) 50 | 38 | 40 | 51 | 65 | 6 | 17 | 36 | 44 | 0 | 0 | 0 | 29 | 7 | 16 | 33 | 47 | 70 | 82 | | 76 | 34 | 46 | 74 | 80 | 24 | 33 | 67 | 75 | 76 | 82 | 80 | 64 | 75 | 78 | 79 | 65 |
| 4N (yellow) 25 | 34 | 44 | 61 | 76 | 16 | 25 | 53 | 68 | 0 | 0 | 14 | 53 | 27 | 37 | 57 | 68 | 48 | 60 | 78 | | 12 | 24 | 52 | 86 | 1 | 11 | 44 | 83 | 51 | 70 | 92 | 87 | 52 | 64 | 89 | 88 |
| 8N (orange) 100 | 58 | 61 | 43 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 51 | 32 | 12 | | 86 | 58 | 23 | 87 | 88 | 66 | 25 | 59 | 40 | 15 | 1 | 60 | 47 | 22 | 1 |
| 8N (orange) 75 | 57 | 60 | 53 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72 | 62 | 43 | 22 | 89 | | 69 | 34 | 78 | 86 | 78 | 36 | 71 | 53 | 26 | 11 | 72 | 56 | 32 | 14 |
| 8N (orange) 50 | 57 | 60 | 69 | 54 | 10 | 4 | 12 | 21 | 0 | 0 | 0 | 5 | 0 | 0 | 6 | 22 | 72 | 74 | 74 | 51 | 60 | 70 | | 63 | 47 | 57 | 88 | 68 | 96 | 80 | 56 | 42 | 91 | 85 | 61 | 41 |
| 8N (orange) 25 | 45 | 55 | 70 | 85 | 26 | 34 | 49 | 57 | 0 | 0 | 2 | 42 | 22 | 27 | 45 | 58 | 57 | 71 | 80 | 87 | 23 | 34 | 63 | | 12 | 21 | 55 | 93 | 63 | 80 | 93 | 75 | 65 | 76 | 95 | 76 |
| 23N (red) 100 | 64 | 56 | 31 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 41 | 22 | 1 | 87 | 76 | 47 | 12 | | 90 | 56 | 15 | 46 | 30 | 4 | 0 | 54 | 35 | 10 | 0 |
| 23N (red) 75 | 69 | 63 | 41 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 49 | 32 | 10 | 88 | 86 | 56 | 22 | 90 | | 64 | 24 | 54 | 39 | 16 | 1 | 58 | 47 | 20 | 0 |
| 23N (red) 50 | 67 | 71 | 76 | 45 | 2 | 0 | 3 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 61 | 63 | 65 | 42 | 68 | 78 | 89 | 55 | 56 | 67 | | 69 | 86 | 72 | 47 | 31 | 91 | 82 | 52 | 33 |
| 23N (red) 25 | 49 | 58 | 75 | 87 | 26 | 33 | 45 | 53 | 0 | 0 | 0 | 41 | 18 | 25 | 40 | 53 | 61 | 68 | 74 | 83 | 27 | 37 | 66 | 93 | 14 | 25 | 59 | | 69 | 86 | 89 | 74 | 64 | 75 | 91 | 72 |
| 77N (brown) 100 | 0 | 0 | 0 | 0 | 1 | 1 | 11 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 79 | 0 | 0 | 85 | 85 | 58 | 0 |
| 77N (brown) 75 | 0 | 0 | 0 | 0 | 15 | 16 | 31 | 0 | 0 | 0 | 0 | 27 | 1 | 9 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 81 | | 0 | 0 | 90 | 94 | 74 | 0 |
| 77N (brown) 50 | 40 | 50 | 69 | 84 | 25 | 35 | 54 | 60 | 0 | 0 | 5 | 48 | 32 | 32 | 48 | 63 | 51 | 64 | 80 | 90 | 19 | 28 | 58 | 92 | 7 | 16 | 49 | 89 | 60 | 75 | | 82 | 70 | 66 | 95 | 83 |
| 77N (brown) 25 | 25 | 34 | 57 | 85 | 23 | 35 | 62 | 78 | 0 | 0 | 20 | 63 | 42 | 50 | 64 | 80 | 38 | 48 | 66 | 88 | 3 | 12 | 42 | 76 | 0 | 0 | 34 | 74 | 44 | 60 | 84 | | 52 | 50 | 80 | 97 |
| 88N (black) 100 | 0 | 0 | 0 | 0 | 10 | 13 | 24 | 35 | 0 | 0 | 0 | 0 | 1 | 9 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 91 | 0 | 0 | | 92 | 71 | 0 |
| 88N (black) 75 | 0 | 0 | 0 | 0 | 11 | 8 | 21 | 32 | 0 | 0 | 0 | 0 | 0 | 5 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 89 | 92 | 0 | 0 | 80 | | 69 | 0 |
| 88N (black) 50 | 0 | 0 | 0 | 0 | 25 | 32 | 48 | 0 | 0 | 0 | 0 | 0 | 24 | 30 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 85 | 0 | 0 | 87 | 77 | | 0 |
| 88N (black) 25 | 26 | 35 | 57 | 86 | 25 | 35 | 63 | 78 | 0 | 0 | 20 | 64 | 45 | 52 | 64 | 78 | 37 | 46 | 68 | 88 | 3 | 13 | 43 | 77 | 0 | 1 | 34 | 75 | 41 | 58 | 84 | 97 | 56 | 53 | 78 | |

| | |
|---|---|
| n < 80 | |
| 80<=n < 85 | |
| 85<=n < 90 | |

| "SP"value = Response time | Hysteresis |
|---|---|
| H1 : 0.8ms | 8 |
| H2 : 1.6ms | 6 |

# Color response (Mark Mode)

Mode : Mark mode

:Excellent :Impossible

| teach color \ measured color | 33N (purple) | | | | 43N (blue) | | | | 47N (light blue) | | | | 54N (green) | | | | 4N (yellow) | | | | 8N (orange) | | | | 23N (red) | | | | 77N (brown) | | | | 88N (black) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 | 100 | 75 | 50 | 25 |
| 33N (purple) 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33N (purple) 75 | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33N (purple) 50 | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33N (purple) 25 | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43N (blue) 100 | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43N (blue) 75 | ○ | ○ | ○ | ○ | × | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43N (blue) 50 | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43N (blue) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47N (light blue) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47N (light blue) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47N (light blue) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47N (light blue) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | | |
| 54N (green) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | | | |
| 54N (green) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | | | | | | | | | | | | | | | | | | | | | | | |
| 54N (green) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | |
| 54N (green) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | | |
| 4N (yellow) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | | | |
| 4N (yellow) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | | | | | | | | | | | | | | | | | | | |
| 4N (yellow) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | | |
| 4N (yellow) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | |
| 8N (orange) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | |
| 8N (orange) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | |
| 8N (orange) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | |
| 8N (orange) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | |
| 23N (red) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | |
| 23N (red) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | |
| 23N (red) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | |
| 23N (red) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | ○ | ○ | | | | | | | | |
| 77N (brown) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | |
| 77N (brown) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | |
| 77N (brown) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | |
| 77N (brown) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | |
| 88N (black) 100 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | |
| 88N (black) 75 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | | | |
| 88N (black) 50 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | |
| 88N (black) 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |

# Specifications

| Model | Mark / RGB Color type |
|---|---|
| Cable type | DM-18TN (or 18TP) |
| M8 connector type | DM-18TCN (or 18TCP) |
| Sensing distance | 18 +/- 2mm |
| Spot size | 1 X 6 mm/18mm |
| Range adjustment | Teach-in |
| Supply voltage | DC10-30V including 10% ripple (P-P) |
| Current consumption | 35mA (12V), 25mA (24V) |
| Response time | Mark mode : H1/250µs, H2/500µs, L/1200µs<br>Color mode : H1/800µs, H2/1600µs, L/4000µs |
| Timer | Off delay/On delay/One shot delay (10msec increment : 0-990msec, 1sec increment for 1-10 sec) |
| Light source | RGB LED |
| LED Indicator | Output indicator (orange), Stable detection (green) |
| Digital indicator | 7 segment, 3 digit Red and Green LED |
| Control output | NPN or PNP open collector DC30V 100mA max |
| Operation mode | Light/Dark On selectable |
| Operating temp / humidity | –25 to 55 °C / 35-95% RH |
| Insulation resistance | 20M Ohm or more (at 500V DC) |
| Protection category | IP67 |
| Noise resistance | IEC, CE |
| Shock resistance | 50G (500m/S2) , XYZ 3 directions |
| Environmental illuminance | Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max |
| Material | Anti-bacterial ABS (housing), PMMA (lens) |

# Options

**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



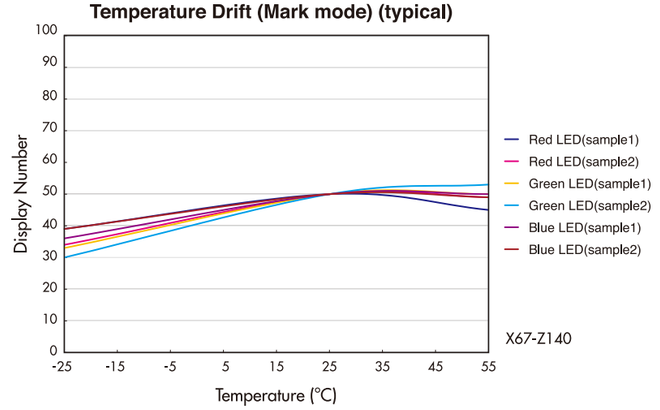




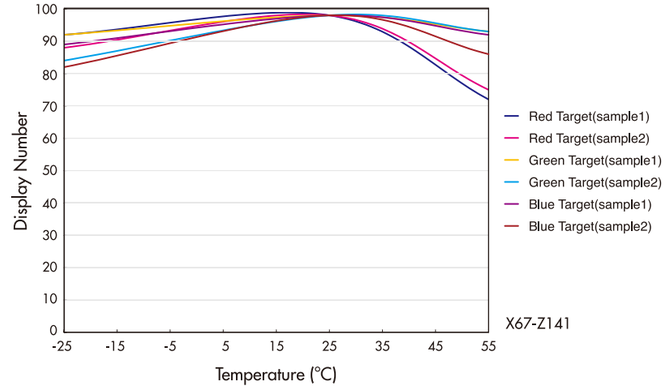
# Reference (typical)

DM-18T

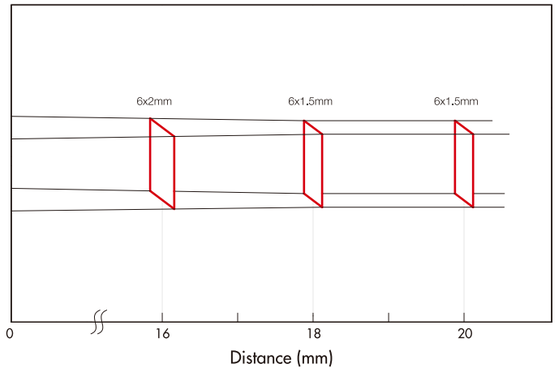
**Temperature Drift (Mark mode) (typical)**




**Temperature Drift (Color mode) (typical)**




**Spot size**

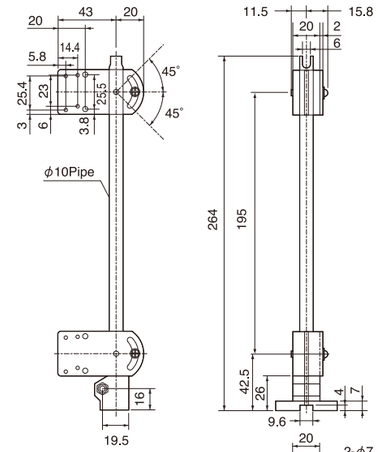


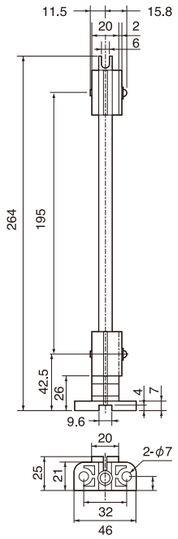
Sensor Stand

# PLN-1 / PLN-1M

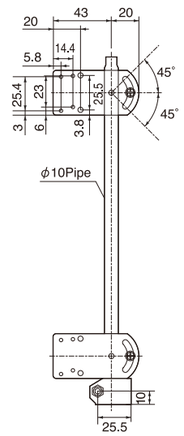
## Dimensions

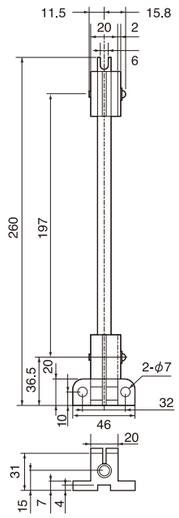
**PLN-1**
**(Floor Installation)**



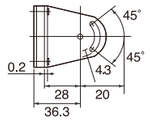

**PLN-1**
**(Wall Installation)**




Sensor stand PLN-1 is applicable to: **Z series, J series, S series, K series, J2 series, J3 series, Z-L series, SR-Q series , BGS-Z series, BGS-2S series,Z2 series,ZM series**

**PLN-1M**
**(Fixture of Reflector)**




Fixture PLN-1M is applicable to: **V-61 , V-42 and P250F**







Handy Tester of Photosensors

# BP-01FA

- DC 18V Battery-driven Power Supply
- Universal NPN/PNP output
- Low battery alarm
- Handheld size

LASER SENSOR

# LASER SENSOR

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.

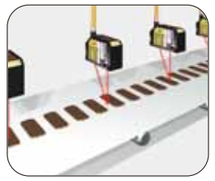

| | |
|---|---|
| D series | 111 |
| D2SA series | 122 |
| Z-L / BGS-ZL series | 134 |

Laser Sensor

# D series

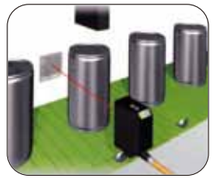
- CMOS Image Sensor + Digital Monitor for easy setting.
- DR-Q series, transparent detection with AGC (Automatic Gain Control) function.
- BGS-DL series, the leading edge of BGS type sensors, the ultimate in Diffuse Reflective sensing.
- DT series, long distance Thru-beam sensor (max. 100 meters).

## 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 |

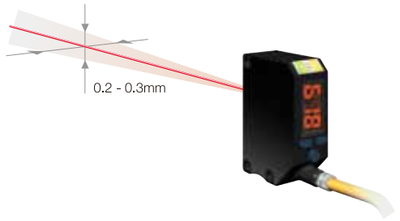




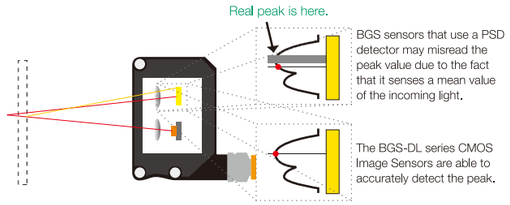


## Repeat Accuracy

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.

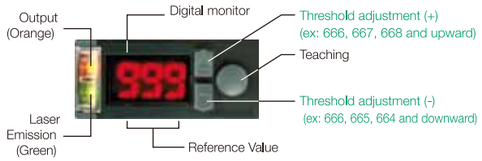



## CMOS Image Sensor

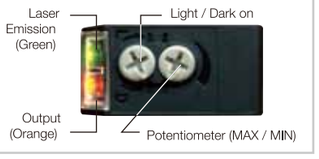



## Pushbutton Teach with Fine Adjustment

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.

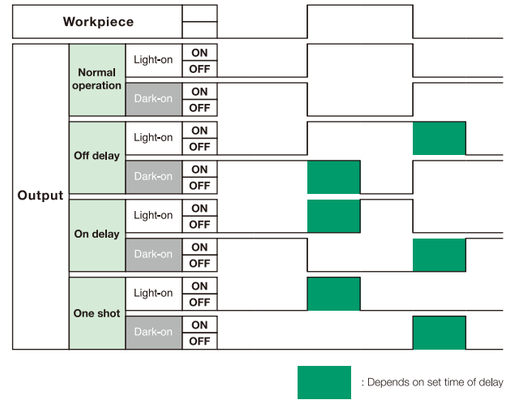



**Low cost: Manual adjust type**




## Timer functions

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




: Depends on set time of delay

Set time is referred as below ;

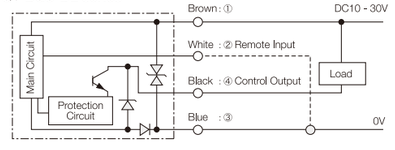
| Time | ms | | | | | | s | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 10 | 20 | ··· | 980 | 990 | 1 | 2 | ··· | 10 |
| Display | 0 | 1 | 2 | ··· | 98 | 99 | 01 | 02 | ··· | 10 |

* 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.

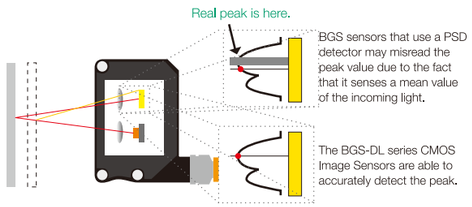
The world's first Laser / BGS with CMOS Image Sensor

# 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.

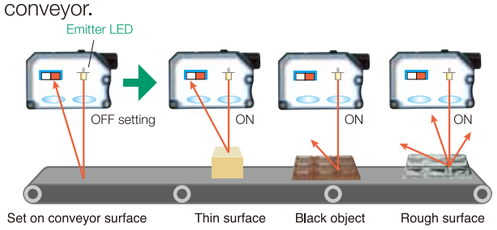
## Great combination ; Laser and CMOS Image Sensor shuts out environmental influence.

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 | $\phi$1mm / 80mm | $\phi$2mm / 200mm | $\phi$3mm / 80mm | $\phi$6mm / 200mm | |
| Sensitivity adjustment | Push button Teach with fine adjust buttons | | 4-turn potentiometer | | |
| Hysteresis | 3% / 80mm | 10% / 200mm | 5% / 80mm | 5% / 200mm | 5% / 300mm |
| Supply voltage | DC10-30V including 10% ripple (P-P) | | | | |
| Power consumption | 50mA max (12V), 35mA max (24V) | | 35mA | | |
| Response time | 1.5msec Max(fixed sensitivity) | | 0.7msec | | |
| Timer | Off delay/On delay/One shot delay (1msec increment : 0-999msec, 1sec increment for 1-10 sec) | | N/A | | |
| External input | Remote Teach / Laser OFF selectable | | N/A | | |
| Light source | Red Laser Diode 650nm, Max 1mW 300s, Class 2 | | Red Laser Diode 650nm, Max 2mW 6s, Class 2 (Max 3mW for BGS-DL70) | | |
| LED Indicator | Output indicator (orange), Laser emission (green) | | | | |
| Digital indicator | 7 segment, 3 digit Red LED | | N/A | | |
| Control output | NPN or PNP open collector DC30V 100mA max | | | | |
| Operating mode | Light/Dark On selectable | | | | |
| Operating temp / humidity | –10 to 50 °C / 35-85% RH | | | | |
| Insulation resistance | 20M Ohm or more (at 500V DC) | | | | |
| Protection category | IP67 | | | | |
| Conformity | IEC, CE | | | | |
| Shock resistance | 50G (500m/S$^2$) , 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

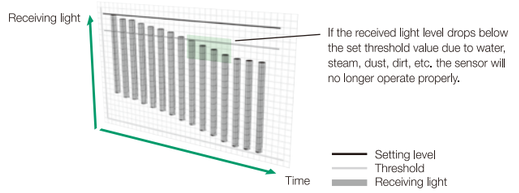
# DR-Q series

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.

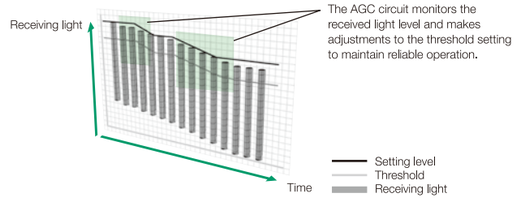
Coaxial Laser

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

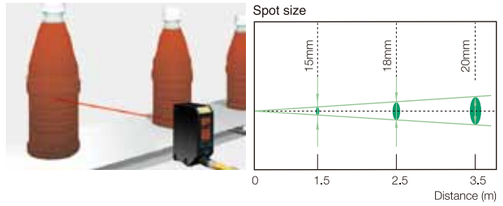
**Conventional Retro Reflection sensor**



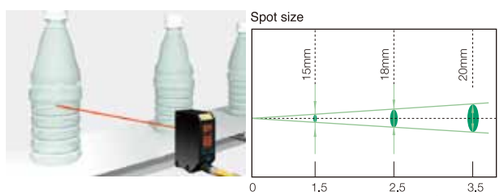

**DR-Q series**




## 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 4$\mu$s, 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/S$^2$) , XYZ 3 directions | |
| Environmental illuminance | Sunlight : 10,000 lux, Incandescent lamp : 3,000 lux max | |
| Materials | Anti-bacterial ABS (housing), PMMA (lens) | |

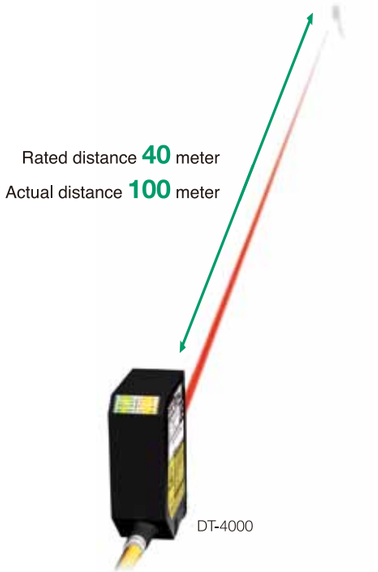
*1 Sensing distance taken with P250F reflector

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

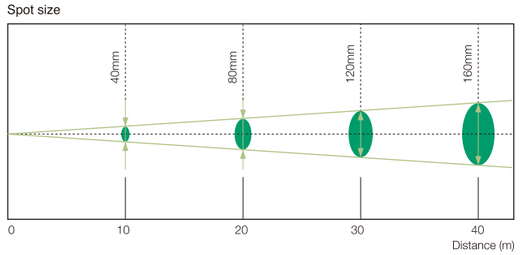
# DT series (Laser thru-beam) / DR series (Laser retro-reflective)

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.

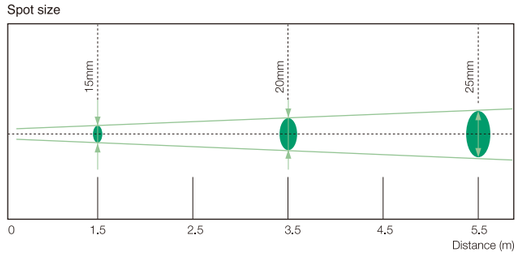
Coaxial Laser




## DT-4000




## DR-500




# 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

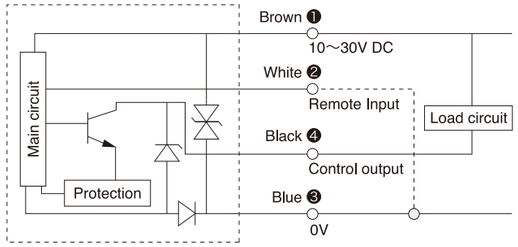






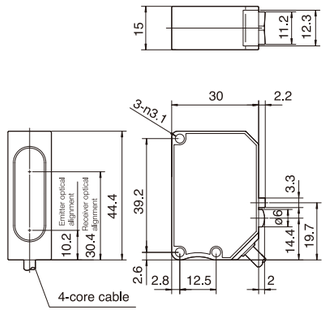
# Circuit diagram

**DR-Q / BGS-DL series**

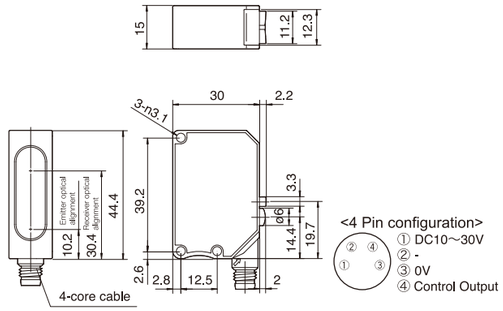



# Dimensions

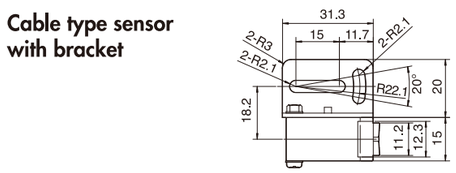
**Cable type sensor**

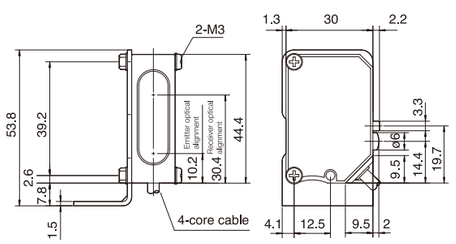



**Connector type sensor**

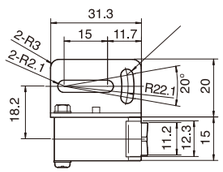


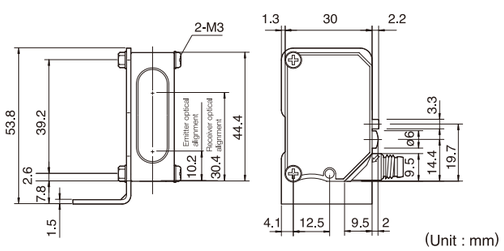

**Cable type sensor with bracket**



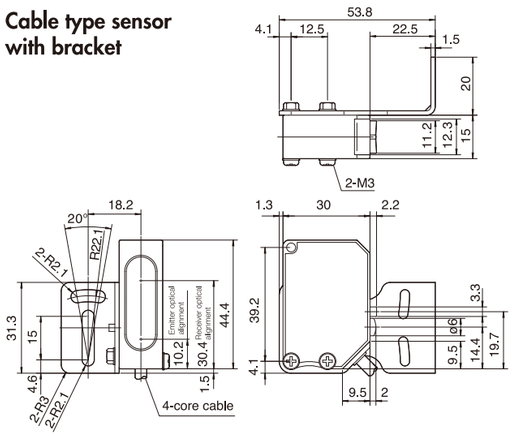

**Connector type sensor with bracket**



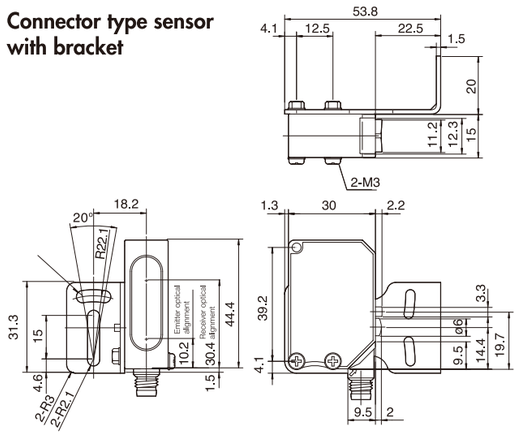




(Unit : mm)

## Cable type sensor with bracket

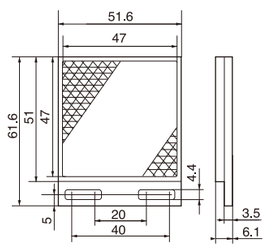



## Connector type sensor with bracket

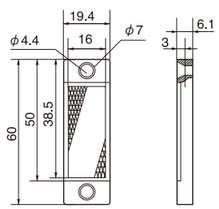



## Reflectors

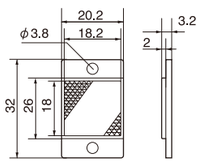
### P250F




### PL20F




### PL10F

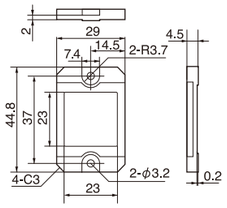



### Sensing distance by reflectors

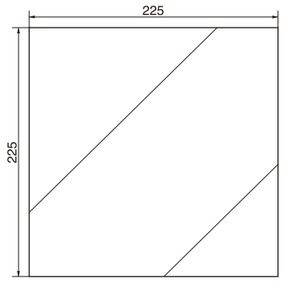
| | P250F | PL20F | PL10F |
|---|---|---|---|
| DR-Q400T | 4.0 | 2.8 | 1.0 |
| DR-Q150T | 1.5 | 1.0 | 0.5 |
| DR-500 | 5.0 | 3.5 | 1.2 |

(Unit : meter)

### MP45




### MP225

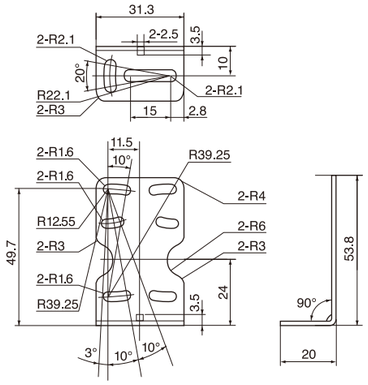




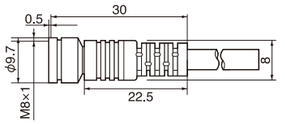




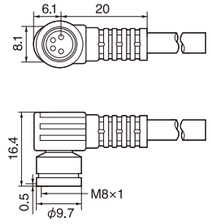

### Mounting Bracket




### JCN-S : M8 Straight type




### JCN-L : M8 L-shape type




## 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

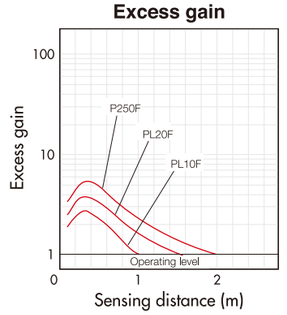
### JCN-L : M8 L-shape type

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

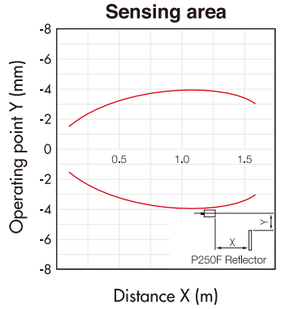
# Reference (typical)

## DR-Q150TN DR-Q150TCN

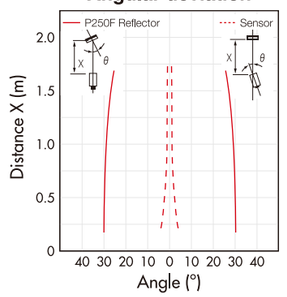
### Excess gain



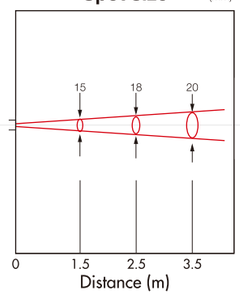

### Sensing area




### Angular deviation

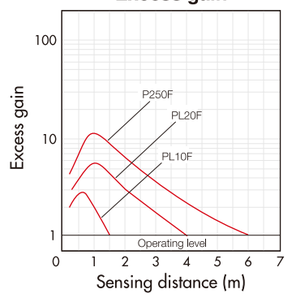



### Spot size (mm)

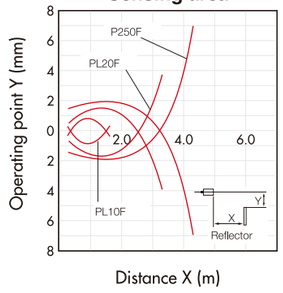



## DR-Q400TN DR-Q400TCN

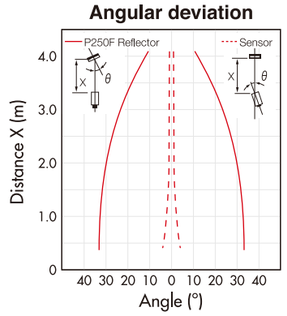
### Excess gain



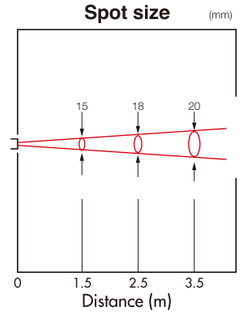

### Sensing area




### Angular deviation




### Spot size (mm)





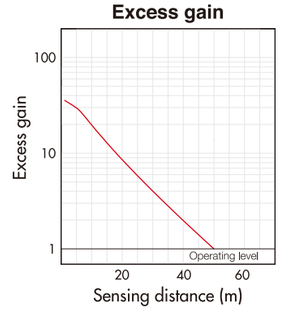




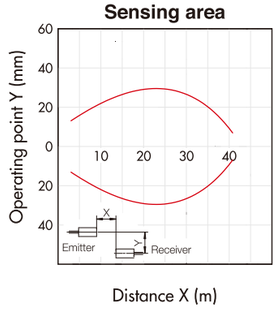

# Reference (typical)

## DT-4000N DT-4000CN

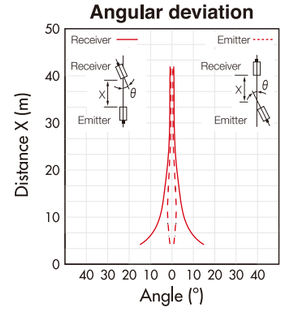
### Excess gain



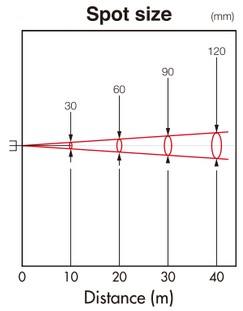

### Sensing area



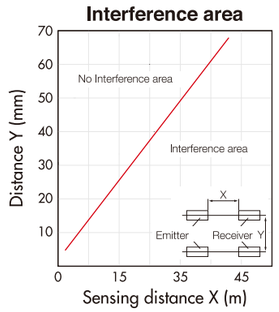

### Angular deviation




### Spot size (mm)

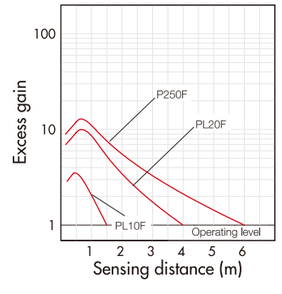



### Interference area

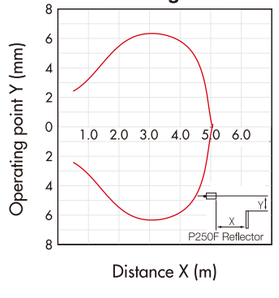



## DR-500N DR-500CN

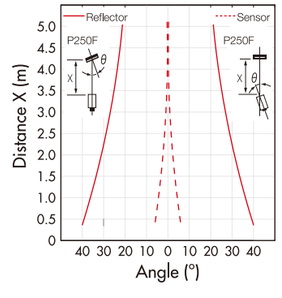
### Excess gain



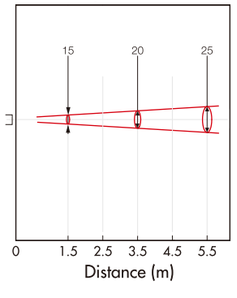

### Sensing area




### Angular deviation

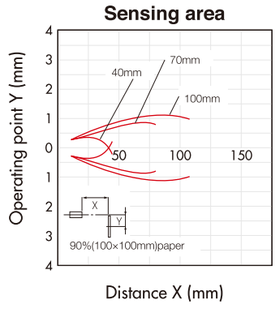


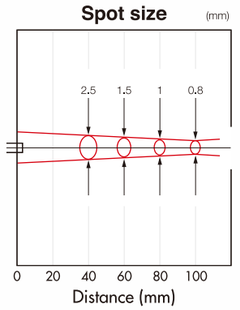

### Spot size (mm)

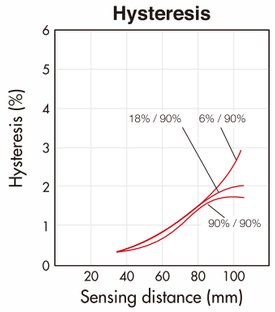


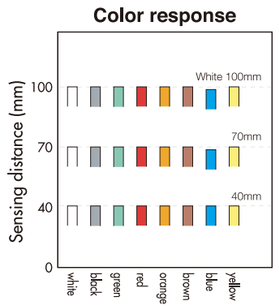
## Reference (typical)

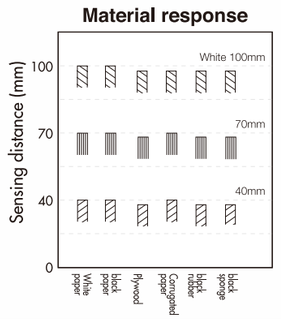
**BGS-DL10TN**
**BGS-DL10TCN**



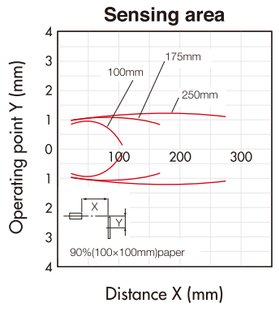



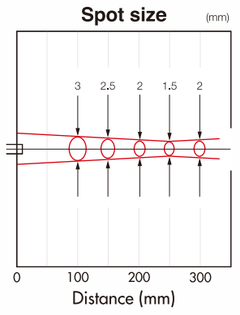



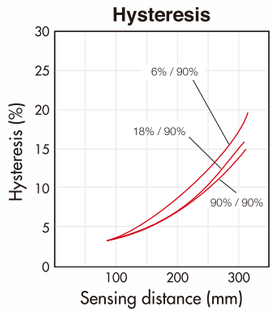



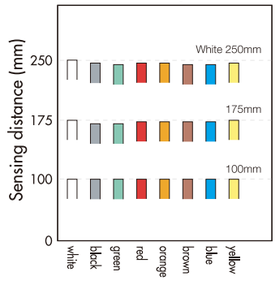



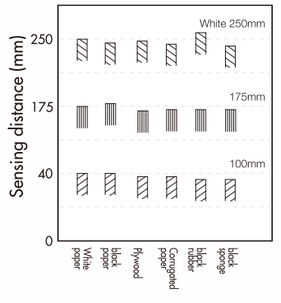

**BGS-DL25TN**
**BGS-DL25TCN**

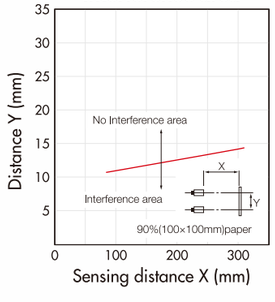








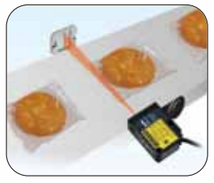

Laser Sensor

# D2SA series

- 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)

## 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

## 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.

# 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.

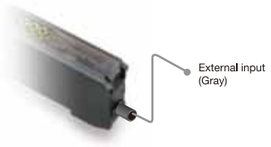
**Stand Alone type**

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

## Programmable external input

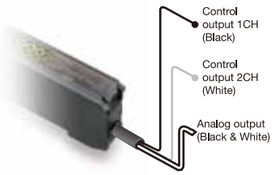
The External input can be programmed to operate in one of the following modes.

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



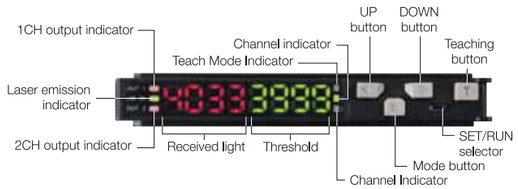

## 2 Independent outputs & Analog

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.



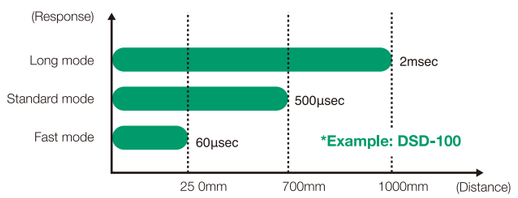

## Dual Digital Display

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



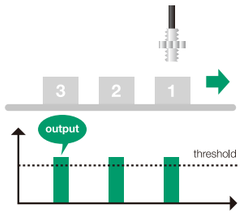

## Response Time

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




## Counter Mode

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




## e-con, the easy connection

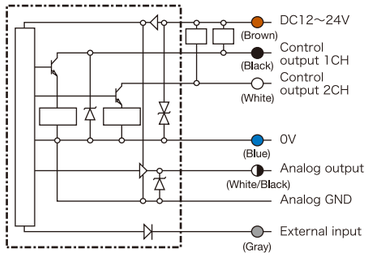
Just snap-in the e-con to connect to amplifiers. All the sensor heads are connectable to any amplifier with the preset e-con mechanics.

## IP67 water tightness

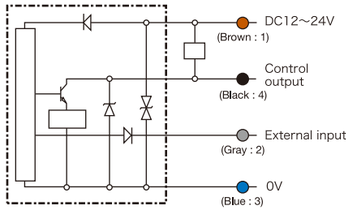
All the DS Series sensor heads secures IP67 Water tightness with its rugged housing.

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

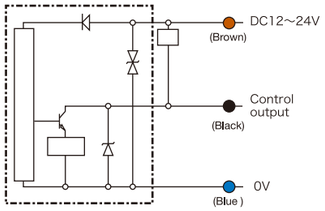
**2CH output types**
D2SA-MN(P)S / D2SA-MN(P) / D2SA-SN(P)




**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



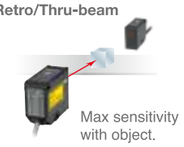

*1 Slave Unit "D2SA-S□□" is powered by Master unit, so power lines are not available.

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

### Single Point Teach

**Diffuse Reflective**

**Retro/Thru-beam**



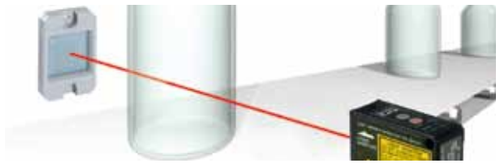

Use this teaching mode when no target is present.
Set the threshold so the sensor does not detect the background.

### Two Point Teach

**Diffuse Reflective**

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

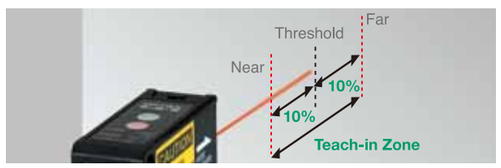


This mode is only for the DSR-800 Retro-Reflective sensor.
Teach without the target present so that the sensor is set to the maximum sensitivity, the DSR-800 is able to easily detect transparent film, bottles, glass, etc.

### Automatic Teach

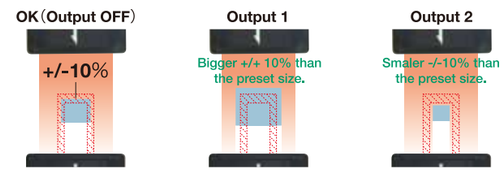
In this mode there is no reason to stop the conveyor. It is possible to teach the sensor while the product is running.

### 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

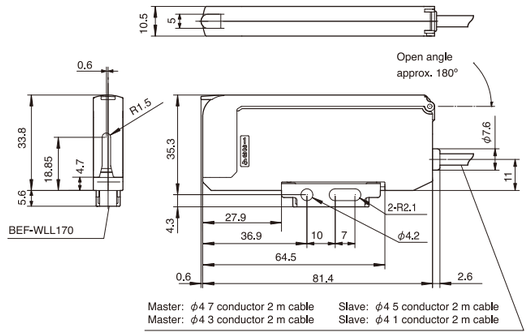



This function is exclusive to the DSTA-200 wide beam measurement sensing heads. Used to judge the size and width of a target within +/- 10% of the specified size. Even if the object position changes the sensor will detect it, so this is actually Area Teach.

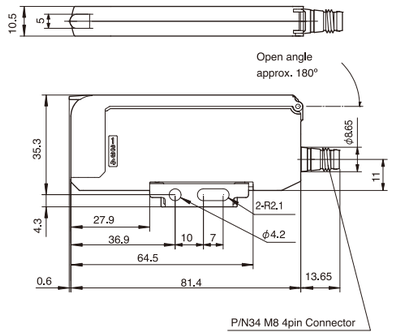
# Amplifier Dimensions

## Stand-alone type

### Cable type




### M8-QD type

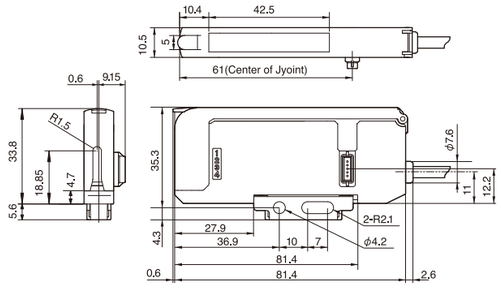



<4 Pin configuration>

① DC12~24V
② External input
③ 0V
④ Control Output

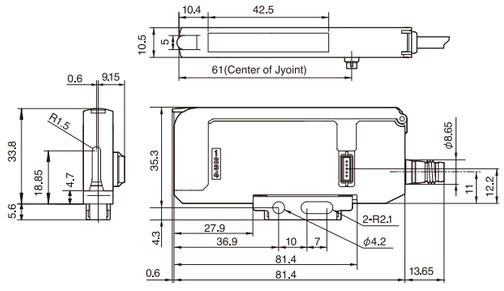
## Interconnection type

### 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<br>(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<br>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 ampliifer will be done with External Teach
*2 Load impedence 300Ω Max
*3 Up to 3pcs of interconnection. Up to 30 pcs with 40 °C (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

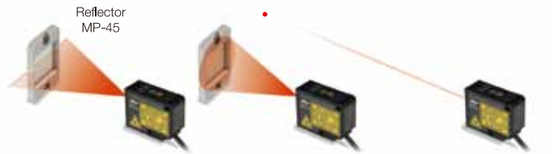
**BEF-EB01-W190 : Fixture terminal**

# 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.



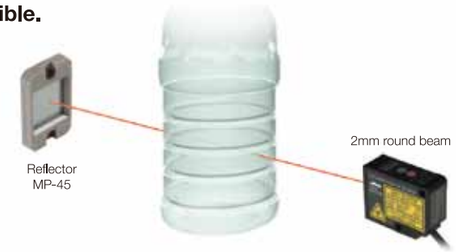

DSR-800 with Line Beam of 40 X 1mm (at 300mm distance) When using the BL-W130L-1 lens attachment

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.

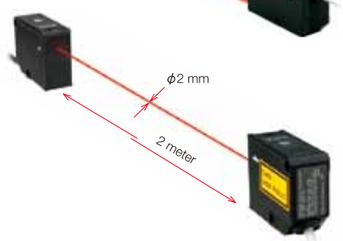
DSTC-200, Standard Thru-beam, 2 mm spot size at 2 meter distance.

### 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.

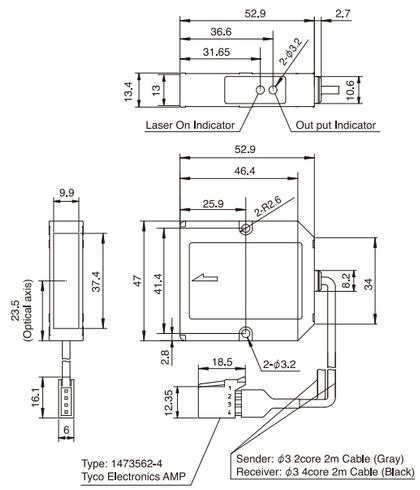
### DSTC-200 : 2mm sharp and small spot

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

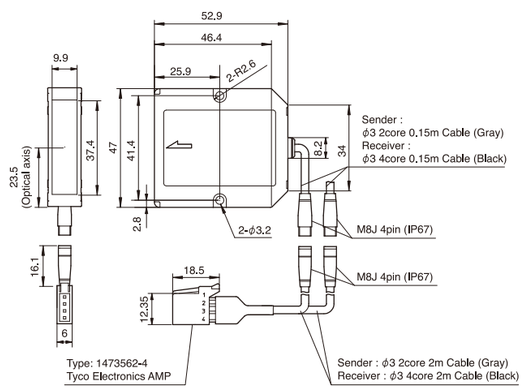


# Laser Head Dimensions

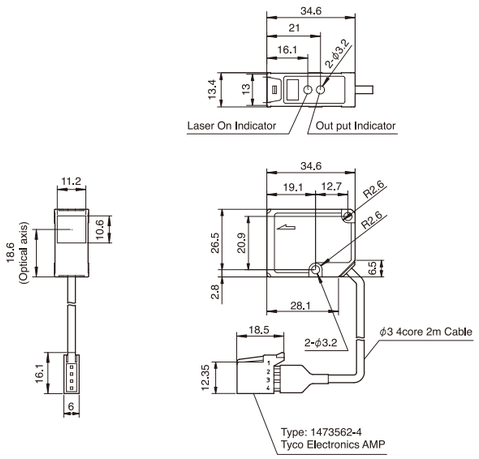
## DSTA-200



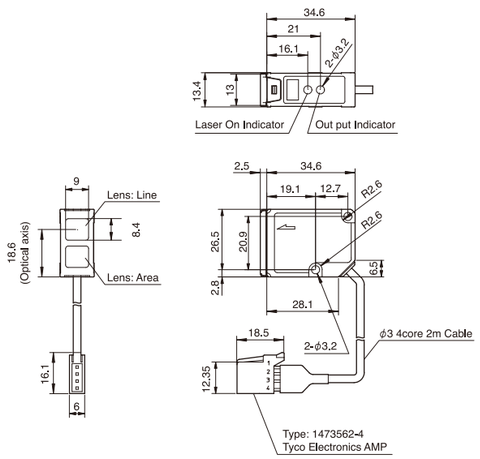

## DSTA-200-M8



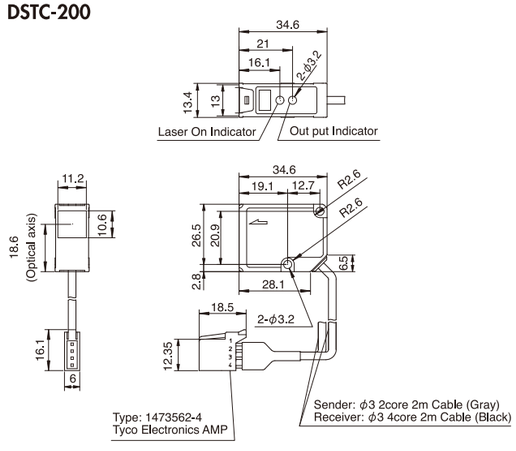

## DSR-800 / DSR-5000 / DSD-100




## DSR-800 + Lens Attachment

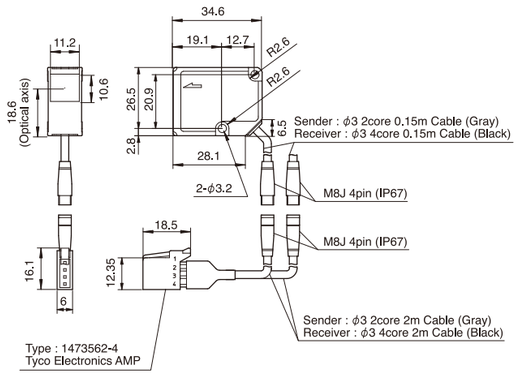



## DSTC-200

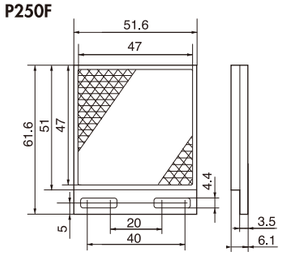



The sensing head dimensions for the DSR-5000,DSR-800 and DSD-100 are the same as the DSTC-200 with the exception of the cable.

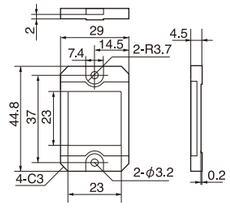
## DSTC-200-M8



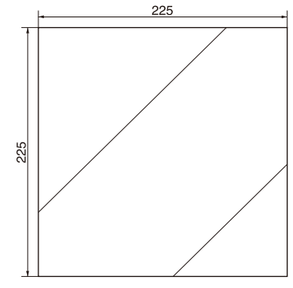

## P250F




## MP45




## MP-225




(Unit : mm)

# Specifications

| Model | | Retro-reflective type | | Diffuse reflective type | Thru-beam type | Thru-beam / Measurement type |
|---|---|---|---|---|---|---|
| | Cable | DSR-5000 | DSR-800 | DSD-100 | DSTC-200<br>Emitter: DSTC-D<br>Receiver: DSTC-200 | DSTA-200<br>Emitter: DSTA-D<br>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<br>Length measurement mode: 0.5 m<br>(Only Long and Standard) |
| | **Standard** | 0.3 - 35 m | 5 m | 0.7 m | | |
| | **Fast** | 0.1 - 20 m | 2 m | 0.25 m | | |
| **Spot size** (*2) | | Approx. ϕ2 mm (Distance: 2 m) | | Approx. ϕ1 mm (Distance: 1 m) | Approx. ϕ2 mm (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**

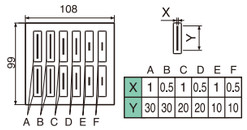
**P250F : Long distance reflector for DSR-5000**

**MP225 : Large reflector**

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

**BL-W130L-1 : Beam Selector**

**BL-W130L-2 : Slit Mask for DSTA-200 sensor head**

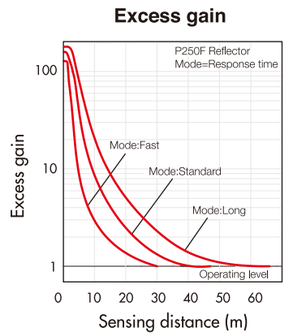


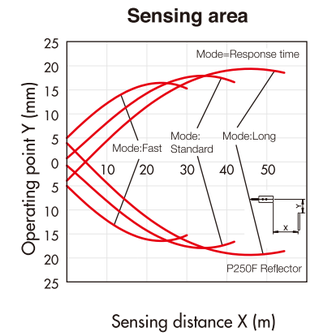

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| X | 1 | 0.5 | 1 | 0.5 | 1 | 0.5 |
| Y | 30 | 30 | 20 | 20 | 10 | 10 |

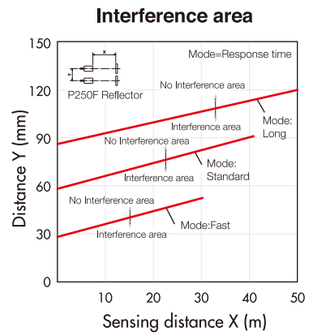
**DSL-8L04-2-130 : M8-QD cable**

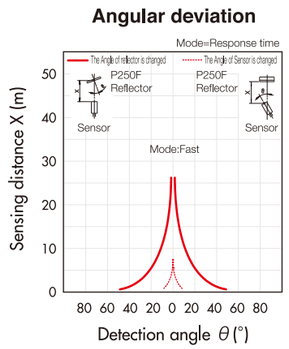
# Reference (typical)

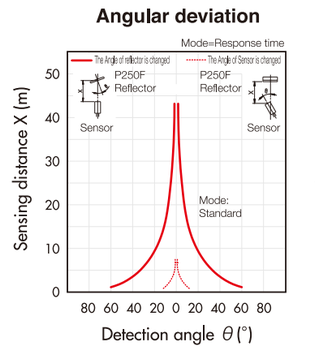
## DSR-5000

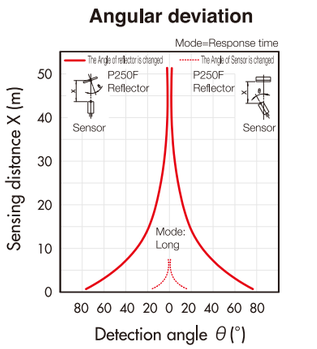


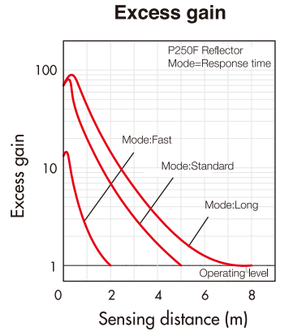



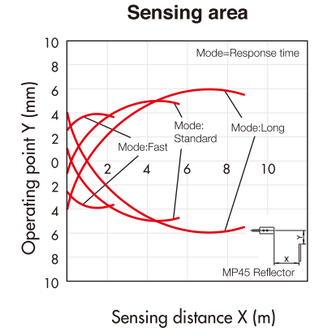



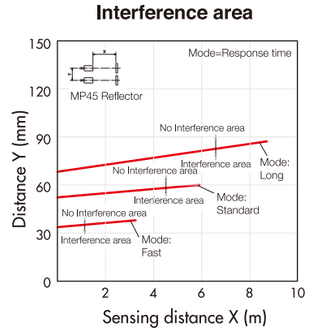



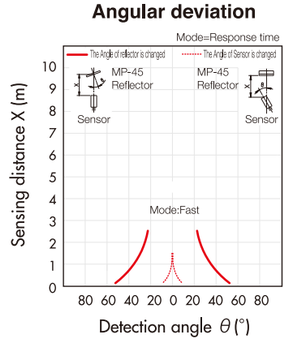



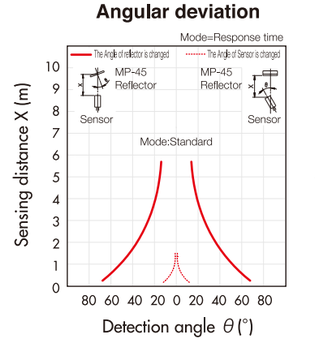

## DSR-800

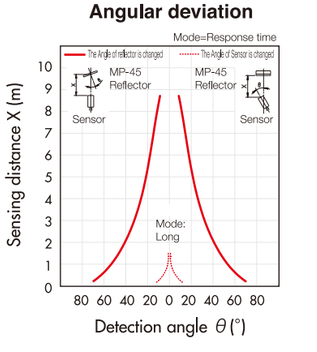


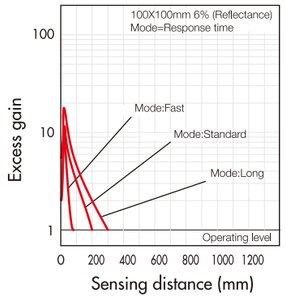



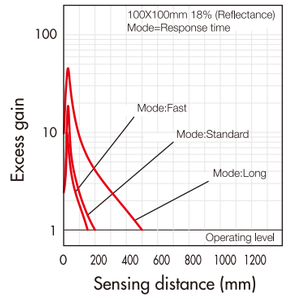
## Reference (typical)

### DSD-100

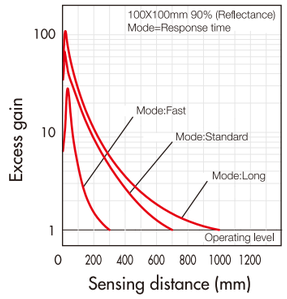
**Excess gain 6%**



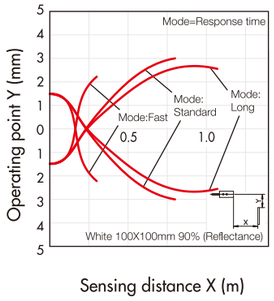

**Excess gain 18%**



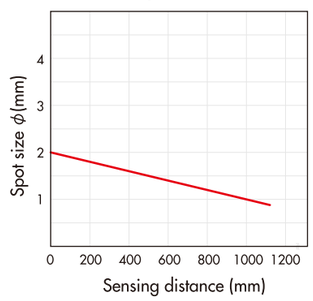

**Excess gain 90%**




**Sensing area**

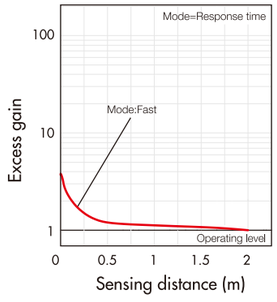



**Spot size**

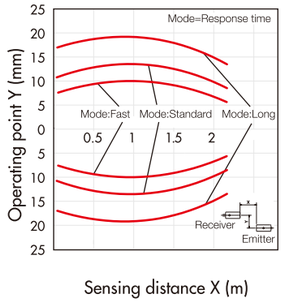



### DSTC-200

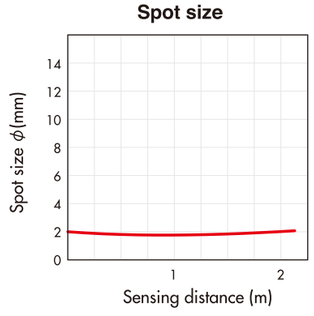
**Excess gain**




**Sensing area**

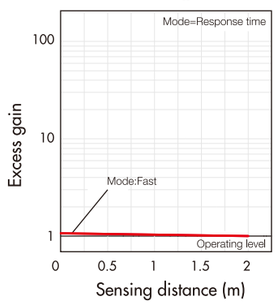



**Spot size**

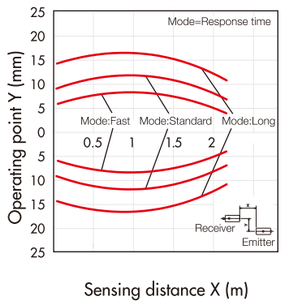



### DSTA-200

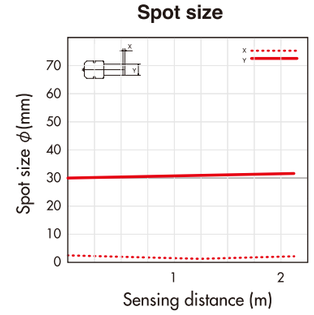
**Excess gain**




**Sensing area**




**Spot size**










Laser Sensor

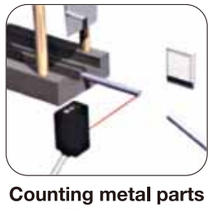
# Z-L / BGS-ZL series

- 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.

## Applications

**Edge control (BGS-ZL30)**

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

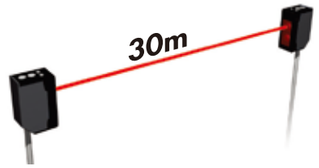


**Counting metal parts (ZR-L1000)**

**Thin plates counting (ZT-L3000)**

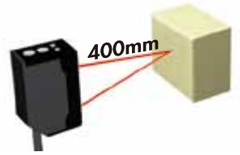
## Features

### Thru-Beam type



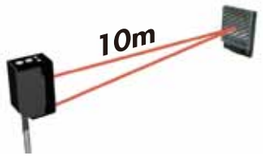

ZT-L3000

### Diffuse type



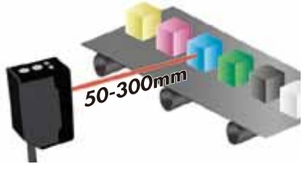

ZD-L40

### 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)

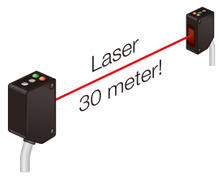
# Laser Thru-beam / RetroType

- ***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

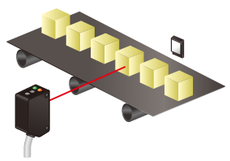
### Thru-beam type, ZT-L series

30mm spot size at 30 meter sensing distance



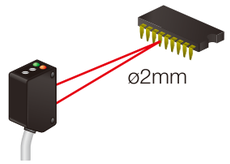

### 250µsec response

Good for fast moving objects.



### Diffuse Reflective, ZD-L type

Fine 2mm spot at 400mm sensing distance

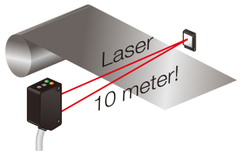



### Cross-talk prevention

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℃ | | |
| Operating humidity | | 35 to 85% | | |
| Storage temp / humidity | | –25 to +70℃/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

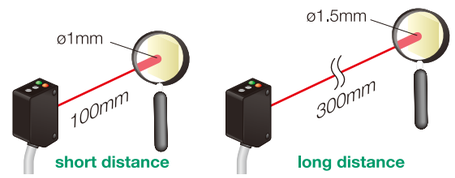
**Fine spot / high speed applications**

- ***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

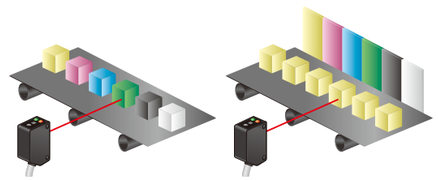
### 1 mm projected spot size

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

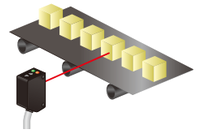
External control of laser OFF is possible by connecting gray wire to GND (NPN type) or DC10-30V (PNP type).
(This function is not available in 3 pin types)

### 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.



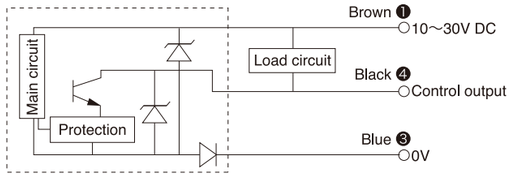
## Specifications

| 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℃ / 35 to 85% RH | | | |
| Materials | | Housing : ABS with glass, Lens : PMMA | | | |

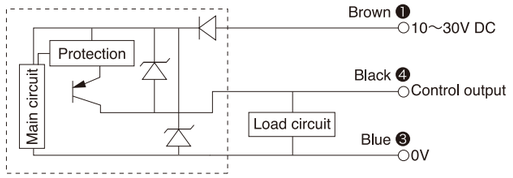
*1 white paper 100 X 100mm "M8-QD in 3 pins for European machines " are available with extention code of -CN(P)3, for instance, "BGS-ZL30CN3".

# Circuit diagram

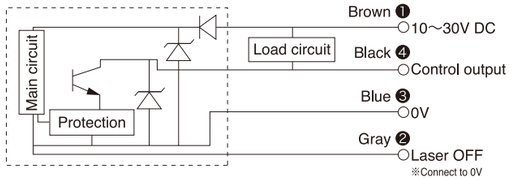
### NPN output Thru-beem receiver



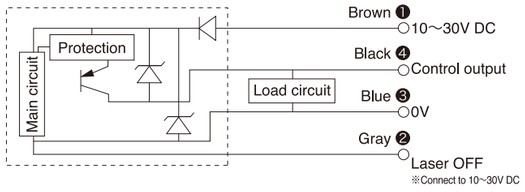

### PNP output Thru-beem receiver



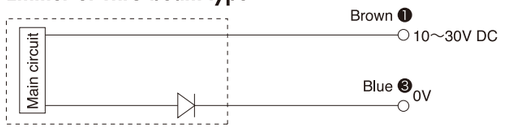

### NPN output（other type）




### PNP output（other type）

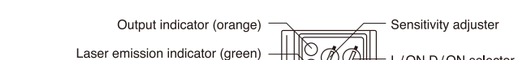



### Emitter of Thru-beam type

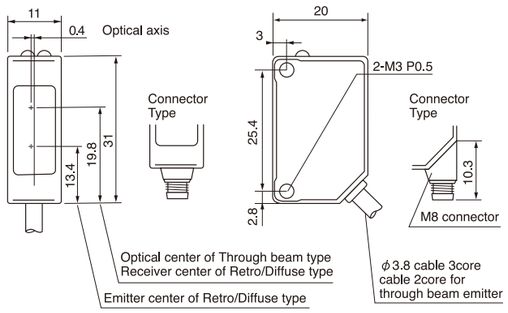



# Dimensions

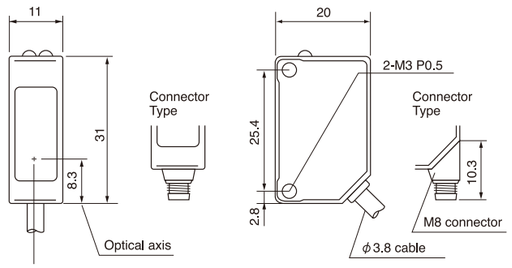
## General Use Type except BGS




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

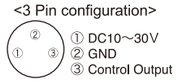



## BGS Type




<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>




<4 Pin configuration>

(Unit : mm)

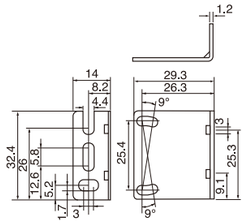




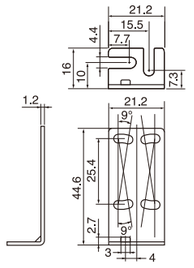


# Options

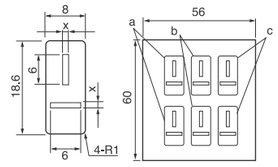
### Standard bracket BEF-W-100-A
For M8 QD type sensors




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

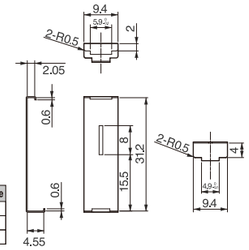



### Slit mask BL-160-SK (for Thru-beam type)



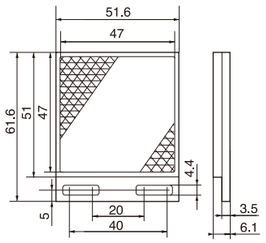

| Type | Size | Attached to | Object size (Min) | Scanning range |
|---|---|---|---|---|
| Slit a | 0.5mm | Receiver,Emitter | 0.4mm | 0.8mm |
| Slit B | 1mm | Receiver,Emitter | 0.6mm | 2.5mm |
| Slit C | 2mm | Receiver,Emitter | 1.5mm | 5mm |

### Slit mask BL-100-M1

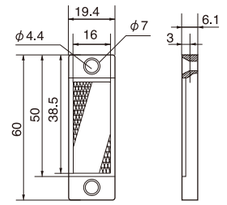



### Reflectors for Laser Type

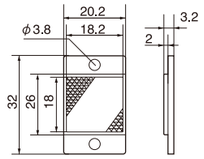
**P250F**
**(Standard, 0.2-10m)**



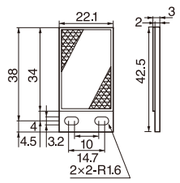

**PL20F**
**(Optional, 0.2-8m)**




**PL10F**
**(Optional, 0.2-7m)**




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




**P250F**

**PL20F**

**PL10F**

**V-42F**

**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**

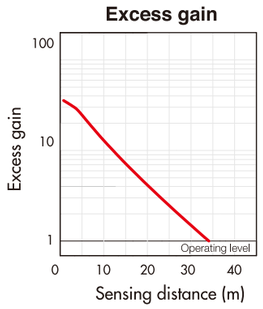
**LK-S02**

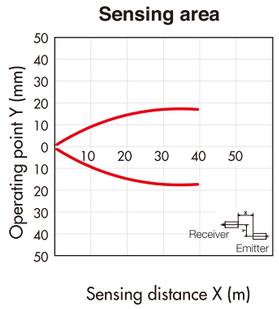
**Sensor stand**
**PLN-1**

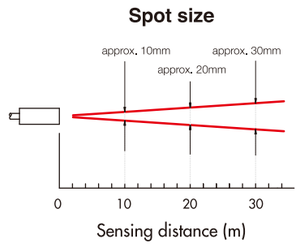
**Fixture of Reflector**
**PLN-1M**

# Reference (typical)

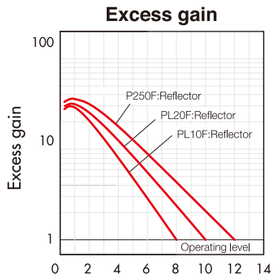
## ZT-L3000N

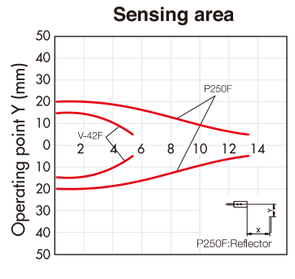


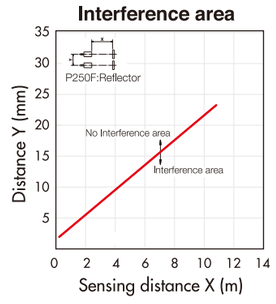



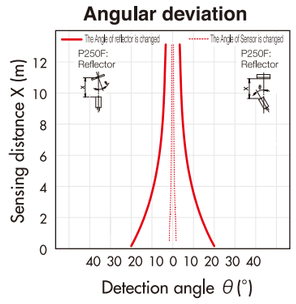




## ZR-L1000

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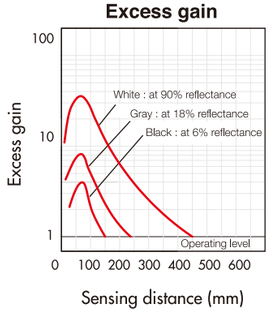
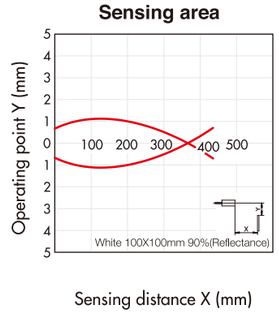
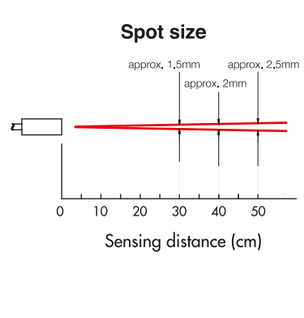


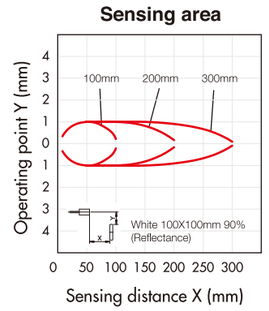


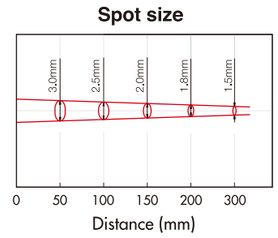


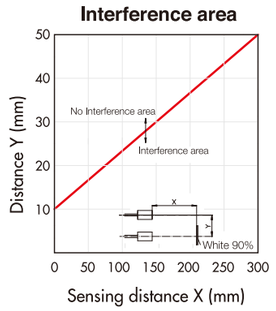


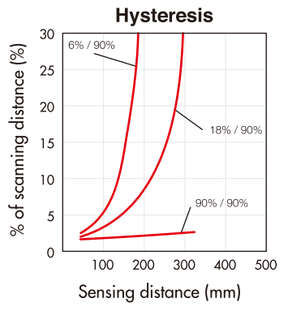

# Reference (typical)

## BGS-ZL30N

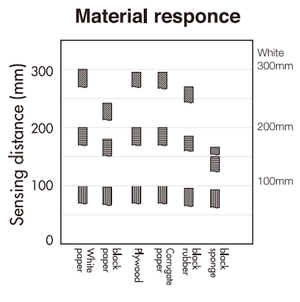


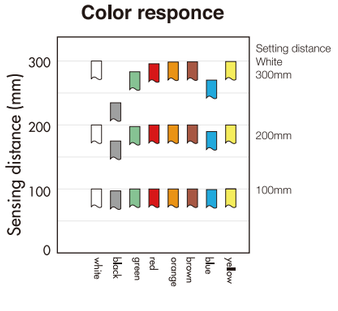



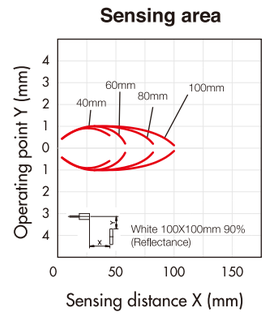



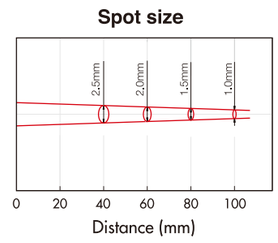

White 90% (KODAK White)
Gray 18% (KODAK Gray)
Black 6% (POTOWAND 4606)

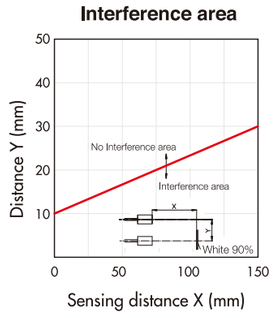


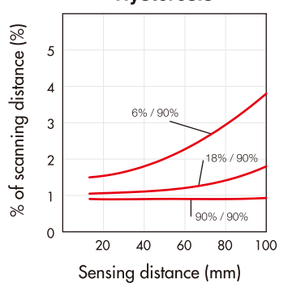




## BGS-ZL10N

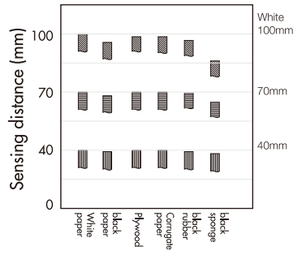


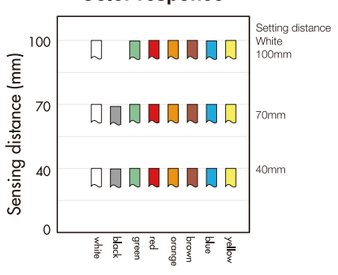




White 90% (KODAK White)
Gray 18% (KODAK Gray)
Black 6% (POTOWAND 4606)



FIBER SENSOR

# FIBER SENSOR

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.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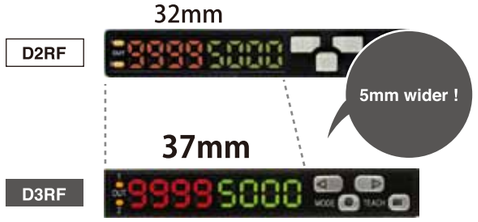
High speed digital fiber sensor

# D3RF series

## 16μsec response, long sensing distance, finest in digital-class amplifiers.

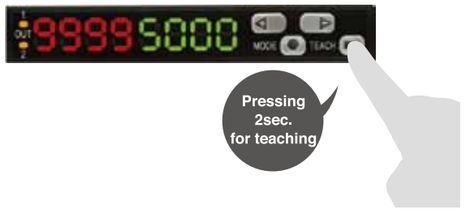
### Widest display in the class

5mm wider display than conventional D2RF.
7 segment with high brightness LED for better visibility.



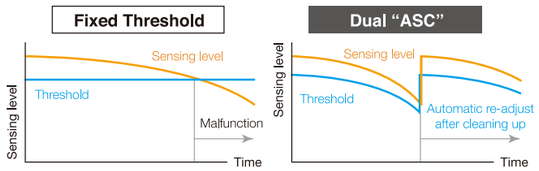

### Easier operation

Basic setup is as easy as pressing the teach button for 2 seconds. More advanced functions are located in a deeper setup layer for solving more complex applications.




### Dual "ASC" for easy maintenance

Detects light degradation due to dust or other debris and adjusts the brightness. It re-adjusts the threshold automatically after cleaning so there is no need for re-teaching.




The returned light level decreases as contamination builds up. Once this sensing level drops below the threshold level the sensor needs to be re-taught.

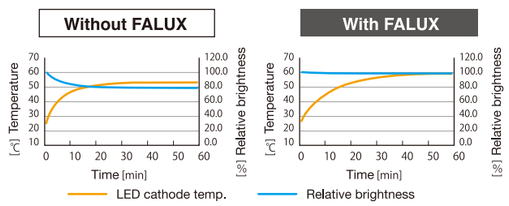
The sensor continuously monitors the received light level and automatically adjusts the threshold to the optimum level.

### 100% display for better recognition of change

Display can be changed to percentage (0~100) by simple single action with buttons. Easy to recognize when the level changes.

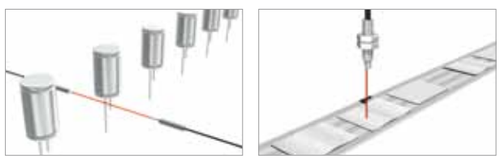
### Brightness stabilizing function "FALUX"

Our original technology "FALUX" stabilizes LED brightness by adjusting LED current even under fluctuation of LED temperature after power up.




### Adjustable hysteresis

Hysteresis can be adjusted from 1% to 40%. This enables the sensor to be optimized for detecting slight differences in parts or applications with a lot of vibration.



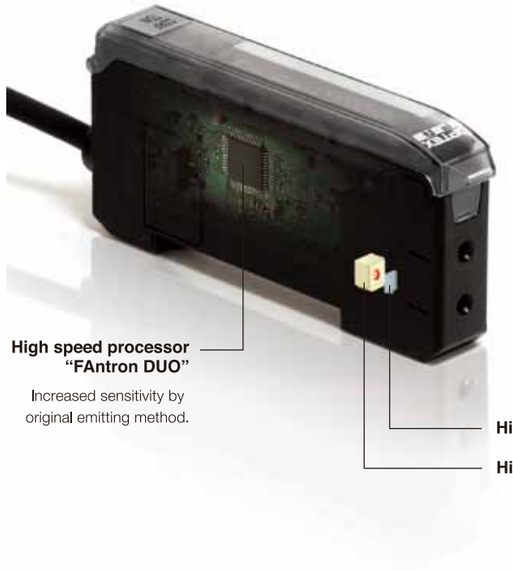
Detecting parts leads

Detecting sheet objects









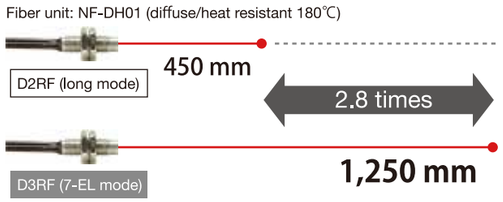

### Fastest in the class
### 16μs(1-HS mode)
### 22μs(inter-connection type)

Digital fiber sensor **No.1**

Originally developed super high speed processor "FAntron DUO" enables fastest speed in the class 16 μs (1-HS mode). It can detect over 30,000 pieces per second. Maximum speed of inter-connection type is 22us. It can prevent cross talk up to 2 units.

### Super sensing distance

Utilizing our original pulse emitting method, High power LED and effective collective lens, the D3RF series has an increased sensing distance of up to 3 times longer for diffuse and 5 times longer for thru beam sensing.




### Sensing distance comparison

| | Fiber unit | D2RF (mm) | D3RF (mm) | ratio (times) |
|---|---|---|---|---|
| Diffuse | NF-DB01(M6 coaxial) | 450 | **1200** | 2.7 |
| | NF-DR01 (M6 R2mm) | 350 | **1100** | 3.1 |
| | NF-DH01 (180°C) | 450 | **1250** | 2.8 |
| Thru-beam | NF-TB01 (M4 coaxial) | 1800 | **4000** | 2.2 |
| | NF-TR01 (M4 R2mm) | 800 | **4000** | 5 |
| | NF-TH02 (180°C) | 1000 | **4000** | 4 |

### ECO mode

ECO mode enables power saving by turning off the sub-display (green) and by dimming the main display (red).

ex.) D3RF-TDN (single, 2 output)

Standard mode : 39mA max. → -30% → **ECO mode : 28mA max.**

## Easy installation

You can connect up to 16 units without any wiring.

**Maximum inter-connect units**

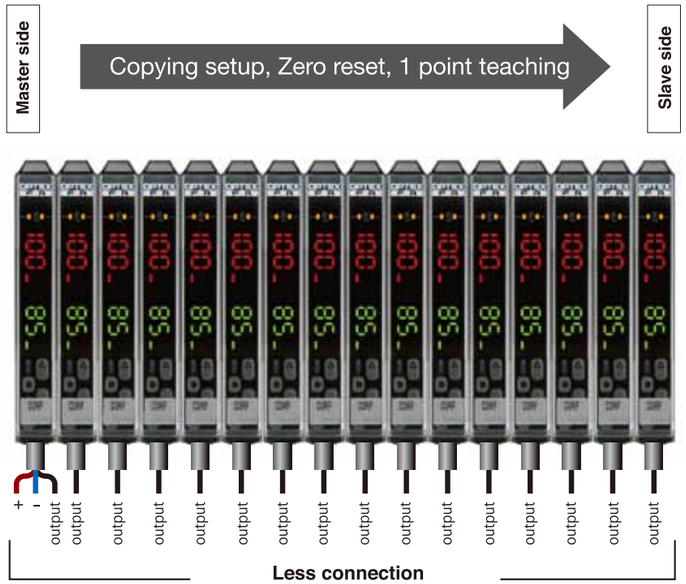
| D2RF | D3RF |
|---|---|
| 8 units | 16 units (cross talk prevention: OFF or ECO mode) |

## Cross talk prevention

The D3RF can prevent cross talk by shifting the timing of the emitting element. You can connect up to 12 units in standard mode and up to 16 units in ECO mode.

## Easy setup

The interconnect version of the D3RF can copy the setup parameters from the master side to the slave slide. Zero reset and 1 pt teaching can also be performed simultaneously to each unit.

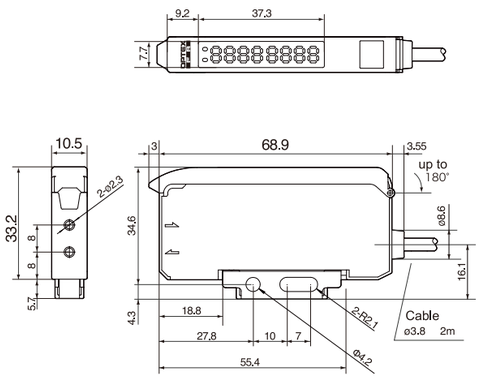



ex.) 18 wires for 16 units inter-connection (1ch output)

## Dimensions

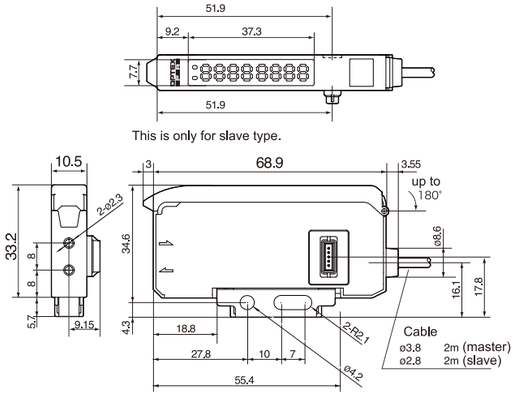
Single type

**D3RF-TN/TDN or TP/TDP**
**D3IF-TN or TP**




Interconnection type

**D3RF-TMN/TDMN or TMP/TDMP (master)**
**D3RF-TSN/TDSN or TSP/TDSP (slave)**








## Specifications

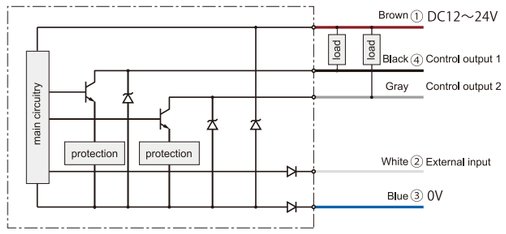
| Model | | Single type | Inter-connection type - master | Inter-connection type - slave | IR type |
|---|---|---|---|---|---|
| Cable type | 1 output type (NPN/PNP) | D3RF-TN / TP | D3RF-TMN / TMP | D3RF-TSN / TSP | D3IF-TN / TP |
| | 2 output type (NPN/PNP) | D3RF-TDN / TDP | D3RF-TDMN / TDMP | D3RF-TDSN / TDSP | - |
| M8 QD type | 1 output type (NPN/PNP) | D3RF-TCN4 / TCP4 | D3RF-TMCN4 / TMCP4 | D3RF-TSCN4 / TSCP4 | D3IF-TCN4 / TCP4 |
| Light source | | Red LED | | | IR LED (1,450nm) |
| Response type (mode) | | 16μs/22μs*1 (1-HS), 70μs (2-FS), 250μs (3-ST), 500μs (4-LG), 1ms (5-PL), 2ms (6-UL), 8ms (7-EL) | | | |
| Sensitivity adjust | | Teaching, Manually adjusting | | | |
| Indicator | 1 output type | 1 Output indicator (Orange) | | | |
| | 2 output type | 2 Output indicator (Orange) | | | |
| Digital display | | 7 segment 8 digit display (red: 4 digit, green: 4 digit) | | | |
| Control output *2 | | NPN or PNP open collector<br>100mA/DC30V max. Load: 100mA max. Residual voltage: 1.8V max. | | | |
| Input | | Teach-in *3, Emitter stop input, Synchronous input, Counter reset input (only for 2 output type) | | | |
| Timer | | ON delay, OFF delay, One shot, ON+OFF delay, ON delay + One shot<br>0.1ms~9.999s | | | |
| Output mode | | Light ON / Dark ON switching is available in setup | | | |
| Cable / Connector | | 2m (single type and interconnection master type : ø3.8mm , slave type : ø2.8mm), or M8 connector | | | |
| Insulation impedance | | 20MΩmax. (DC500V) | | | |
| Ratings | Power supply | DC12~24V±10%including ripple | | | |
| | Power consumption (normal mode) | 36mA max. (1 output type), 39mA max. (2 output type) / DC24V | | | |
| | Power consumption (saving mode) | 25mA max. (1 output type), 28mA max. (2 output type) / DC24V (Eco All mode) | | | |
| Conformity | | CE, IEC | | | |
| Operating temp./humid. | | -25~+55°C*4 / 35~85%RH without condensation | | | |
| Environmental illuminance | | Sunlight: 10000 lux max., Incandescent lamp: 3,000 lux max | | | |
| Vibration resistance | | 10~55Hz 1.5mm swing X,Y,Z 2hours | | | |
| Shock resistance | | 50G (500m/s²) X,Y,Z 3times | | | |
| Protection category / Material | | IP50 / Case: PPE, Cover: PC | | | |
| Weight | | Approx. 71g including cable | | | |
| Bracket | | BEF-WLL170 | | | |

*1 Single type: 16us. When cross talk prevention mode is activated on interconnection type, it's 22us.
*2 Threshold, Timer and Light ON/Dark ON of control output for 2 output type can be setup individually.
*3 External teaching mode is done based on the mode that is set on sensor (default is 1 point teach).
*4 When you use 1~3 pieces interconnected including master.
Please use output less than 50mA each and in -25~+50°C when you use 4~8 pieces interconnected including maste.

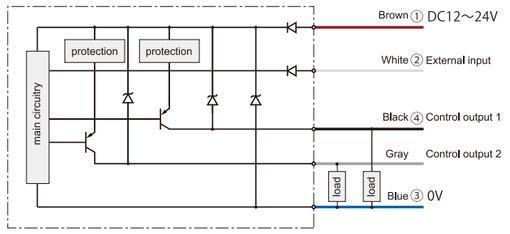
Interconnection type

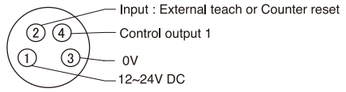
## Circuit diagram

**NPN output**



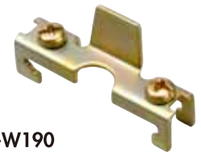

**PNP output**




## Options

End plate
**BEF-EB01-W190**



JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter
**JCN-S : M8 Straight type**

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter
**JCN-L : M8 L-shape type**

Digital Fiber Sensor

# D2RF series

## Digital Fiber Amplifier with Two Independent Outputs. High speed 60 micro second response.

## 6 teach methods for individual applications

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

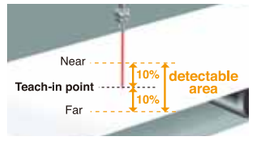
**Full automatic Teaching**
Set while the equipment is operating.

**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.



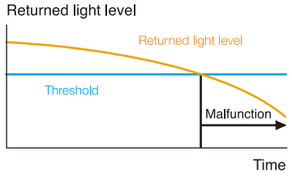

## SAM Circuit - The ASC function (Auto Sensitivity Control)

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.

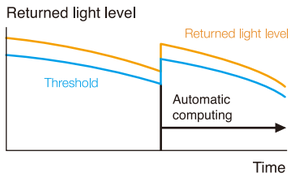
After cleaning off the lens / reflector it used to be necessary to reset the threshold setting. The D2RF does not require this step. Simply clean off the lens and wait three seconds without a target present. The sensor will automatically reset the threshold level for the change. This is how the SAM circuit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



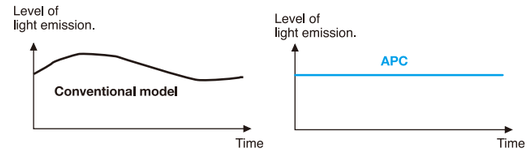







## APC Function (Auto Power Control)

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.




## Two four digit display's.

Received Light Level and Threshold Setting

## 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.

## 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.

## 60 micro second high speed response.

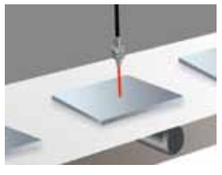
Both outputs can be set to operate at this speed.
This response time is available in 5 of the teach modes.

## 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%



## 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.

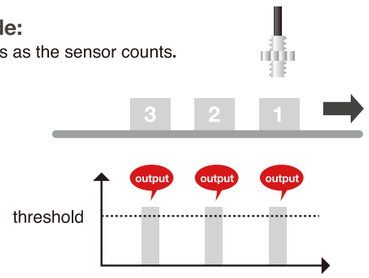
## Automatic Tuning

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.

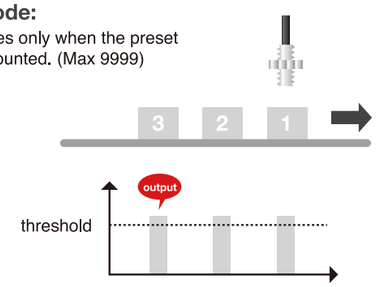
## Counter Mode

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)



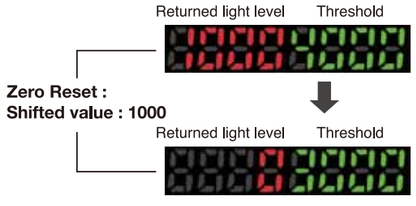

## Edge Sensing

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**

## Zero Reset

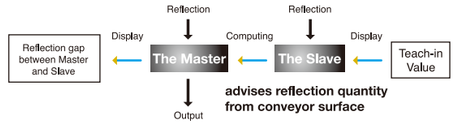
The sensor display can be reset to zero. This is useful for adjusting the display's of the Master and Slave units to read the same. It is also good to set the value to zero when the light is interrupted.



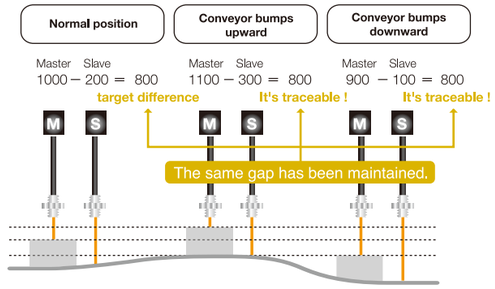

## Differential Sensing Mode

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:**

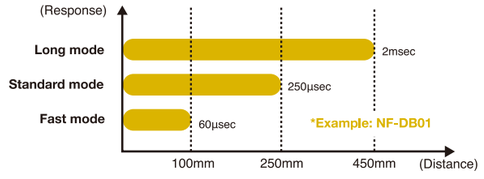



**How to follow the changing condition!**




## 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**

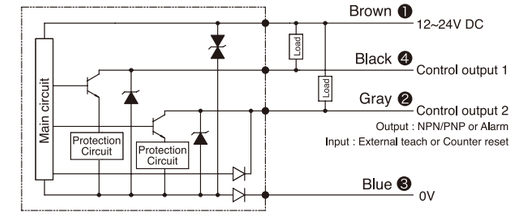


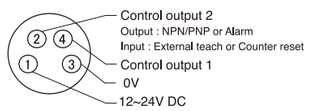




## Two Independent Outputs. Each output can be set separately.

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.

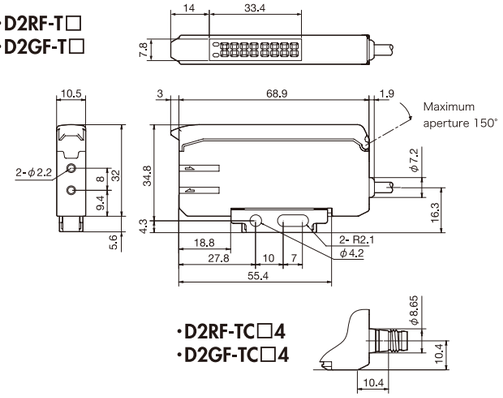
## External Teach Input (CH2)

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)

# Dimensions

## Stand-alone model

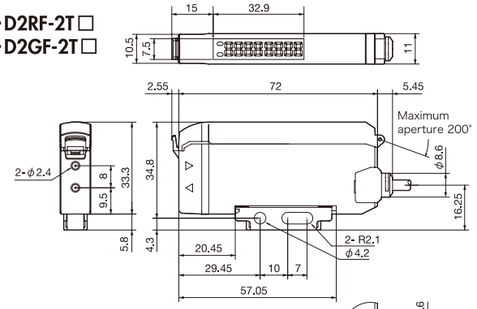
**·D2RF-T□**
**·D2GF-T□**



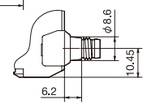

**·D2RF-TC□4**
**·D2GF-TC□4**




**·D2RF-2T□**
**·D2GF-2T□**

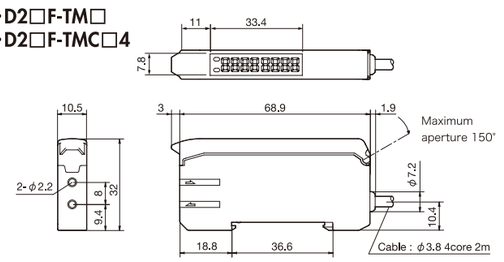



**·D2RF-2TC□3/4**
**·D2GF-2TC□3/4**

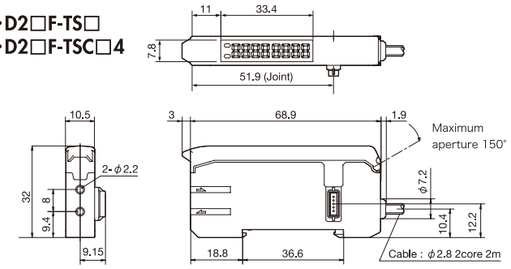



## Interconnection model

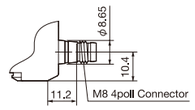
**·D2□F-TM□**
**·D2□F-TMC□4**




**·D2□F-TS□**
**·D2□F-TSC□4**

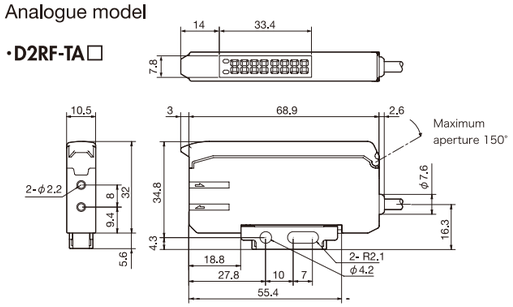



·M8 Connector type

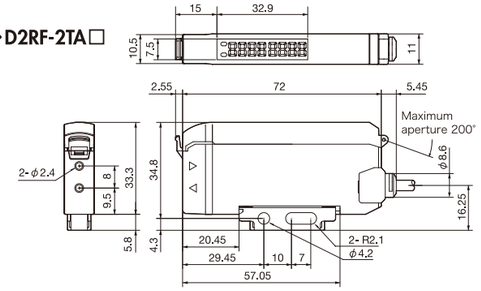



## Analogue model

**·D2RF-TA□**




**·D2RF-2TA□**







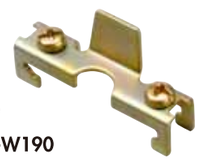

# Specifications

| 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

End plate
**BEF-EB01-W190**



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

**JCN-S : M8 Straight type**

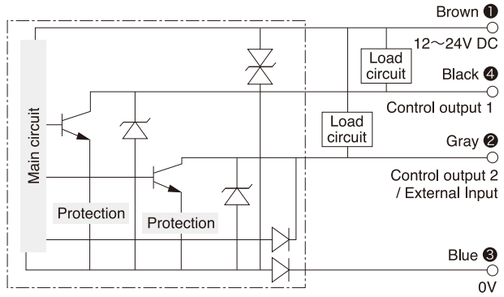
JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

**JCN-L : M8 L-shape type**

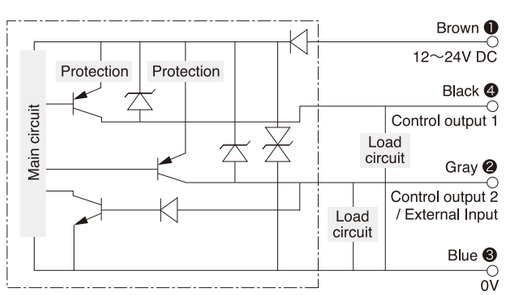
# Circuit diagram

## Stand-alone model

**NPN output**

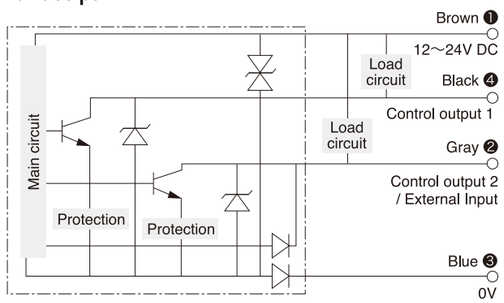



**PNP output**

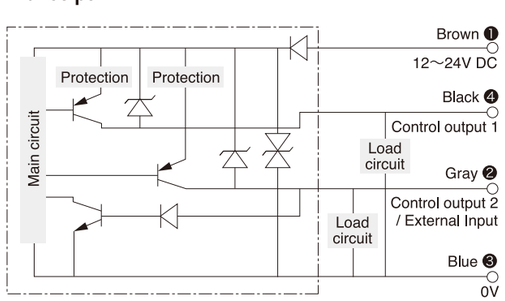



## Interconnection model

**NPN output**



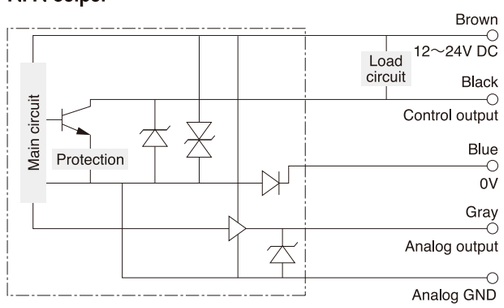

**PNP output**



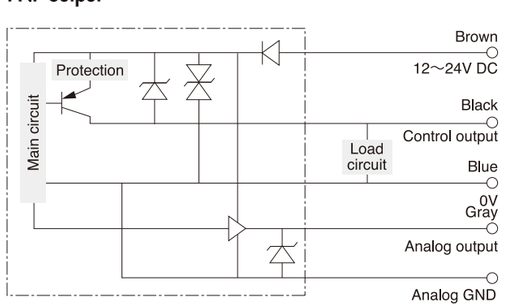

・Power wires (Brown ❶, Blue ❸) are not attached to Handset unit, both on cable and connector type.

## Analogue model

**NPN output**




**PNP output**





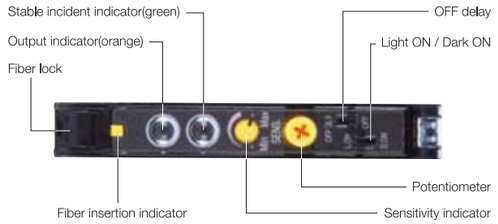



Fiber Sensor

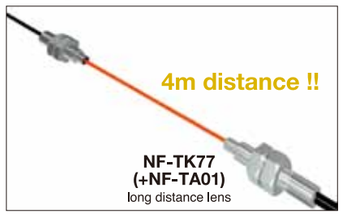
# BRF series

- 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.

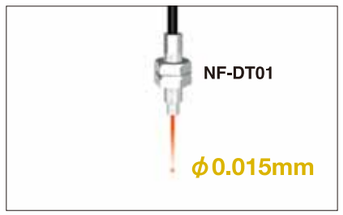
## Part Identification



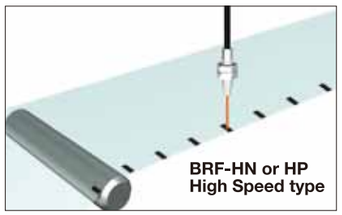
## Long distance sensing




## Min object ϕ0.015mm

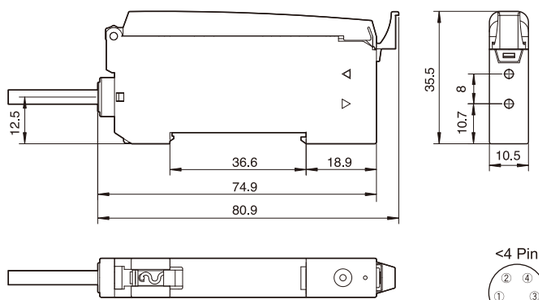



## High Speed response 50μsec

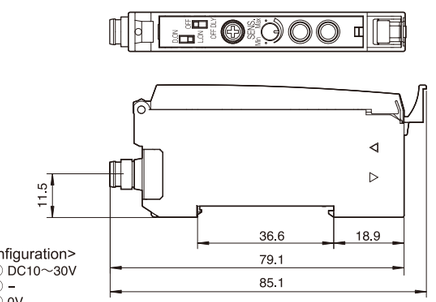



# Dimensions

**Cable Type Stand-alone**




**M8 Connector Stand-alone**

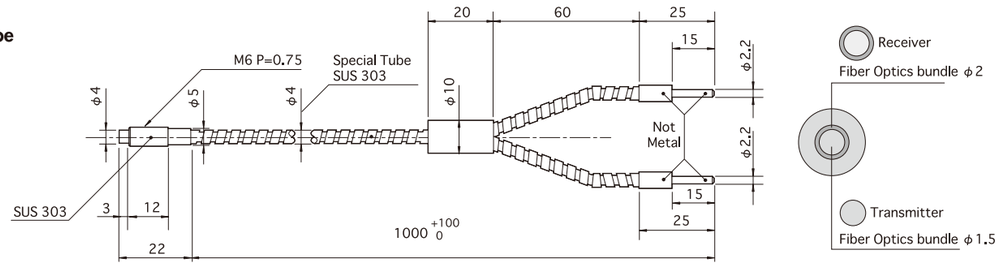



<4 Pin configuration>
① DC10~30V
② –
③ 0V
④ Control Output

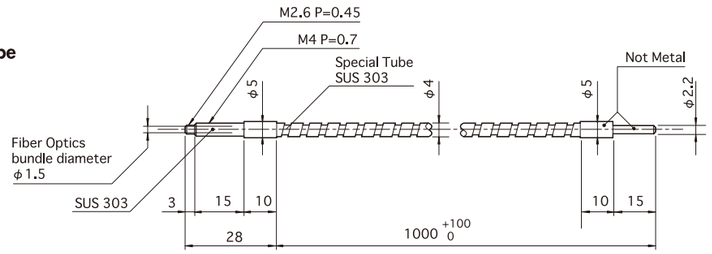
(Unit : mm)

# Dimensions

**NF-DW01**
**Diffuse Type**




**NF-TW01**
**Thru-beam Type**




# Specifications

| Model | | Standard type | High speed type | Mark type | Moisture type |
|---|---|---|---|---|---|
| Stand-alone | Cable type | BRF-N / P | BRF-HN / HP | BGF-N / P | BIF-WN / WP |
| | M8 QD type | BRF-CN / CP | BRF-CHN / CHP | BGF-CN / CP | BIF-CWN / CWP |
| Sensing distance (*1) | 90% 250mm×200mm DK-06 Diffuse Fiber | 150mm | 50mm | 40mm | 30mm Diffuse<br>100mm Thru-beam |
| Response time | | 250 μs | 50 μs | 250 μs | 1ms |
| Control output | | NPN or PNP Open Collector 100mA/DC30V max. 1.8V/100mA max. | | | |
| Light source | | Red LED | | Green LED | 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 | | | |
| 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.

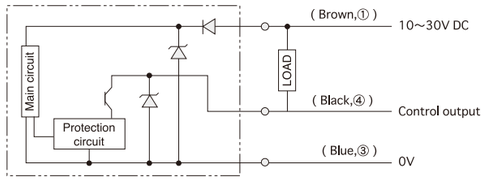




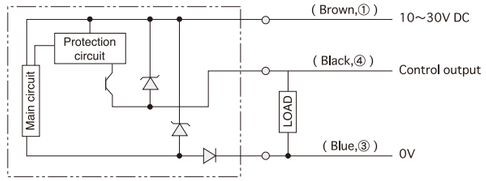


# Circuit diagram

**NPN output**




**PNP output**







<4 Pin configuration>
① : DC10~30V ③ : 0V
② : - ④ : Control output

# Options

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



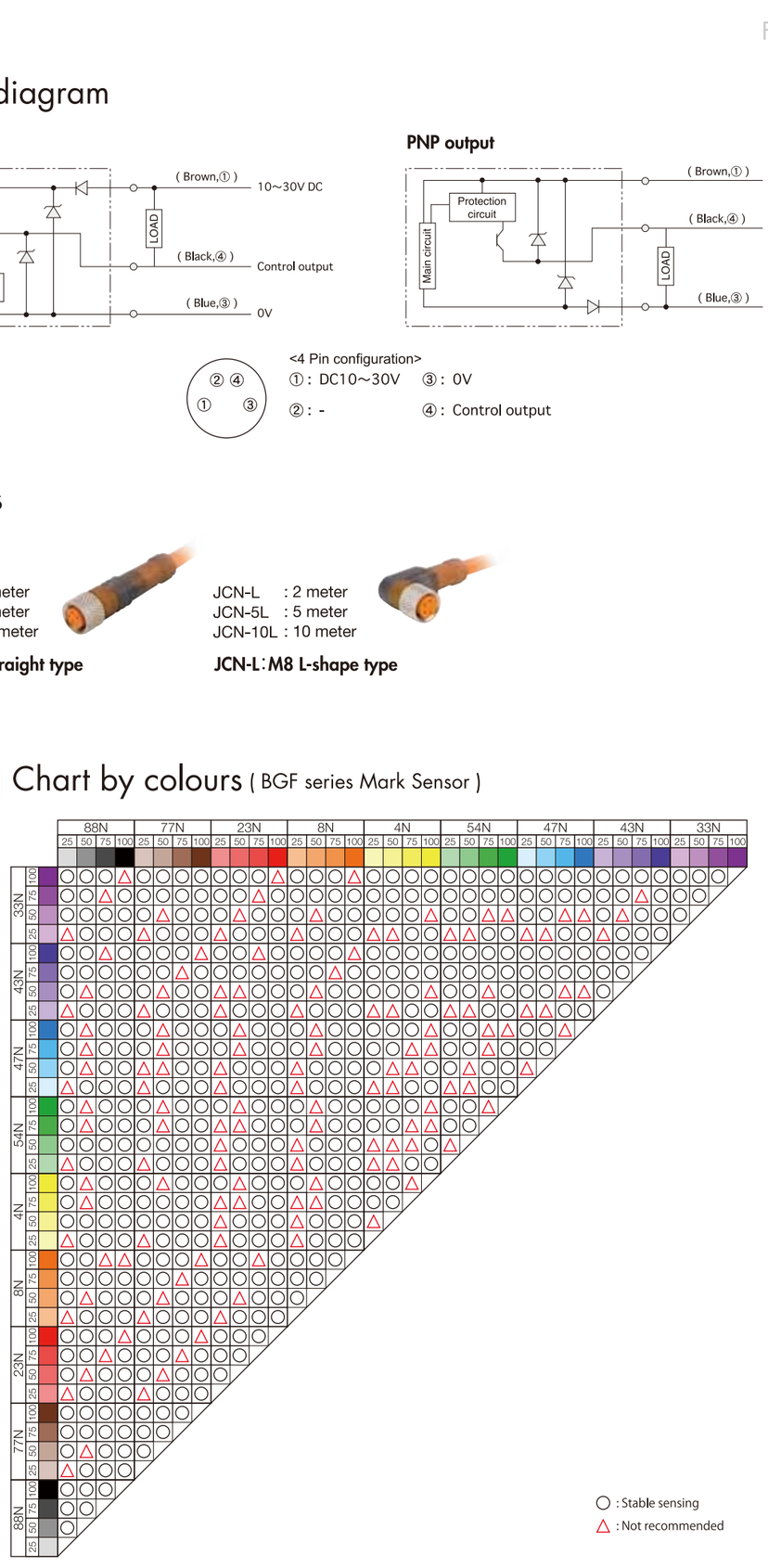
**JCN-S : M8 Straight type**

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



**JCN-L : M8 L-shape type**

# Sensing Chart by colours ( BGF series Mark Sensor )



# Fiber unit NF series

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-FA offers more than 80 different cables in both Thru-beam and Diffuse sensing modes.

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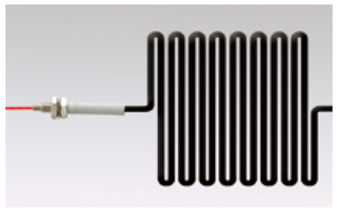

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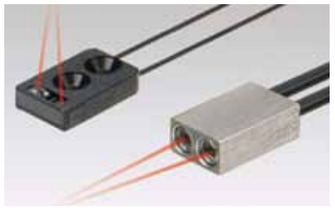

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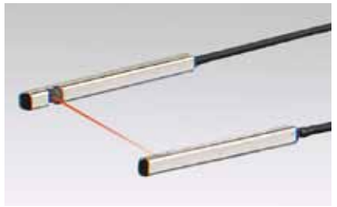

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Fiber Sensor



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# EASY MOUNTING

## Flexible mounting configurations and space saving installations

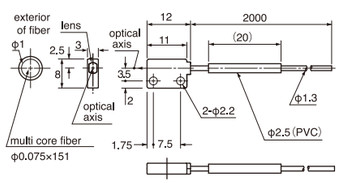
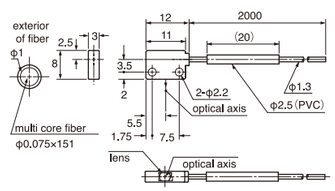
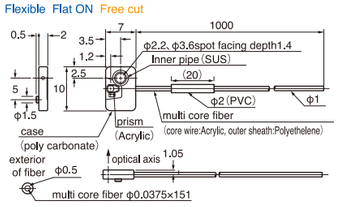
### All in one top and side sensing

The Fiber can easily be adjusted for front or side sensing reducing inventory. The fiber also has a 1mm bending radius that improves mounting flexibility.

### Top, side and front sensing type

You can choose from top, side, and front sensing versions.
You can also choose between R1mm and R4mm versions.

## Specifications (Thru-beam Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam | Flexible Head ON Free cut  | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,580<br>4-LG 3,060<br>3-ST 1,980<br>2-FS 1,350<br>1-HS 530 | Long 2,700<br>Std 1,600<br>Fast 850 | 1,600 | −40～60 | R=1 | NF-TR11 |
| | Flexible Side ON Free cut  | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,600<br>4-LG 3,150<br>3-ST 2,000<br>2-FS 1,200<br>1-HS 540 | Long 2,700<br>Std 1,500<br>Fast 1,000 | 1,300 | −40～60 | R=1 | NF-TR12 |
| | Flexible Flat ON Free cut  | 7-EL 1,190<br>6-UL 1,120<br>5-PL 980<br>4-LG 850<br>3-ST 550<br>2-FS 310<br>1-HS 100 | Long 600<br>Std 350<br>Fast 200 | 220 | −40～60 | R=1 | NF-TE01 |

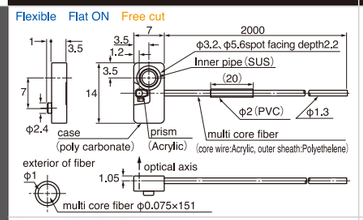
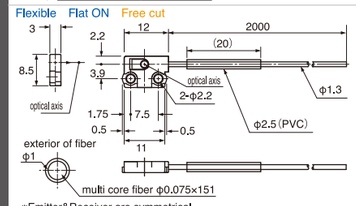
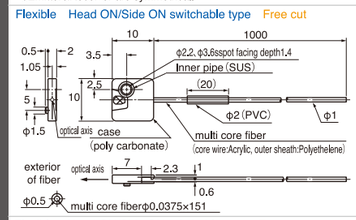
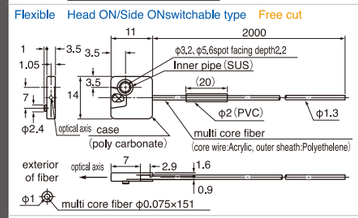
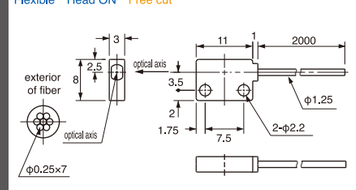
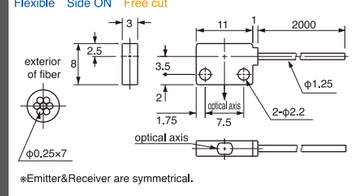
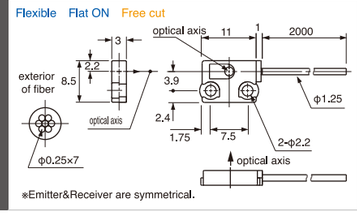
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH





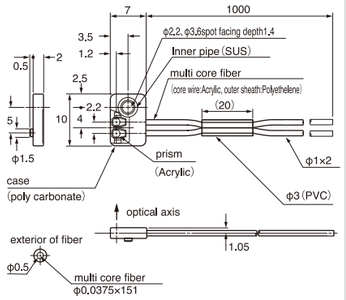
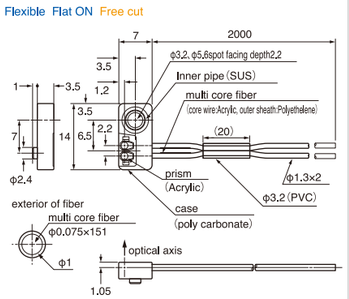
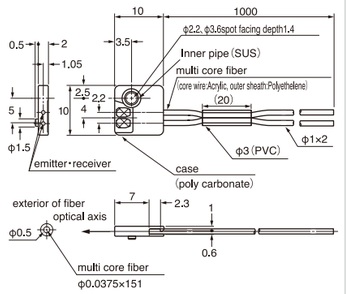
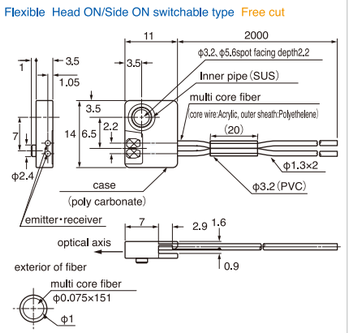


## Specifications (Thru-beam Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam | Flexible Flat ON Free cut  | 7-EL 1,890<br>6-UL 1,770<br>5-PL 1,540<br>4-LG 1,350<br>3-ST 880<br>2-FS 520<br>1-HS 170 | Long 900<br>Std 500<br>Fast 350 | 450 | −40～60 | R=1 | NF-TE03 |
| | Flexible Flat ON Free cut  ※Emitter&Receiver are symmetrical. | 7-EL 2,450<br>6-UL 2,300<br>5-PL 2,010<br>4-LG 1,710<br>3-ST 1,150<br>2-FS 650<br>1-HS 220 | Long 1,200<br>Std 650<br>Fast 330 | 500 | −40～60 | R=1 | NF-TR13 |
| | Flexible Head ON/Side ON switchable type Free cut  | 7-EL 430<br>6-UL 400<br>5-PL 350<br>4-LG 300<br>3-ST 190<br>2-FS 120<br>1-HS 36 | Long 250<br>Std 120<br>Fast 55 | 110 | −40～60 | R=1 | NF-TE02 |
| | Flexible Head ON/Side ONswitchable type Free cut  | 7-EL 1,340<br>6-UL 1,260<br>5-PL 1,090<br>4-LG 960<br>3-ST 630<br>2-FS 390<br>1-HS 130 | Long 750<br>Std 450<br>Fast 250 | 280 | −40～60 | R=1 | NF-TE04 |
| | Flexible Head ON Free cut  | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,580<br>4-LG 3,060<br>3-ST 1,980<br>2-FS 1,400<br>1-HS 500 | Long 2,700<br>Std 1,600<br>Fast 850 | 1,100 | −40～60 | R=4 | NF-TR06 |
| | Flexible Side ON Free cut  ※Emitter&Receiver are symmetrical. | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,600<br>4-LG 3,150<br>3-ST 2,000<br>2-FS 1,100<br>1-HS 320 | Long 2,700<br>Std 1,300<br>Fast 600 | 1,100 | −40～60 | R=4 | NF-TR05 |
| | Flexible Flat ON Free cut  ※Emitter&Receiver are symmetrical. | 7-EL 1,800<br>6-UL 1,510<br>5-PL 1,320<br>4-LG 1,150<br>3-ST 750<br>2-FS 410<br>1-HS 130 | Long 750<br>Std 450<br>Fast 350 | 300 | −40～60 | R=4 | NF-TE05 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Specifications (Diffuse Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Diffuse | Flexible Flat ON Free cut   | 7-EL 140 6-UL 135 5-PL 110 4-LG 99 3-ST 70 2-FS 34 1-HS 10 | Long 60 Std 30 Fast 10～16 | 30 | −40～60 | R=1 | NF-DE01 |
| | Flexible Flat ON Free cut   | 7-EL 490 6-UL 450 5-PL 400 4-LG 350 3-ST 225 2-FS 117 1-HS 41 | Long 250 Std 100 Fast 60 | 100 | −40～60 | R=1 | NF-DE03 |
| | Flexible Head ON/Side ON switchable type Free cut   | 7-EL 160 6-UL 150 5-PL 130 4-LG 117 3-ST 77 2-FS 43 1-HS 12 | Long 65 Std 35 Fast 20 | 30 | −40～60 | R=1 | NF-DE02 |
| | Flexible Head ON/Side ON switchable type Free cut   | 7-EL 480 6-UL 450 5-PL 390 4-LG 340 3-ST 225 2-FS 117 1-HS 45 | Long 250 Std 120 Fast 80 | 100 | −40～60 | R=1 | NF-DE04 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.







# THREAD TYPE

M3, M4, and M6 threaded versions with lock nut for easy mounting. Optional lenses provide longer sensing distances of smaller objects.

## Space saving

The NF25-T and NF25-D have right angled heads to save space when installed. Heat resistant and R2 mm flexible types are available.

Straight type

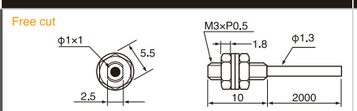
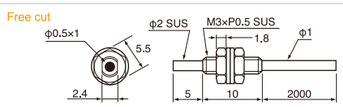
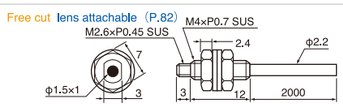
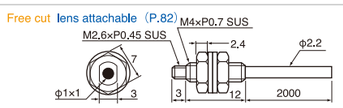
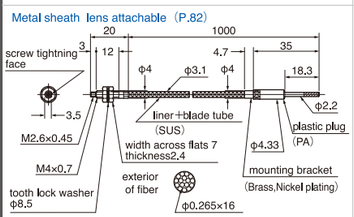
Nut type

## Metal Sheath type

Stainless steel braid protects the fiber cable and prevents fiber cable breakage due to snagging. The R10mm allows the cable to bend in tight areas without breaking.

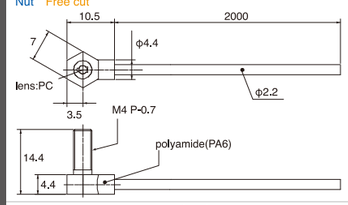
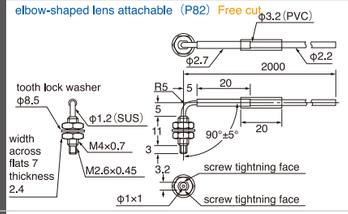
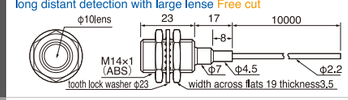
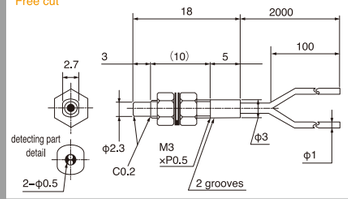
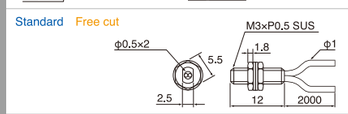
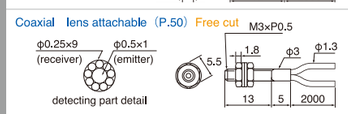
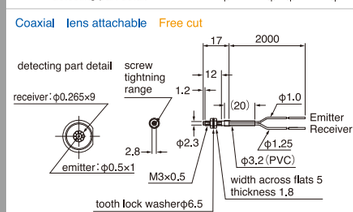
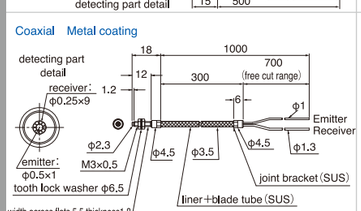
Metal sheath type

## Specifications (Thru-beam Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam M3 | Free cut   | 7-EL 3,500 6-UL 2,100 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 175 | Long 1,000 Std 500 Fast 250 | 450 | −40～70 | R=25 | NF-TM01 |
| | Free cut   | 7-EL 900 6-UL 550 5-PL 400 4-LG 350 3-ST 250 2-FS 140 1-HS 45 | Long 350 Std 200 Fast 90 | 120 | −40～70 | R=15 | NF-TM02 |
| Thru-beam M4 | Free cut lens attachable (P.82)   | 7-EL 4,000 6-UL 3,000 5-PL 2,200 4-LG 1,900 3-ST 1,400 2-FS 750 1-HS 45 | Long 1,800 Std 800 Fast 450 | 700 | −40～70 | R=30 | NF-TB01 |
| | Free cut lens attachable (P.82)   | 7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 175 | Long 1,000 Std 500 Fast 250 | 450 | −40～70 | R=25 | NF-TB02 |
| | Metal sheath lens attachable (P.82)   | 7-EL 1,590 6-UL 1,440 5-PL 1,260 4-LG 1,140 3-ST 740 2-FS 410 1-HS 130 | Long 350 Std 220 Fast 110 | 300 | −40～60 | R=10 | NF-TJ01 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Thru-beam/Diffuse Type : Standard)

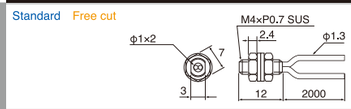
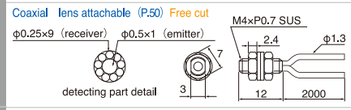
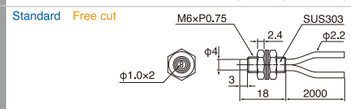
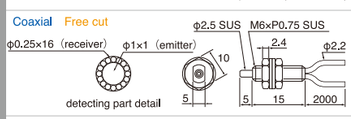
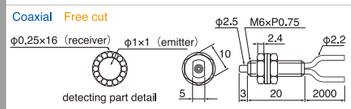
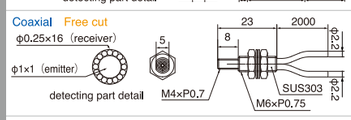
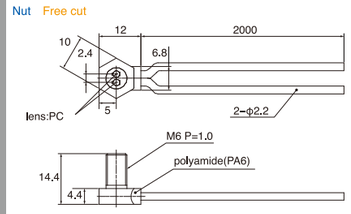
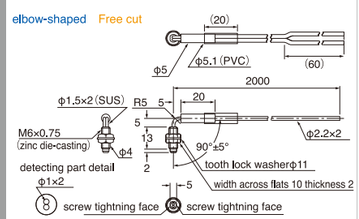
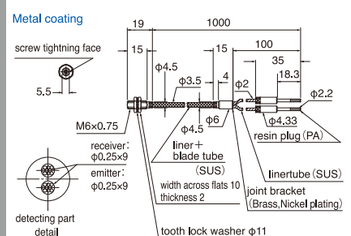
| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | M4 | Nut Free cut  | 7-EL 2,500 6-UL 1,400 5-PL 1,300 4-LG 1,000 3-ST 750 2-FS 350 1-HS 100 | Long 800 Std 600 Fast 200 | 350 | −40～70 | R=25 | NF25-T |
| | | elbow-shaped lens attachable (P82) Free cut  | 7-EL 1,440 6-UL 1,350 5-PL 1,170 4-LG 1,060 3-ST 690 2-FS 430 1-HS 130 | Long 750 Std 450 Fast 200 | 350 | −40～70 | R=25 | NF-TB06 |
| | M14 | long distant detection with large lense Free cut  | 7-EL 19,500 6-UL 19,500 5-PL 19,500 4-LG 19,500 3-ST 19,500 2-FS 19,500 1-HS 5,900 | Long 19,500 Std 19,500 Fast 19,500 | 19,500 | −40～70 | R=25 | NF-TB08 |
| Diffuse | M3 | Free cut  | 7-EL 300 6-UL 160 5-PL 150 4-LG 120 3-ST 80 2-FS 40 1-HS 10 | Long 100 Std 50 Fast 25 | 35 | −40～70 | R=15 | FD-TT2 |
| | | Standard Free cut  | 7-EL 400 6-UL 200 5-PL 190 4-LG 160 3-ST 100 2-FS 50 1-HS 10 | Long 100 Std 60 Fast 30 | 45 | −40～70 | R=15 | NF-DS06 |
| | | Coaxial lens attachable (P.50) Free cut  | 7-EL 500 6-UL 300 5-PL 250 4-LG 225 3-ST 150 2-FS 100 1-HS 30 | Long 250 Std 120 Fast 50 | 70 | −40～70 | R=15 | NF-DT01 |
| | | Coaxial lens attachable Free cut  | 7-EL 310 6-UL 290 5-PL 260 4-LG 220 3-ST 140 2-FS 70 1-HS 20 | Long 170 Std 80 Fast 45 | 55 | −40～60 | R=25 | NF-DB07 |
| | | Coaxial lens attachable (P.50) | 7-EL 180 6-UL 110 5-PL 100 4-LG 85 3-ST 60 2-FS 40 1-HS 12 | Long 70 Std 40 Fast 15 | 20 | −40～70 | R=15 | NF-DK21 |
| | | Coaxial Metal coating  | 7-EL 180 6-UL 170 5-PL 150 4-LG 130 3-ST 80 2-FS 40 1-HS 10 | Long 120 Std 50 Fast 30 | 50 | −40～60 | R=10 | NF-DJ01 |

Operating humidity is 35~85%RH. Please use in 0~40℃C when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.





# Specifications (Difffuse Type : Standard)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | M4 | Standard Free cut  | 7-EL 1,100 6-UL 650 5-PL 550 4-LG 450 3-ST 350 2-FS 200 1-HS 60 | Long 400 Std 250 Fast 100 | 160 | −40～70 | R=25 | NF-DM01 |
| | | Coaxial lens attachable (P.50) Free cut  | 7-EL 500 6-UL 300 5-PL 250 4-LG 225 3-ST 150 2-FS 100 1-HS 30 | Long 250 Std 120 Fast 50 | 70 | −40～70 | R=15 | NF-DM02 |
| | | Standard Free cut  | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80 | Long 400 Std 250 Fast 100 | 160 | −40～70 | R=25 | NF-DK06 |
| | | Coaxial Free cut  | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 75 | Long 450 Std 250 Fast 100 | 150 | −40～70 | R=25 | NF-DB01 |
| | | Coaxial Free cut  | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 575 3-ST 400 2-FS 250 1-HS 75 | Long 450 Std 250 Fast 100 | 150 | −40～70 | R=25 | NF-DB03 |
| | | Coaxial Free cut  | 7-EL 1,200 6-UL 650 5-PL 550 4-LG 500 3-ST 300 2-FS 150 1-HS 50 | Long 450 Std 250 Fast 100 | 80 | −40～70 | R=25 | NF-DB04 |
| | M6 | Nut Free cut  | 7-EL 550 6-UL 330 5-PL 240 4-LG 200 3-ST 150 2-FS 90 1-HS 23 | Long 120 Std 80 Fast 25 | 45 | −40～70 | R=25 | NF25-D |
| | | elbow-shaped Free cut  | 7-EL 540 6-UL 510 5-PL 450 4-LG 390 3-ST 250 2-FS 140 1-HS 40 | Long 300 Std 150 Fast 60 | 100 | −40～70 | R=25 | NF-DB09 |
| | | Metal coating  | 7-EL 440 6-UL 410 5-PL 360 4-LG 310 3-ST 200 2-FS 100 1-HS 30 | Long 280 Std 150 Fast 70 | 100 | −40～70 | R=10 | NF-DJ02 |

Operating humidity is 35~85%RH. Please use in 0~40℃C when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

# CYLINDRICAL TYPE

Smooth Barrel space saving fiber optic sensor. Install with set-screw.

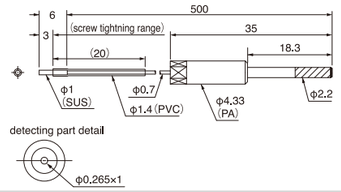
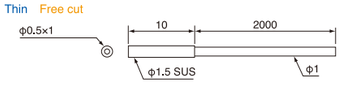
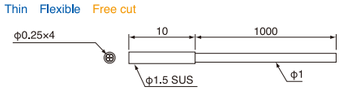
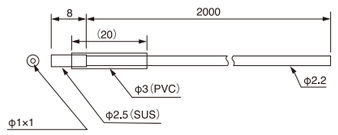
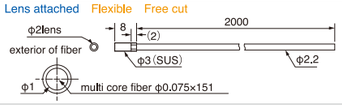
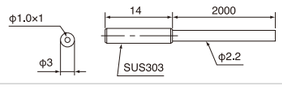
## Three types to choose from

Super narrow type

Side beam type

Sleeve type

## Specifications (Thru-beam Type : Standard)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | ϕ1 | Thin Flexible   | 7-EL 54<br>6-UL 50<br>5-PL 44<br>4-LG 38<br>3-ST 25<br>2-FS 15<br>1-HS 5 | Long 30<br>Std 18<br>Fast 8 | 10 | −40～60 | R=4 | NF-TR04 |
| | ϕ1.5 | Thin Free cut   | 7-EL 900<br>6-UL 550<br>5-PL 400<br>4-LG 350<br>3-ST 250<br>2-FS 140<br>1-HS 45 | Long 350<br>Std 200<br>Fast 90 | 120 | −40～70 | R=15 | NF-TM03 |
| | | Thin Flexible Free cut   | 7-EL 850<br>6-UL 550<br>5-PL 450<br>4-LG 400<br>3-ST 275<br>2-FS 150<br>1-HS 50 | Long 350<br>Std 200<br>Fast 90 | 110 | −40～70 | R=4 | NF-TR03 |
| | ϕ2.5 | Free cut   | 7-EL 1,710<br>6-UL 1,530<br>5-PL 1,350<br>4-LG 1,230<br>3-ST 800<br>2-FS 480<br>1-HS 160 | Long 900<br>Std 550<br>Fast 250 | 350 | −40～70 | R=25 | NF-TB07 |
| | ϕ3 | Lens attached Flexible Free cut   | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,150<br>4-LG 2,790<br>3-ST 1,800<br>2-FS 1,000<br>1-HS 340 | Long 2,300<br>Std 1,300<br>Fast 550 | 550 | −40～60 | R=1 | NF-TR10 |
| | | Flexible Free cut   | 7-EL 4,000<br>6-UL 2,000<br>5-PL 1,600<br>4-LG 1,400<br>3-ST 1,000<br>2-FS 550<br>1-HS 180 | Long 800<br>Std 400<br>Fast 200 | 360 | −40～70 | R=2 | NF-TK05 |

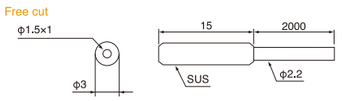
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.



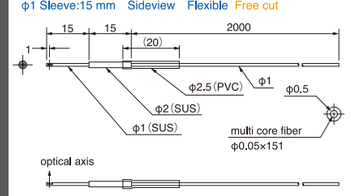
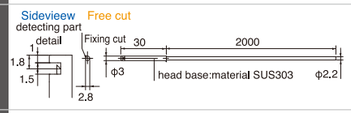
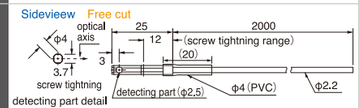
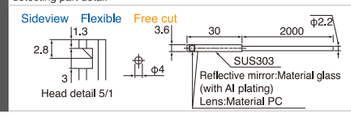




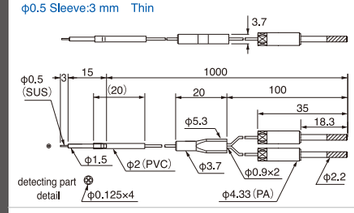
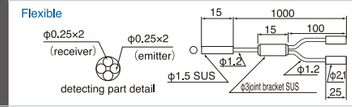
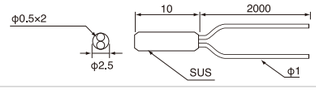
## Specifications (Thru-beam Type : Standard)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | ϕ3 | Free cut   | 7-EL 4,000<br>6-UL 3,000<br>5-PL 2,400<br>4-LG 2,100<br>3-ST 1,500<br>2-FS 800<br>1-HS 220 | Long 1,800<br>Std 800<br>Fast 450 | 700 | −40～70 | R=30 | NF-TS07 |

## Specifications (Thru-beam Type : Sideview)

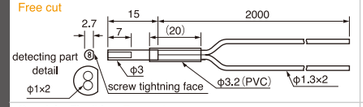
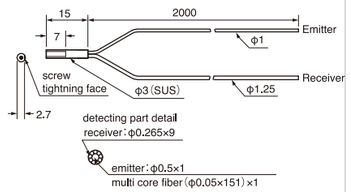
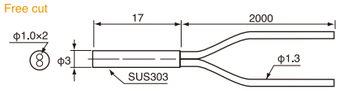
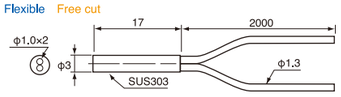
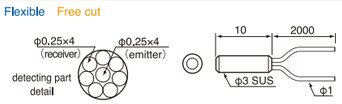
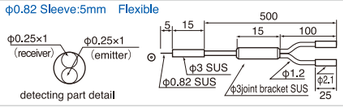
| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam Side | ϕ2 | ϕ1 Sleeve:15 mm Sideview Flexible Free cut   | 7-EL 160<br>6-UL 150<br>5-PL 130<br>4-LG 110<br>3-ST 76<br>2-FS 45<br>1-HS 11 | Long 90<br>Std 50<br>Fast 25 | 20 | −40～60 | R=1 | NF-TG05 |
| | ϕ3 | Sideview Free cut   | 7-EL 2,500<br>6-UL 1,900<br>5-PL 1,300<br>4-LG 1,100<br>3-ST 800<br>2-FS 400<br>1-HS 140 | Long 800<br>Std 400<br>Fast 200 | 180 | −40～70 | R=25 | NF-TS08 |
| | ϕ4 | Sideview Free cut   | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,600<br>4-LG 3,240<br>3-ST 2,100<br>2-FS 1,600<br>1-HS 530 | Long 2,800<br>Std 2,000<br>Fast 1,000 | 1,000 | −40～60 | R=25 | NF-TV08 |
| | | Sideview Flexible Free cut   | 7-EL 3,500<br>6-UL 3,500<br>5-PL 3,500<br>4-LG 3,000<br>3-ST 2,000<br>2-FS 1,000<br>1-HS 300 | Long 1,800<br>Std 1,000<br>Fast 500 | 700 | −40～70 | R=1 | NF-TS22V |

## Specifications (Diffuse Type : Standard)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | ϕ1.5 | ϕ0.5 Sleeve:3 mm Thin   | 7-EL 28<br>6-UL 26<br>5-PL 23<br>4-LG 20<br>3-ST 13<br>2-FS 3<br>1-HS 1 | Long 18<br>Std 5<br>Fast N.A. | 3 | −40～60 | R=10 | NF-DP01 |
| | | Flexible   | 7-EL 300<br>6-UL 180<br>5-PL 150<br>4-LG 130<br>3-ST 80<br>2-FS 45<br>1-HS 18 | Long 70<br>Std 30<br>Fast 15 | 20 | −40～70 | R=4 | NF-DR04 |
| | ϕ2.5 | Free cut   | 7-EL 400<br>6-UL 200<br>5-PL 190<br>4-LG 160<br>3-ST 100<br>2-FS 50<br>1-HS 10 | Long 100<br>Std 60<br>Fast 30 | 45 | −40～70 | R=15 | NF-DT03 |

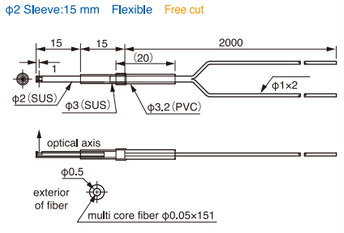
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

## Specifications (Diffuse Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Diffuse φ3 | Free cut   | 7-EL 690 6-UL 640 5-PL 560 4-LG 490 / 3-ST 320 2-FS 120 1-HS 60 | Long 400 Std 200 Fast 100 | 150 | −40～70 | R=25 | NF-DB10 |
| | Coaxial Flexible Free cut   | 7-EL 270 6-UL 250 5-PL 210 4-LG 180 3-ST 120 2-FS 60 1-HS 20 | Long 120 Std 70 Fast 35 | 55 | −40～60 | R=2 | NF-DR11 |
| | Free cut   | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 / 3-ST 400 2-FS 250 1-HS 80 | Long 400 Std 250 Fast 100 | 160 | −40～70 | R=25 | NF-DK04 |
| | Flexible Free cut   | 7-EL 850 6-UL 550 5-PL 450 4-LG 375 / 3-ST 275 2-FS 170 1-HS 55 | Long 300 Std 180 Fast 90 | 110 | −40～70 | R=2 | NF-DK04Z |
| | Flexible Free cut   | 7-EL 450 6-UL 250 5-PL 190 4-LG 160 / 3-ST 120 2-FS 70 1-HS 25 | Long 120 Std 50 Fast 25 | 35 | −40～70 | R=4 | NF-DR03 |
| | φ0.82 Sleeve:5mm Flexible   | 7-EL 190 6-UL 125 5-PL 75 4-LG 65 / 3-ST 45 2-FS 25 1-HS 8 | Long 40 Std 15 Fast 5 | 10 | −40～70 | R=4 | NF-DR05 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

## Specifications (Diffuse Type : Sideview)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Diffuse φ3 | φ2 Sleeve:15 mm Flexible Free cut   | 7-EL 53 6-UL 50 5-PL 43 4-LG 36 3-ST 20 2-FS 12 1-HS 4 | Long 25 Std 12 Fast 5 | 10 | −40～60 | R=1 | NF-DR12 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.







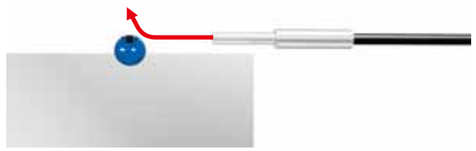
# SLEEVE-STRAIGHT

Fiber sensors with small diameter sleeves are available in both threaded and smooth barrels. This provides a wide range of installation options in narrow spaces.

## Flexible Mounting

Sleeve type enables position adjustment after installation.

Standard type without sleeve



Sleeve type

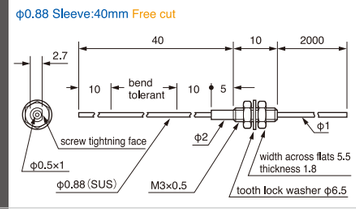
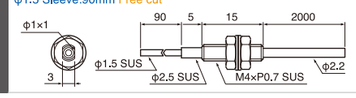
## Easy position adjustment

Sleeve type allows for easy position adjustment in narrow spaces without affecting existing installation.

Without sleeve

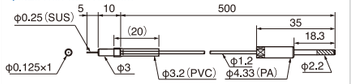
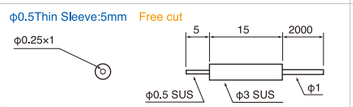
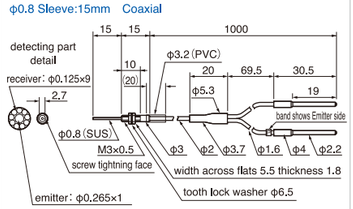
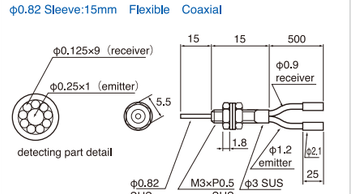
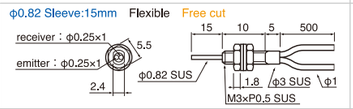
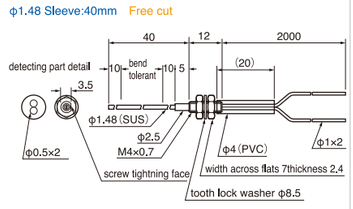
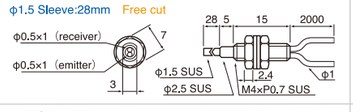
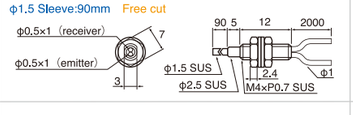
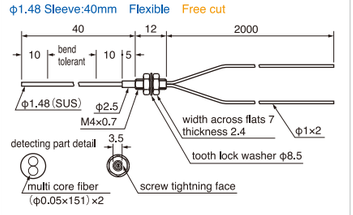
Sleeve type

## Specifications (Thru-beam Type : Standard)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam M3 | φ0.88 Sleeve:40mm Free cut   | 7-EL 270 6-UL 250 5-PL 210 4-LG 180 3-ST 120 2-FS 60 1-HS 20 | Long 120 Std 70 Fast 35 | 55 | −40～70 | Fiber R=25 Sleeve R=10 | NF-TB05 |
| Thru-beam M4 | φ1.5 Sleeve:90mm Free cut   | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 / 3-ST 400 2-FS 250 1-HS 80 | Long 400 Std 250 Fast 100 | 160 | −40～70 | Fiber R=25 Sleeve R=15 | NF-TB03 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Thru-beam/Diffufse Type : Standard)

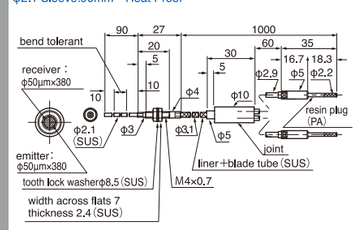
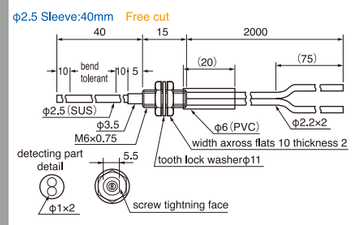
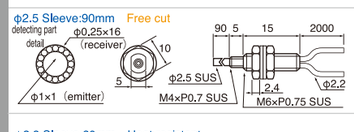
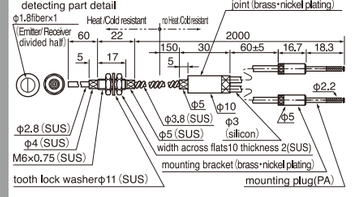
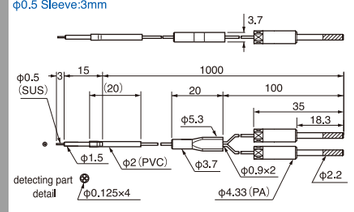
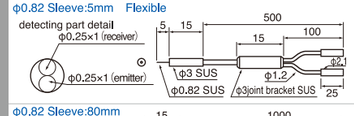
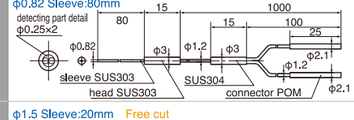
| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | φ3 | φ0.25Thin Sleeve:5mm   | 7-EL 27 6-UL 25 5-PL 21 4-LG 18 / 3-ST 12 2-FS 7 1-HS 2 | Long 6 Std 3.5 Fast 2 | 1 | −40～70 | R=5 | NF-TP01 |
| | | φ0.5Thin Sleeve:5mm Free cut   | 7-EL 170 6-UL 110 5-PL 80 4-LG 70 / 3-ST 50 2-FS 25 1-HS 8 | Long 80 Std 40 Fast 20 | 30 | −40～70 | R=15 | NF-TT01 |
| Diffuse | M3 | φ0.8 Sleeve:15mm Coaxial   | 7-EL 99 6-UL 90 5-PL 80 4-LG 70 3-ST 40 2-FS 20 1-HS 7 | Long 50 Std 25 Fast 14 | 20 | −40～60 | R=25 | NF-DB05 |
| | | φ0.82 Sleeve:15mm Flexible Coaxial   | 7-EL 240 6-UL 120 5-PL 100 4-LG 85 3-ST 60 2-FS 35 1-HS 10 | Long 70 Std 40 Fast 15 | 15 | −40～70 | R=4 | NF-DT04 |
| | | φ0.82 Sleeve:15mm Flexible Free cut   | 7-EL 190 6-UL 125 5-PL 70 4-LG 65 / 3-ST 45 2-FS 25 1-HS 8 | Long 40 Std 15 Fast 5 | 10 | −40～70 | R=4 | NF-DT02 |
| Diffuse | M4 | φ1.48 Sleeve:40mm Free cut   | 7-EL 195 6-UL 180 5-PL 160 4-LG 140 3-ST 90 2-FS 50 1-HS 15 | Long 110 Std 50 Fast 30 | 40 | −40～70 | Fiber R=25 Sleeve R=10 | NF-DB08 |
| | | φ1.5 Sleeve:28mm Free cut   | 7-EL 450 6-UL 240 5-PL 220 4-LG 190 / 3-ST 120 2-FS 60 1-HS 16 | Long 100 Std 60 Fast 30 | 45 | −40～70 | R=15 | NF-DT05 |
| | | φ1.5 Sleeve:90mm Free cut   | 7-EL 450 6-UL 240 5-PL 220 4-LG 190 / 3-ST 120 2-FS 60 1-HS 16 | Long 120 Std 50 Fast 30 | 45 | −40～70 | Fiber R=15 Sleeve R=10 | NF-DM03 |
| | | φ1.48 Sleeve:40mm Flexible Free cut   | 7-EL 140 6-UL 135 5-PL 110 4-LG 95 3-ST 65 2-FS 30 1-HS 10 | Long 60 Std 35 Fast 17 | 30 | −40～60 | Fiber R=1 Sleeve R=10 | NF-DR10 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.





# Specifications (Diffuse Type : Standard)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | M4 | φ2.1 Sleeve:90mm Heat Proof   | 7-EL 1,110 6-UL 1,050 5-PL 910 4-LG 800 3-ST 520 2-FS 190 1-HS 50 | Long 750 Std 250 Fast 80 | 200 | −30～350 or −60～200 | Fiber R=25 Sleeve R=10 | NF-DH05 |
| | M6 | φ2.5 Sleeve:40mm Free cut   | 7-EL 680 6-UL 630 5-PL 550 4-LG 480 3-ST 320 2-FS 180 1-HS 50 | Long 400 Std 240 Fast 110 | 130 | −40～70 | Fiber R=25 Sleeve R=10 | NF-DB06 |
| | | φ2.5 Sleeve:90mm Free cut   | 7-EL 1,100 6-UL 750 5-PL 750 4-LG 650 / 3-ST 450 2-FS 300 1-HS 80 | Long 450 Std 250 Fast 100 | 150 | −40～70 | Fiber R=25 Sleeve R=20 | NF-DB02 |
| | | φ2.8 Sleeve:60mm Heat resistant   | 7-EL 950 6-UL 900 5-PL 780 4-LG 680 3-ST 450 2-FS 200 1-HS 59 | Long 650 Std 250 Fast 80 | 300 | −30～350 or −60～200 | Fiber R=25 Sleeve R=10 | NF-DH04 |
| | φ1.5 | φ0.5 Sleeve:3mm   | 7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1 | Long 18 Std 5 Fast N.A. | 3 | −40～60 | R=10 | NF-DP01 |
| | φ3 | φ0.82 Sleeve:5mm Flexible   | 7-EL 190 6-UL 125 5-PL 75 4-LG 65 / 3-ST 45 2-FS 25 1-HS 8 | Long 40 Std 15 Fast 5 | 10 | −40～70 | R=4 | NF-DR05 |
| | | φ0.82 Sleeve:80mm   | 7-EL 90 6-UL 50 5-PL 45 4-LG 40 / 3-ST 25 2-FS 10 1-HS 4 | Long 35 Std 18 Fast 10 | 7 | −40～70 | R=25 | NF-DR07 |
| | φ4 | φ1.5 Sleeve:20mm Free cut   | 7-EL 400 6-UL 200 5-PL 190 4-LG 160 / 3-ST 100 2-FS 50 1-HS 16 | Long 100 Std 60 Fast 12 | 45 | −40～70 | R=15 | NF-DK43 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

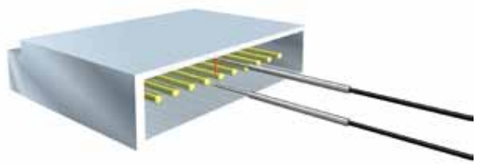
# SLEEVE-SIDEVIEW

## 90° angle beam enables detection in a limited narrow space.

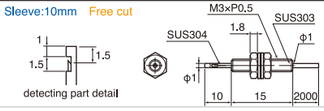
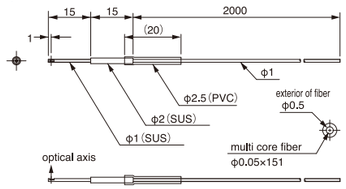
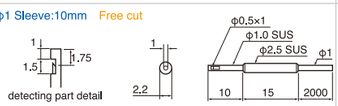
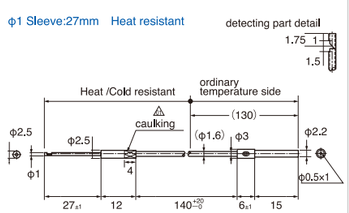
## You can detect objects in narrow area.

Sleeve-Side beam type enables installation in very narrow complicated objects. For example, it can detect very small pins in a connector.

Pins in a connector housing.



## Specifications (Thru-beam Type : Sideview)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | M3 | φ1 Sleeve:10mm Free cut  | 7-EL 650 6-UL 450 5-PL 300 4-LG 250 / 3-ST 200 2-FS 100 1-HS 25 | Long 200 Std 150 Fast 60 | 75 | −40～70 | R=15 | NF-TV04 |
| | φ2 | φ1 Sleeve:15mm Flexible Free cut  | 7-EL 160 6-UL 150 5-PL 130 4-LG 110 3-ST 76 2-FS 45 1-HS 11 | Long 90 Std 50 Fast 25 | 20 | −40～60 | R=1 | NF-TG05 |
| | | φ1 Sleeve:10mm Free cut  | 7-EL 650 6-UL 450 5-PL 300 4-LG 250 / 3-ST 200 2-FS 100 1-HS 25 | Long 200 Std 150 Fast 60 | 75 | −40～70 | R=15 | NF-TV02 |
| | φ2.5 | φ1 Sleeve:27mm Heat resistant  | 7-EL 950 6-UL 900 5-PL 780 4-LG 680 3-ST 450 2-FS 200 1-HS 59 | Long 650 Std 250 Fast 80 | 300 | −40～200 | R=30 | NF-TH04S-27V2 |

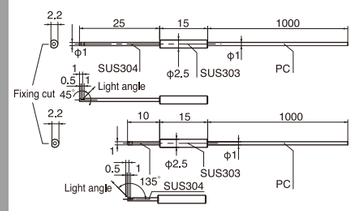
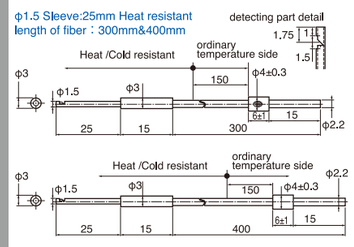
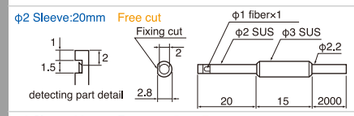
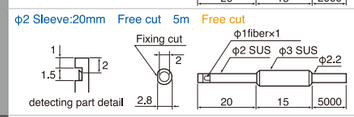
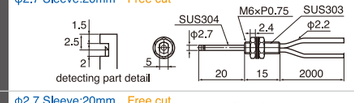
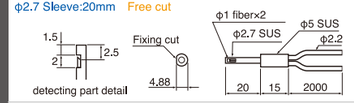
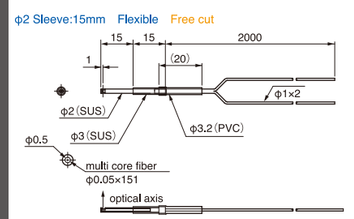
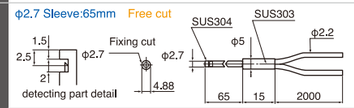
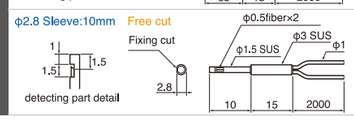
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.







## Specifications (Thru-beam/Diffuse Type : Sideview)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | φ2.5 | φ1 Sleeve:25mm&10mm 45°oblique light axis Heat resistant Free cut  | 7-EL 100 6-UL 55 5-PL 50 4-LG 40 3-ST 30 2-FS 10 1-HS 4 | Long 28 Std 20 Fast 15 | 16 | −40～105 | R=10 | NF-TH06 |
| | φ3 | φ1.5 Sleeve:25mm Heat resistant length of fiber : 300mm&400mm  | 7-EL 1,600 6-UL 850 5-PL 800 4-LG 600 3-ST 400 2-FS 200 1-HS 60 | Long 350 Std 250 Fast 150 | 150 | −40～200 | R=30 | NF-TH05S-A |
| | | φ2 Sleeve:20mm Free cut  | 7-EL 2,000 6-UL 1,300 5-PL 1,000 4-LG 900 / 3-ST 600 2-FS 300 1-HS 100 | Long 800 Std 400 Fast 200 | 320 | −40～70 | R=25 | NF-TV01 |
| | | φ2 Sleeve:20mm Free cut 5m Free cut  | 7-EL 1,700 6-UL 1,100 5-PL 850 4-LG 750 / 3-ST 500 2-FS 250 1-HS 85 | Long 600 Std 300 Fast 150 | 200 | −40～70 | R=25 | NF-TV01-5 |
| Thru-beam | M6 | φ2.7 Sleeve:20mm Free cut  | 7-EL 680 6-UL 400 5-PL 350 4-LG 300 / 3-ST 200 2-FS 100 1-HS 30 | Long 200 Std 120 Fast 50 | 90 | −40～70 | R=25 | NF-DV03 |
| | φ3 | φ2.7 Sleeve:20mm Free cut  | 7-EL 680 6-UL 400 5-PL 350 4-LG 300 / 3-ST 200 2-FS 100 1-HS 30 | Long 200 Std 120 Fast 50 | 90 | −40～70 | R=25 | NF-DV01 |
| | | φ2 Sleeve:15mm Flexible Free cut  | 7-EL 53 6-UL 50 5-PL 43 4-LG 36 3-ST 20 2-FS 12 1-HS 4 | Long 25 Std 12 Fast 5 | 10 | −40～60 | R=1 | NF-DR12 |
| | φ5 | φ2.7 Sleeve:65mm Free cut  | 7-EL 230 6-UL 110 5-PL 85 4-LG 75 / 3-ST 55 2-FS 30 1-HS 8 | Long 80 Std 30 Fast 7 | 15 | −40～70 | R=25 | NF-DK33 |
| | | φ2.8 Sleeve:10mm Free cut  | 7-EL 680 6-UL 400 5-PL 350 4-LG 300 / 3-ST 200 2-FS 100 1-HS 30 | Long 200 Std 120 Fast 50 | 90 | −40～70 | R=15 | NF-DV02 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

# FLEXIBLE R4mm

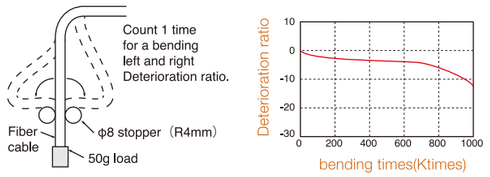
## You can mount this flexible fiber unit on a robot arm that moves continuously.

## Withstands over 800,000 flexes in bending test.

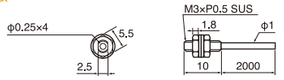
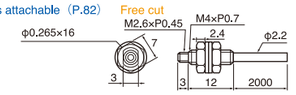
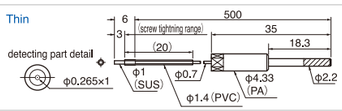
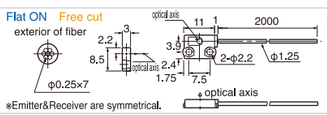
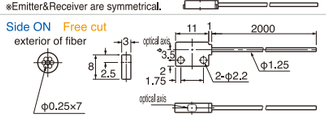
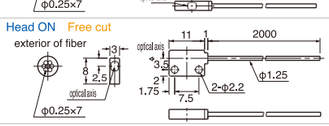
Fiber cable only shows 10% deterioration even after 800,000 flexes in the bending tests at 90 dgree under 50g load. Good for mounting on a robot arm.

Test conditions are :

- Bending speed: 30time/minutes
- Angle: +/- 90 deg. Per bending
- Count one time for a bending left and right




## Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|---|
| Thru-beam | M3 | Free cut  | 7-EL 850 6-UL 550 5-PL 450 4-LG 400 | 3-ST 275 2-FS 150 1-HS 50 | Long 350 Std 200 Fast 90 | 110 | −40～70 | R=4 | NF-TR02 |
| | M4 | Lens attachable（P.82） Free cut  | 7-EL 4,000 6-UL 1,800 5-PL 1,400 4-LG 1,200 | 3-ST 850 2-FS 500 1-HS 175 | Long 800 Std 400 Fast 250 | 330 | −40～70 | R=4 | NF-TR01 |
| | φ1 | Thin  | 7-EL 54 6-UL 50 5-PL 44 4-LG 38 | 3-ST 25 2-FS 15 1-HS 5 | Long 30 Std 18 Fast 8 | 10 | −40～60 | R=4 | NF-TR04 |
| | φ1.5 | Thin Free cut | 7-EL 850 6-UL 550 5-PL 450 4-LG 400 | 3-ST 275 2-FS 150 1-HS 50 | Long 350 Std 200 Fast 90 | 110 | −40～70 | R=4 | NF-TR03 |
| | Square | Flat ON Free cut exterior of fiber  ※Emitter&Receiver are symmetrical. | 7-EL 1,600 6-UL 1,510 5-PL 1,320 4-LG 1,150 | 3-ST 750 2-FS 410 1-HS 130 | Long 750 Std 450 Fast 280 | 300 | −40～60 | R=4 | NF-TE05 |
| | | Side ON Free cut exterior of fiber  | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 | 3-ST 2,000 2-FS 1,100 1-HS 320 | Long 2,700 Std 1,300 Fast 600 | 1,100 | −40～60 | R=4 | NF-TR05 |
| | | Head ON Free cut exterior of fiber  | 7-EL 3,600 6-UL 3,600 5-PL 3,580 4-LG 3,060 | 3-ST 1,980 2-FS 1,400 1-HS 500 | Long 2,700 Std 1,800 Fast 850 | 1,100 | −40～60 | R=4 | NF-TR06 |

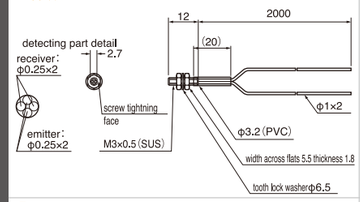
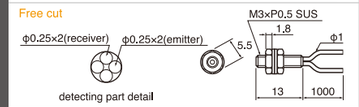
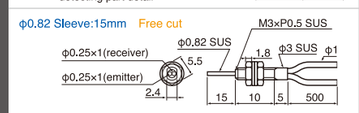
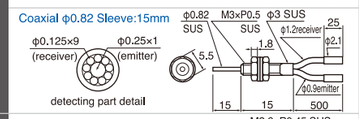
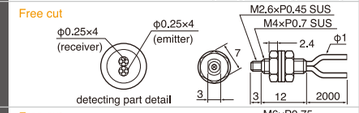
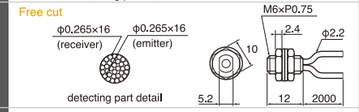
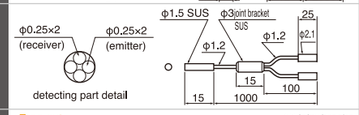
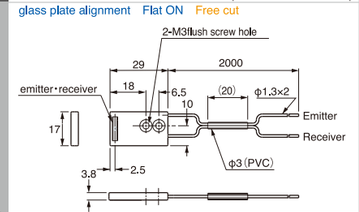
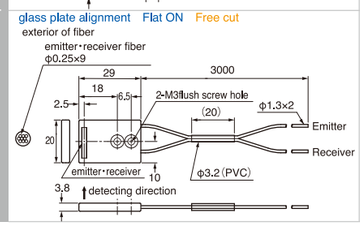
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH
Sensing distance of diffuse type is for 500 x 500mm white paper.





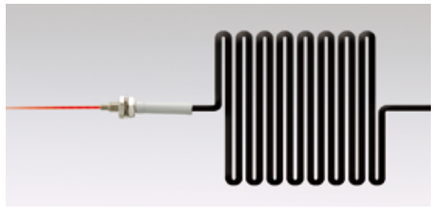


## Specifications (Diffuse/Limited Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|---|
| Diffuse | M3 | Free cut  | 7-EL 88 6-UL 80 5-PL 70 4-LG 60 3-ST 40 2-FS 20 1-HS 7 | | Long 40 Std 20 Fast 14 | 20 | −40～70 | R=4 | NF-DR08 |
| | | Free cut  | 7-EL 300 6-UL 180 5-PL 130 4-LG 100 | 3-ST 80 2-FS 45 1-HS 16 | Long 70 Std 30 Fast 15 | 20 | −40～70 | R=4 | NF-DR02 |
| | | φ0.82 Sleeve:15mm Free cut  | 7-EL 190 6-UL 125 5-PL 70 4-LG 65 | 3-ST 45 2-FS 25 1-HS 8 | Long 40 Std 15 Fast 5 | 10 | −40～70 | R=4 | NF-DT02 |
| | | Coaxial φ0.82 Sleeve:15mm  | 7-EL 240 6-UL 120 5-PL 100 4-LG 85 | 3-ST 60 2-FS 35 1-HS 10 | Long 70 Std 40 Fast 15 | 15 | −40～70 | R=4 | NF-DT04 |
| | M4 | Free cut  | 7-EL 300 6-UL 180 5-PL 140 4-LG 120 | 3-ST 80 2-FS 45 1-HS 16 | Long 120 Std 50 Fast 25 | 35 | −40～70 | R=4 | NF-DR06 |
| | M6 | Free cut  | 7-EL 1,100 6-UL 700 5-PL 600 4-LG 500 | 3-ST 350 2-FS 230 1-HS 70 | Long 350 Std 200 Fast 80 | 130 | −40～70 | R=4 | NF-DR01 |
| | φ1.5 |  | 7-EL 300 6-UL 180 5-PL 150 4-LG 130 | 3-ST 80 2-FS 45 1-HS 18 | Long 70 Std 30 Fast 15 | 20 | −40～70 | R=4 | NF-DR04 |
| | φ3 | Free cut | 7-EL 450 6-UL 250 5-PL 190 4-LG 160 | 3-ST 1,120 2-FS 70 1-HS 25 | Long 120 Std 50 Fast 25 | 35 | −40～70 | R=4 | NF-DR03 |
| | | φ0.82 Sleeve:5mm Free cut | 7-EL 190 6-UL 125 5-PL 75 4-LG 65 | 3-ST 45 2-FS 25 1-HS 8 | Long 40 Std 15 Fast 5 | 10 | −40～70 | R=4 | NF-DR05 |
| Limited Diffuse | Square | glass plate alignment Flat ON Free cut  | 7-EL 0～23 6-UL 0～23 5-PL 0～22 4-LG 0～22 3-ST 0～21 2-FS 0～20 1-HS 5～13 | | Long 0～23 Std 0～17 Fast 0～12 | 15 | 0 ～70 | R=4 | NF-DC06 |
| | | glass plate alignment Flat ON Free cut exterior of fiber  | 7-EL 0～38 6-UL 0～38 5-PL 0～38 4-LG 0～38 3-ST 0～34 2-FS 0～31 1-HS 4～22 | | Long 0～36 Std 0～30 Fast 0～15 | 使用不可 | 0 ～70 | R=4 | NF-DC04 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# FLEXIBLE R1mm



Fiber designed to be placed in areas with extremely tight bending requirements.

## Worry free mounting

When you need bend resistant type, please use Bend-tolerant fibers on page 22.

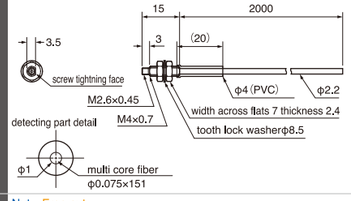
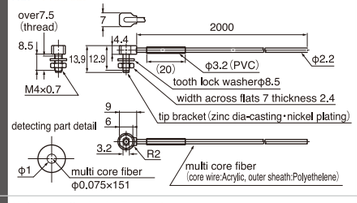
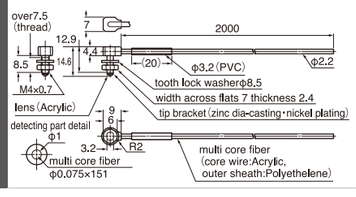
Standard fiber cable

The large bending radius requirements of the fiber may break when bent tightly.

Flexible fiber cable

Because the fiber is very flexible it can be easily and neatly mounted in tight bending locations.

## Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | M4 | Lens attachable (P.82) Free cut   | 7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 180 | Long 800 Std 400 Fast 200 | 360 | −40～60 | R=1 | NF-TK77 |
| | M5 | Nut Free cut   | 7-EL 1,530 6-UL 1,440 5-PL 1,260 4-LG 1,000 3-ST 720 2-FS 420 1-HS 140 | Long 800 Std 450 Fast 250 | 300 | −40～60 | R=1 | NF-TR08 |
| | M6 | Nut Lens attached Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 1,980 2-FS 1,000 1-HS 320 | Long 2,300 Std 1,300 Fast 550 | 800 | −40～60 | R=1 | NF-TR09 |

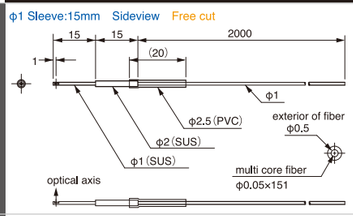
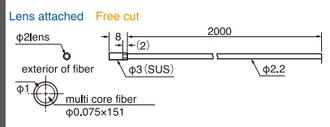
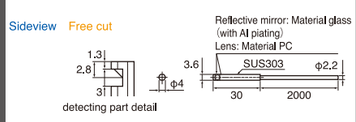
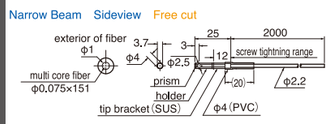
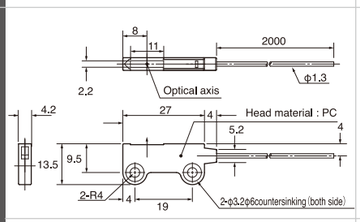
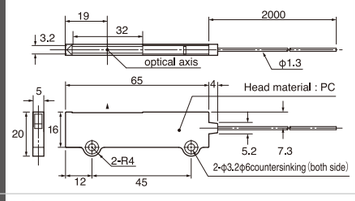
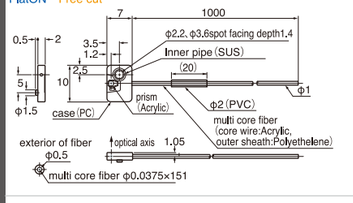
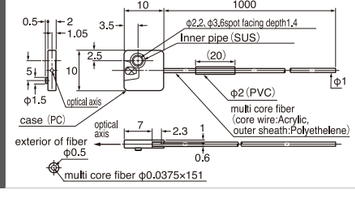
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.





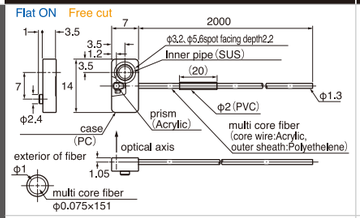
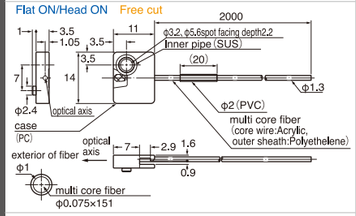
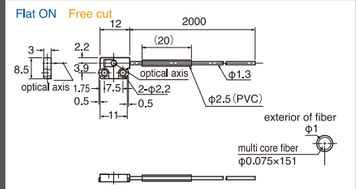
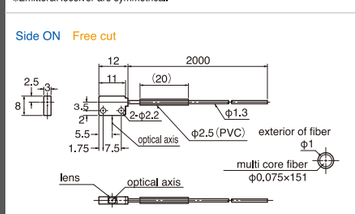
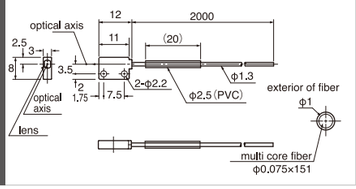


## Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | ϕ2 | ϕ1 Sleeve:15mm Sideview Free cut   | 7-EL 160 6-UL 150 5-PL 130 4-LG 110 3-ST 76 2-FS 45 1-HS 11 | Long 90 Std 50 Fast 25 | 20 | −40～60 | R=1 | NF-TG05 |
| | ϕ3 | Lens attached Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,150 4-LG 2,790 / 3-ST 1,800 2-FS 1,000 1-HS 340 | Long 2,300 Std 1,300 Fast 550 | 550 | −40～60 | R=1 | NF-TR10 |
| | ϕ4 | Sideview Free cut   | 7-EL 3,500 6-UL 3,500 5-PL 3,500 4-LG 3,500 / 3-ST 2,000 2-FS 1,000 1-HS 300 | Long 1,800 Std 1,000 Fast 500 | 700 | −40～70 | R=1 | NF-TS22V |
| | ϕ5 | Narrow Beam Sideview Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 / 3-ST 2,100 2-FS 1,500 1-HS 520 | Long 2,500 Std 1,600 Fast 800 | 1,000 | −40～60 | R=1 | NF-TG02 |
| | Screen |   | 7-EL 3,700 6-UL 3,000 5-PL 3,000 4-LG 3,000 3-ST 2,500 2-FS 2,000 1-HS 1,000 | Long 3,000 Std 2,500 Fast 1,200 | 2,000 | −40～55 | R=1 | NF-TZ09 |
| | |   | 7-EL 3,700 6-UL 3,700 5-PL 3,700 4-LG 3,700 3-ST 3,700 2-FS 3,000 1-HS 2,500 | Long 3,700 Std 3,000 Fast 2,500 | 2,500 | −40～55 | R=1 | NF-TZ07 |
| | Square | FlatON Free cut   | 7-EL 1,190 6-UL 1,120 5-PL 980 4-LG 850 3-ST 550 2-FS 310 1-HS 100 | Long 600 Std 350 Fast 200 | 220 | −40～60 | R=1 | NF-TE01 |
| | | Head ON/Side ON Free cut   | 7-EL 430 6-UL 400 5-PL 350 4-LG 300 3-ST 190 2-FS 120 1-HS 36 | Long 250 Std 120 Fast 55 | 110 | −40～60 | R=1 | NF-TE02 |

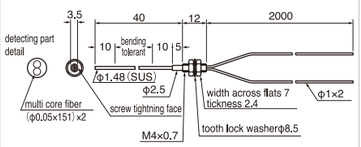
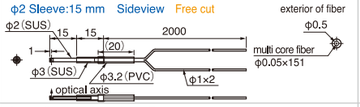
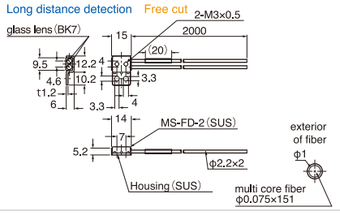
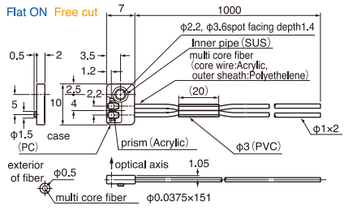
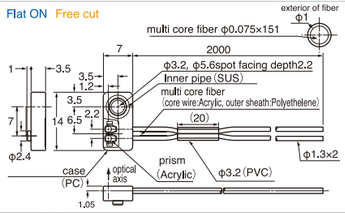
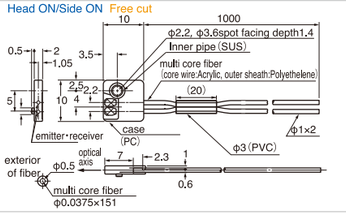
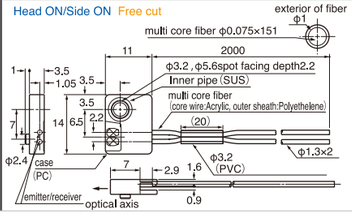
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | Square | Flat ON Free cut   | 7-EL 1,890<br>6-UL 1,770<br>5-PL 1,540<br>4-LG 1,350<br>3-ST 880<br>2-FS 520<br>1-HS 170 | Long 900<br>Std 500<br>Fast 350 | 450 | −40～60 | R=1 | NF-TE03 |
| | | Flat ON/Head ON Free cut   | 7-EL 1,340<br>6-UL 1,260<br>5-PL 1,090<br>4-LG 960<br>3-ST 630<br>2-FS 390<br>1-HS 130 | Long 750<br>Std 450<br>Fast 250 | 300 | −40～60 | R=1 | NF-TE04 |
| | | Flat ON Free cut   ※Emitter&Receiver are symmetrical. | 7-EL 2,450<br>6-UL 2,300<br>5-PL 2,010<br>4-LG 1,710<br>3-ST 1,150<br>2-FS 650<br>1-HS 220 | Long 1,200<br>Std 650<br>Fast 330 | 500 | −40～60 | R=1 | NF-TR13 |
| | | Side ON Free cut   | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,600<br>4-LG 3,150<br>3-ST 2,000<br>2-FS 1,200<br>1-HS 540 | Long 2,700<br>Std 1,500<br>Fast 1,000 | 1,300 | −40～60 | R=1 | NF-TR12 |
| | | Head ON Free cut   | 7-EL 3,600<br>6-UL 3,600<br>5-PL 3,580<br>4-LG 3,060<br>3-ST 1,980<br>2-FS 1,350<br>1-HS 530 | Long 2,700<br>Std 1,600<br>Fast 850 | 1600 | −40～60 | R=1 | NF-TR11 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | M4 | φ1.48 Sleeve:40 mm Free cut   | 7-EL 140<br>6-UL 135<br>5-PL 110<br>4-LG 95<br>3-ST 65<br>2-FS 30<br>1-HS 10 | Long 60<br>Std 35<br>Fast 17 | 30 | −40～60 | Fiber R=1 Sleeve R=10 | NF-DR10 |
| | φ3 | φ2 Sleeve:15 mm Sideview Free cut   | 7-EL 53<br>6-UL 50<br>5-PL 43<br>4-LG 36<br>3-ST 20<br>2-FS 12<br>1-HS 4 | Long 25<br>Std 12<br>Fast 5 | 10 | −40～60 | R=1 | NF-DR12 |
| | Square | Long distance detection Free cut   | 7-EL 1,070<br>6-UL 990<br>5-PL 880<br>4-LG 770<br>3-ST 500<br>2-FS 310<br>1-HS 90 | Long 600<br>Std 380<br>Fast 200 | 250 | −40～60 | R=1 | NF-DR09 |
| | | Flat ON Free cut   | 7-EL 140<br>6-UL 135<br>5-PL 110<br>4-LG 99<br>3-ST 70<br>2-FS 34<br>1-HS 10 | Long 60<br>Std 30<br>Fast 10～16 | 30 | −40～60 | R=1 | NF-DE01 |
| | | Flat ON Free cut   | 7-EL 490<br>6-UL 450<br>5-PL 400<br>4-LG 350<br>3-ST 225<br>2-FS 117<br>1-HS 41 | Long 250<br>Std 100<br>Fast 60 | 100 | −40～60 | R=1 | NF-DE03 |
| | | Head ON/Side ON Free cut   | 7-EL 160<br>6-UL 150<br>5-PL 130<br>4-LG 117<br>3-ST 77<br>2-FS 43<br>1-HS 12 | Long 65<br>Std 35<br>Fast 20 | 30 | −40～60 | R=1 | NF-DE02 |
| | | Head ON/Side ON Free cut   | 7-EL 480<br>6-UL 450<br>5-PL 390<br>4-LG 340<br>3-ST 225<br>2-FS 117<br>1-HS 45 | Long 250<br>Std 120<br>Fast 80 | 100 | −40～60 | R=1 | NF-DE04 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

# FLEXIBLE R2mm

Flexibility of the fiber and the right angled head shape make installation very easy.

## Space saving and flexible mounting

Please use flexible R2mm type with thread when you need space saving and easy installation. We have thru-beam type and diffuse type.

Thru-beam
NF02-TK

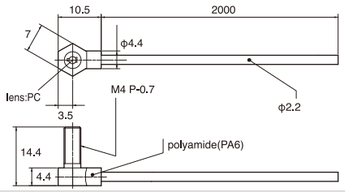
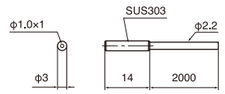
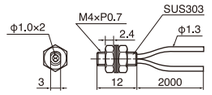
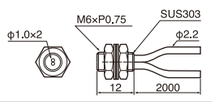
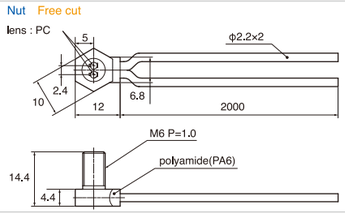
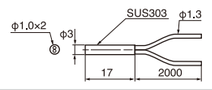
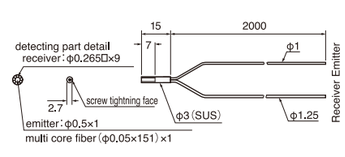
Diffuse
NF02-DK

Straight type

Threaded right angle type

Thread type can be installed saving space.

## Specifications (Thru-beam/Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | M4 | Nut Free cut   | 7-EL 2,000 6-UL 1,000 5-PL 950 4-LG 800 3-ST 550 2-FS 250 1-HS 80 | Long 600 Std 500 Fast 150 | 270 | −40～70 | R=2 | NF02-TK |
| | φ3 | Free cut   | 7-EL 4,000 6-UL 2,000 5-PL 1,600 4-LG 1,400 3-ST 1,000 2-FS 550 1-HS 180 | Long 800 Std 400 Fast 200 | 360 | −40～70 | R=2 | NF-TK05 |
| Diffuse | M4 | Free cut   | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80 | Long 300 Std 180 Fast 80 | 110 | −40～70 | R=2 | NF-DK66 |
| | M6 | Free cut   | 7-EL 1,200 6-UL 750 5-PL 650 4-LG 550 3-ST 400 2-FS 250 1-HS 80 | Long 300 Std 180 Fast 80 | 110 | −40～70 | R=2 | NF-DK67 |
| | M6 | Nut Free cut   | 7-EL 550 6-UL 330 5-PL 230 4-LG 200 3-ST 150 2-FS 90 1-HS 18 | Long 65 Std 45 Fast 10 | 15 | −40～70 | R=2 | NF02-DK |
| | φ3 | Free cut   | 7-EL 850 6-UL 550 5-PL 450 4-LG 375 3-ST 275 2-FS 170 1-HS 55 | Long 65 Std 45 Fast 10 | 110 | −40～70 | R=2 | NF-DK04Z |
| | φ3 | Coaxial Free cut   | 7-EL 270 6-UL 250 5-PL 210 4-LG 180 3-ST 120 2-FS 80 1-HS 20 | Long 120 Std 70 Fast 35 | 55 | −40～60 | R=2 | NF-DR11 |

Operating humidity is 35~85%RH. Please use in 0~40°C when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

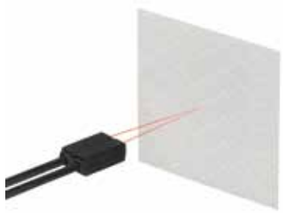
# RETRO-REFLECTIVE

- Retro-reflective type for detecting transparent object.
- Super thin type for wafer mapping.

## Detects transparent object

NF-RRO1 can detect transparent objects without being affected by shiny glass tilted surface because of its built in polarizing filter. Narrow view version NF-RB01 and NF-R02 are also available.

NF-RR01



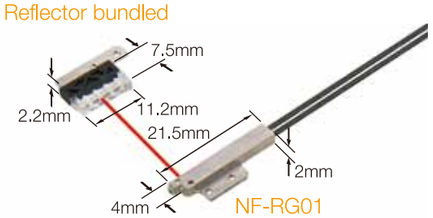
NF-RB01

NF-RB02

## Wafer mapping

Super thin 2mm height Retro-reflective type enables wafer mapping saving space.

Reflector bundled

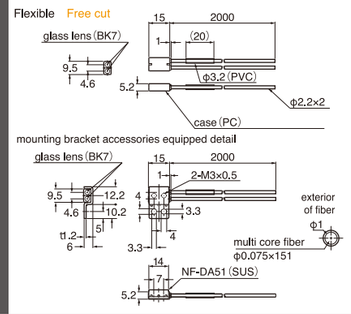
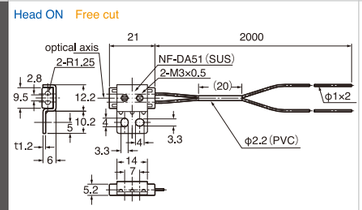
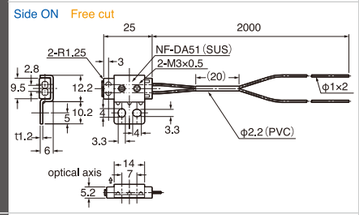
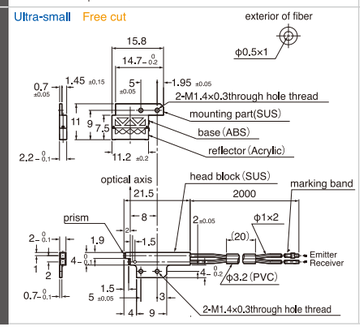








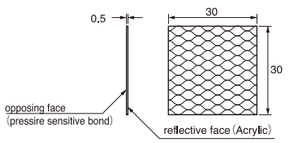

## Specifications (Polarizing Filter Built in/Narrow Beam/Wafer Mapping)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Polarized filter built in | Flexible Free cut<br>  <br> | 7-EL 1,390<br>6-UL 1,300<br>5-PL 1,140<br>4-LG 990<br>3-ST 640<br>2-FS 520<br>1-HS 260 | Long 850<br>Std 750<br>Fast 10～550 | 600 | −25～55 | R=1 | NF-RR01 |
| Narrow beam | Head ON Free cut<br>  <br> | 7-EL 440<br>6-UL 410<br>5-PL 360<br>4-LG 310<br>3-ST 200<br>2-FS 170<br>1-HS 95 | Long 250<br>Std 200<br>Fast 200 | 200 | −40～60 | R=10 | NF-RB01 |
| | Side ON Free cut<br>  <br> | 7-EL 410<br>6-UL 380<br>5-PL 340<br>4-LG 290<br>3-ST 180<br>2-FS 150<br>1-HS 90 | Long 250<br>Std 200<br>Fast 200 | 200 | −40～60 | R=10 | NF-RB02 |
| Wafer mapping | Ultra-small Free cut<br>  <br> | 7-EL 590<br>6-UL 550<br>5-PL 480<br>4-LG 420<br>3-ST 270<br>2-FS 180<br>1-HS 70 | Long 350<br>Std 230<br>Fast 130 | N.A. | −40～60 | R=10 | NF-RG01 |

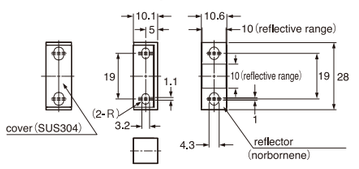
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Reflector dimentions

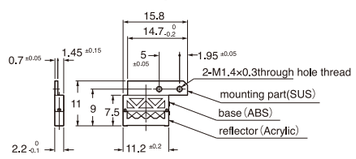
DG3030
(Standard accessory for NF-RR01)




P31
(Standard accessory for NF-RB01, -RB02)




Reflector for NF-RG01
(Standard accessory for NF-RG01)



# SMALL FOCUSED BEAM

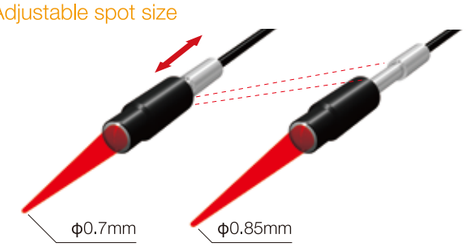
## Very tiny focused spot beam for detecting small objects

### Detects small object by fine spot focus beam

Fine spot lens NF-DA03 and coaxial diffuse fiber unit NF-DK21 enables 0.2mm Dia. Spot.

### Adjustable spot size

You can adjust spot size, 0.7~0.85mm, by changing length of fiber inserted in the lens NF-DA06, 20 +/- 1.5mm. Space saving Side-beam type NF-DA07 is available.



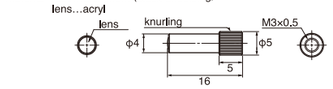
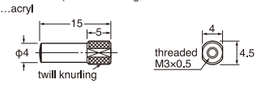
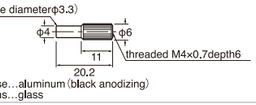
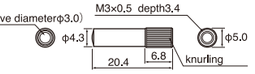
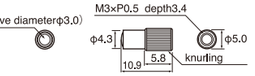
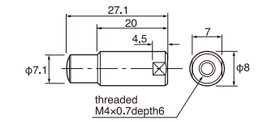
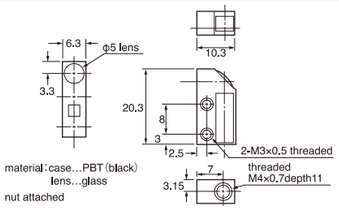

### Detects small object by fine fiber core

0.125mm Dia. fiber core is built in NF-TP01 and NF-DP01 that enables detecting small object. The sleeve provides easy position adjustment.

NF-TP01 Thru-beam

NF-DP01 Diffuse

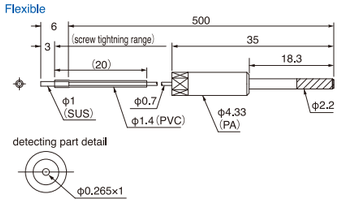
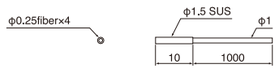
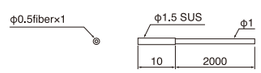
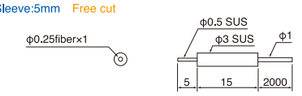
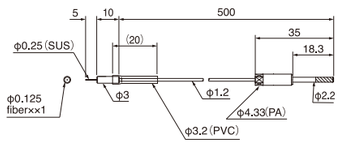
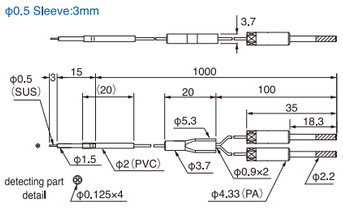
## Specifications (Diffuse)

| | Sensing head | Spot Size and applicable fibers (Min. detected object in parenthesized) | Center sensing distance (unit=mm) | Operation temperature (℃～℃) | Part Number |
|---|---|---|---|---|---|
| Very small spot | material：case…aluminum (black anodizing)<br>lens…acryl<br>  | ϕ0.2mm @ NF-DK21<br>ϕ0.4mm @ NF-DT01<br>(ϕ0.005mm gold-coated wire) | 7 | −20～60 | NF-DA03 |
| | material：case…aluminum (black anodizing)<br>lens…acryl<br>  | ϕ0.3mm @ NF-DK21<br>ϕ0.5mm @ NF-DT01<br>(ϕ0.005mm gold-coated wire) | 7.5 | −40～70 | NF-DA04 |
| Small spot | lens (effective diameterϕ3.3)<br>  <br>material：case…aluminum (black anodizing)<br>lens…glass | ϕ0.5mm @ NF-DM02<br>(ϕ0.005mm gold-coated wire) | 6 | −40～70 | NF-DA05 |
| | lens (effective diameterϕ3.0)<br>  | ϕ0.2mm @ NF-DK21<br>(ϕ0.005 gold-coated wire)<br>ϕ0.4mm @ NF-DT01<br>(ϕ0.01mm gold-coated wire) | 6 | −40～70 | NF-DA01 |
| | lens (effective diameterϕ3.0)<br>  | ϕ1.2mm @ NF-DK21<br>(ϕ0.005mm gold-coated wire)<br>ϕ1.4mm @ NF-DT01<br>(ϕ0.01mm gold-coated wire) | 15 | −40～70 | NF-DA02 |
| Spot size adjust lens |  <br>material：case…aluminum (black anodizing)<br>lens…glass | ϕ0.7mm - 0.85mm @ NF-DM02<br>(ϕ0.2mm gold-coated wire) | about 20 | −40～70 | NF-DA06 |
| Spot size adjust lens side view |  <br>material：case…PBT (black)<br>lens…glass<br>nut attached | ϕ0.5mm - 0.8mm @ NF-DM02<br>(ϕ0.1mm gold-coated wire) | about 14 | −40～70 | NF-DA07 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

Thin and Tiny objects detected with diffuse fibers become easier to detect under higher sensitivity with longer response times or by boosting power of the emitter.

## Specifications (Thru-beam/Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | φ1 | Flexible   | 7-EL 54 6-UL 50 5-PL 44 4-LG 38 3-ST 25 2-FS 15 1-HS 5 | Long 30 Std 18 Fast 8 | 10 | −40～60 | R=4 | NF-TR04 |
| | φ1.5 | Flexible Free cut   | 7-EL 850 6-UL 550 5-PL 450 4-LG 400 / 3-ST 275 2-FS 150 1-HS 50 | Long 350 Std 200 Fast 90 | 110 | −40～70 | R=4 | NF-TR03 |
| | | Free cut   | 7-EL 900 6-UL 550 5-PL 400 4-LG 350 / 3-ST 250 2-FS 140 1-HS 45 | Long 350 Std 200 Fast 90 | 120 | −40～70 | R=15 | NF-TM03 |
| | φ3 | φ0.5 Sleeve:5mm Free cut   | 7-EL 170 6-UL 110 5-PL 80 4-LG 70 / 3-ST 50 2-FS 140 1-HS 45 | Long 80 Std 40 Fast 20 | 30 | −40～70 | R=15 | NF-TT01 |
| | | φ0.25 Super-slim Sleeve:5mm   | 7-EL 27 6-UL 25 5-PL 21 4-LG 18 3-ST 12 2-FS 7 1-HS 2 | Long 6 Std 3.5 Fast 2 | 1 | −40～70 | R=5 | NF-TP01 |
| Diffuse | φ1.5 | φ0.5 Sleeve:3mm   | 7-EL 28 6-UL 26 5-PL 23 4-LG 20 3-ST 13 2-FS 3 1-HS 1 | Long 18 Std 5 Fast N.A. | 3 | −40～60 | R=10 | NF-DP01 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.





# SCREEN BEAM ARRAY

## NF-TS40 series

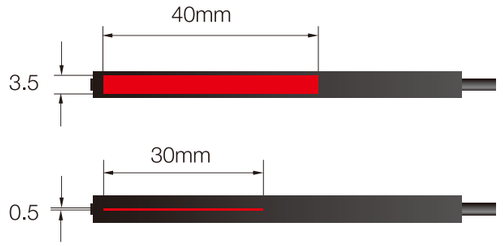
40 x 3.5mm Beam Array type with SUS (stainless steel) mounting metal.

### SUS ( stainless steel ) mounting

A rugged Stainless Steel mounting enables tough tightening of mounting position without breaking the mounting hole.

### Adjustable line beam

40 x 3.5mm area of Beam Array is possible to change by using optional slit that limits the array into 30 x 0.5mm

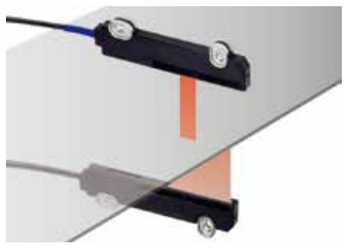



### Fine sensing of 0.4mm diameter

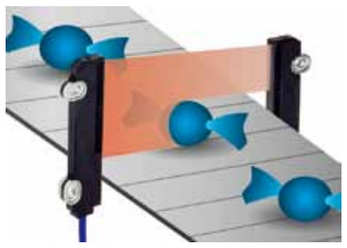
The Clear optical system of the NF-TS40 ensures 0.4mm diameter detection at a 3500mm sensing distance (with D3RF amplifier)

## Applications

Control of dropping pills

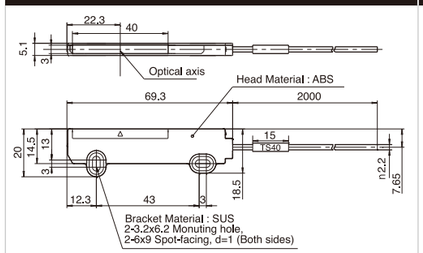


Control of meandering sheet



Counting on a conveyor

## Specifications (Thru-beam/Diffuse)

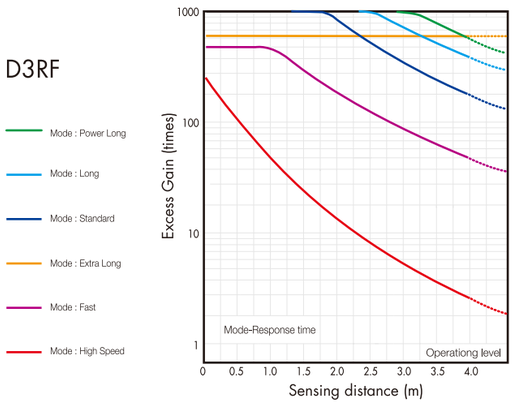
| Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃~℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|
|  | 7-EL 3,500<br>6-UL 3,500<br>5-PL 3,500<br>4-LG 3,500<br>3-ST 3,500<br>2-FS 3,000<br>1-HS 2,500 | Long 3,600<br>Std 3,600<br>Fast 3,000 | 3,600 | −40~70 | R=2 | NF-TS40 |



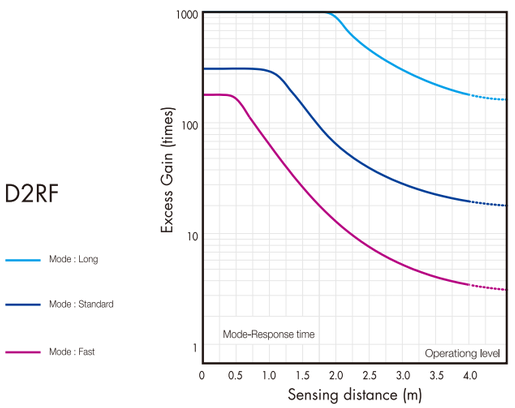
| Model | NF-TS40 |
|---|---|
| Sensing Range (D3RF amplifier) | 0 - 3500mm |
| Spot Size | W40 × H3.5 @ 0mm |
| Bending Radius | R2 |
| Fiber Lengfth | 2000mm Free cut |
| Ambient Temp | −40~+60℃ |
| Storage Temp | −40~+70℃ |
| Demensions ( W × D × H ) | 69.3 × 20 × 5.1 mm |
| Material | Base , Cover : ABS Fiber : PMMA |
| Torque | 3kgfcm max. |
| Weight | 30g |

## Excess Gain Curves (Typical Value)

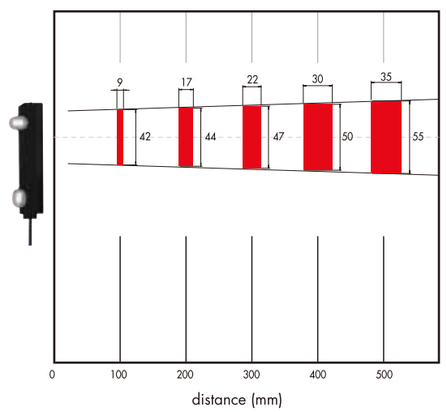
D3RF




D2RF




## Spot size







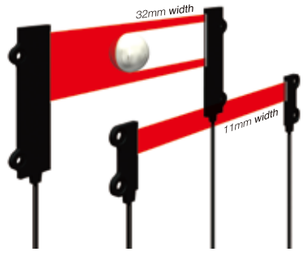



# Screen array

It can detect object going through an area utilizing beam screen. It's effective when the position of the object goes through is not stable. We have 11mm width and 32mm width types.

NF-DZ01 is head ON type screen array, 2×15mm,fiber unit that can detect object with holes.

NF-TZ01
NF-TZ02




NF-TZ03
NF-TZ04

Lead frame

Slit masks can be used to shorten detection distance and for very small object detection.

The screen array beam is very collimated which helps prevent cross talk between sensors.

# Beam array

Beam array fibers that have core fibers aligned are also available.

**Thru-beam type**

NF-TZ05 Head ON

NF-TZ06 Side ON

**Diffuse type**

NF-DZ02 Head ON

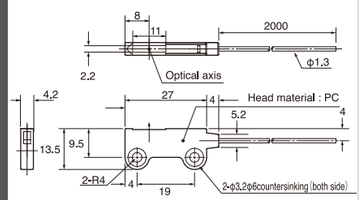
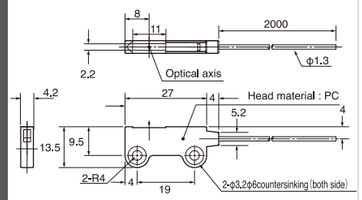
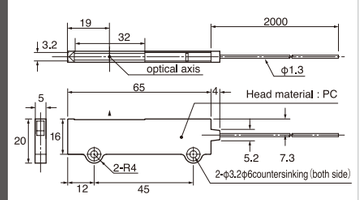
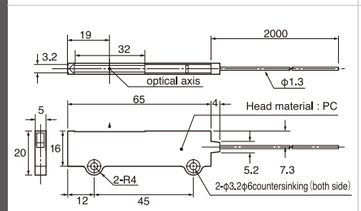
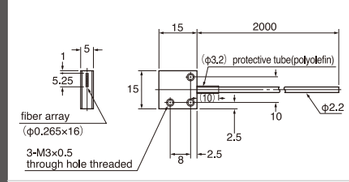
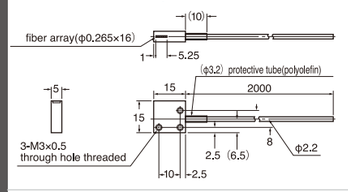
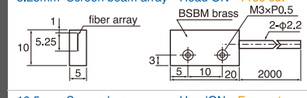
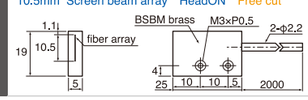
NF-DZ03 Side ON

NF-TS10 Head ON

NF-TS14 Head ON

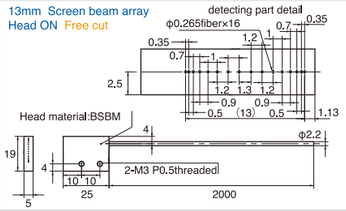
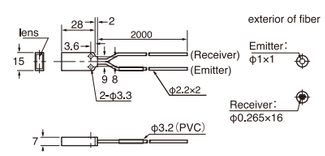
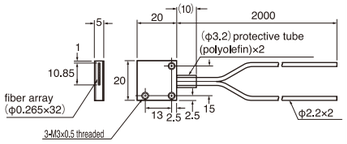
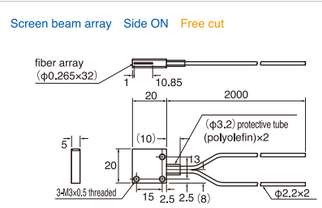
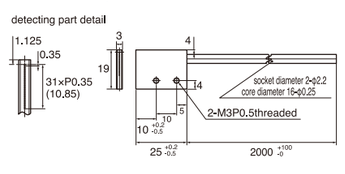
FD-ML02

# Specifications (Thru-beam)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam |  | 7-EL 3,700<br>6-UL 3,000<br>5-PL 3,000<br>4-LG 2,200<br>3-ST 2,500<br>2-FS 2,000<br>1-HS 1,500 | Long 3,500<br>Std 2,500<br>Fast 1,800 | 2,500 | −40～70 | R=2 | NF-TZ10 |
| |  | 7-EL 3,700<br>6-UL 3,000<br>5-PL 3,000<br>4-LG 3,000<br>3-ST 2,500<br>2-FS 2,000<br>1-HS 1,000 | Long 3,000<br>Std 2,500<br>Fast 1,200 | 2,000 | −40～55 | R=1 | NF-TZ09 |
| |  | 7-EL 3,700<br>6-UL 3,700<br>5-PL 3,700<br>4-LG 3,700<br>3-ST 3,700<br>2-FS 3,000<br>1-HS 2,500 | Long 3,700<br>Std 3,000<br>Fast 2,500 | 2,500 | −40～60 | R=2 | NF-TZ08 |
| |  | 7-EL 3,700<br>6-UL 3,700<br>5-PL 3,700<br>4-LG 3,700<br>3-ST 3,700<br>2-FS 3,000<br>1-HS 2,500 | Long 3,700<br>Std 3,000<br>Fast 2,500 | 2,500 | −40～55 | R=1 | NF-TZ07 |
| | 5.25mm Screen beam array Head ON Free cut<br>  | 7-EL 1,350<br>6-UL 1,260<br>5-PL 1,170<br>4-LG 990<br>3-ST 660<br>2-FS 400<br>1-HS 130 | Long 650<br>Std 400<br>Fast 250 | 300 | −40～70 | R=25 | NF-TZ05 |
| | 5.25mm Screen beam array Side ON Free cut<br>  | 7-EL 1,440<br>6-UL 1,350<br>5-PL 1,170<br>4-LG 1,080<br>3-ST 710<br>2-FS 430<br>1-HS 130 | Long 650<br>Std 400<br>Fast 250 | 300 | −40～70 | R=25 | NF-TZ06 |
| | 5.25mm Screen beam array Head ON Free cut<br>  | 7-EL 4,000<br>6-UL 1,600<br>5-PL 1,000<br>4-LG 900<br>3-ST 650<br>2-FS 330<br>1-HS 100 | Long 800<br>Std 500<br>Fast 250 | 330 | −40～70 | R=25 | NF-TS10 |
| | 10.5mm Screen beam array HeadON Free cut<br>  | 7-EL 4,000<br>6-UL 1,600<br>5-PL 1,000<br>4-LG 900<br>3-ST 650<br>2-FS 330<br>1-HS 100 | Long 800<br>Std 500<br>Fast 250 | 330 | −40～70 | R=25 | NF-TS14 |

Operating humidity is 35~85%RH. Please use in 0~40°C when it's 85%RH.

# Specifications (Thru-beam/Diffuse)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam | 13mm Screen beam array Head ON Free cut<br>  | 7-EL 4,000<br>6-UL 1,500<br>5-PL 1,400<br>4-LG 1,200<br>3-ST 800<br>2-FS 400<br>1-HS 100 | Long 850<br>Std 500<br>Fast 250 | 350 | −40～70 | R=25 | NF-TS28 |
| Diffuse | Screen beam array Head ON Free cut<br>  | 7-EL 620<br>6-UL 580<br>5-PL 500<br>4-LG 440<br>3-ST 280<br>2-FS 210<br>1-HS 59 | Long 350<br>Std 250<br>Fast 100 | N.A. | −40～60 | R=25 | NF-DZ01 |
| | Screen beam array Head ON Free cut<br>  | 7-EL 600<br>6-UL 560<br>5-PL 490<br>4-LG 430<br>3-ST 270<br>2-FS 170<br>1-HS 51 | Long 320<br>Std 170<br>Fast 85 | 130 | −40～70 | R=25 | NF-DZ02 |
| | Screen beam array Side ON Free cut<br>  | 7-EL 530<br>6-UL 500<br>5-PL 440<br>4-LG 370<br>3-ST 250<br>2-FS 140<br>1-HS 45 | Long 320<br>Std 170<br>Fast 85 | 100 | −40～70 | R=25 | NF-DZ03 |
| | Screen beam array Head ON Free cut<br>detecting part detail<br>  | 7-EL 950<br>6-UL 500<br>5-PL 450<br>4-LG 400<br>3-ST 250<br>2-FS 100<br>1-HS 40 | Long 300<br>Std 180<br>Fast 80 | 35 | −40～70 | R=25 | FD-ML02 |

Operating humidity is 35~85%RH. Please use in 0~40°C when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

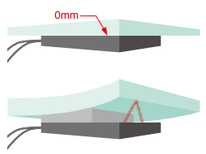
# LIMITED DIFFUSE

## NF-DC38 / DC39 series

Despite the sensor's thin-flat mechanical design it is excellent in canceling optical influence from background material. Best-in-class Excess Gain is not easily affected by colors of objects.

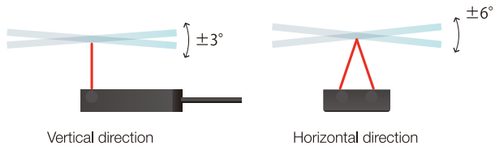
### From "0mm" distance (NF-DC39)

NF-DC39 has no dead zone at all.
Clear glass objects are possible to detect in 0-4 mm distance.

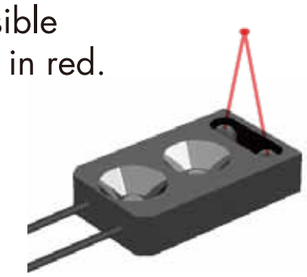



### Not Affected by change in angle

Vibration of glass/silicon object in 3 – 6 degree does not matter.
Fine optical system secures stable sensing.

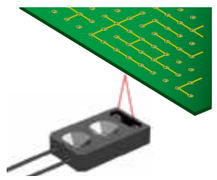



### Clearly visible circle spot in red.

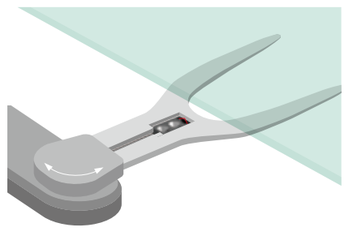


### 4mm wide spot (NF-DC39)

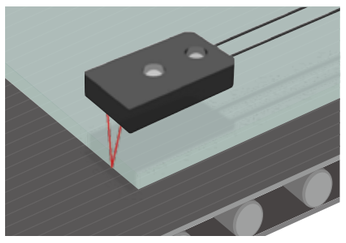
NF-DC39 has 4mm size spot that is applicable to PCB/PWB with holes.



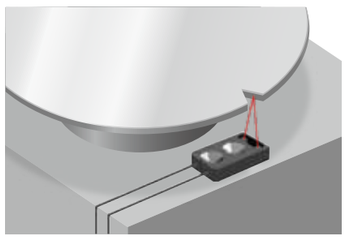
## Applications



Edge Detection of Quartz Sheet



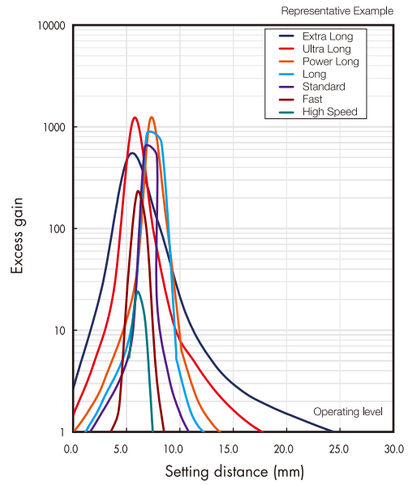
Edge Alignment on conveyor



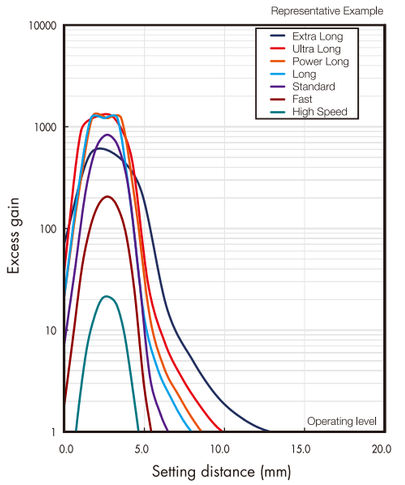
Notch Detection

## Excess Gain Curves (Typical Value)

**NF-DC38**

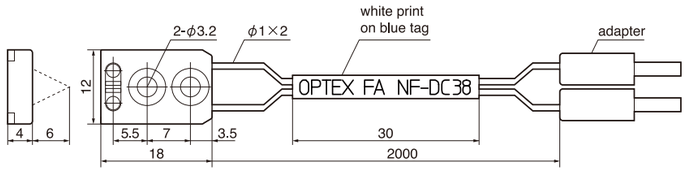



**NF-DC39**

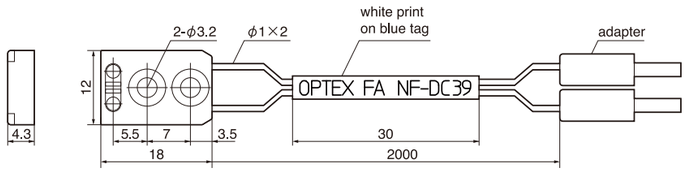


## Dimensions (mm)

**NF-DC38**




**NF-DC39**




## Specifications

| Model | NF-DC38 | NF-DC39 |
|---|---|---|
| Sensing Range (D3RF amplifier) | 6mm around | 0 - 4mm |
| Spot Size | φ1.5mm @ 6mm | φ4mm @ 4mm |
| Bending Radius | R10 | |
| Fiber Lengfth | 2000mm Free cut | |
| Ambient Temp | −40～+60℃ | |
| Storage Temp | −40～+70℃ | |
| Demensions ( W × D × H ) | 12 × 18 × 4 mm | 12 × 18 × 4.3 mm |
| Material | Base , Cover : PC Fiber : PMMA | |
| Torque | 3kgfcm max. | |
| Weight | 7g | |

## Sensing distance

**NF-DC38**

| Value in parenthesis is the Minimum detectable object size. (copper wire) | | | Operation temperature (℃～℃) | Radius (mm) |
|---|---|---|---|---|
| D3RF | | D2RF | BRF | |
| 7-EL 0～12 | 3-ST 2.5～8 | Long 2～9 | 3.5～7 | −40～60 | R=10 |
| 6-UL 0.5～11 | 2-FS 3.5～7.5 | Std 4～8 | | | |
| 5-PL 1.5～10 | 1-HS 4.5～6 | Fast 5～6 | | | |
| 4-LG 1.5～10 | | | | | |

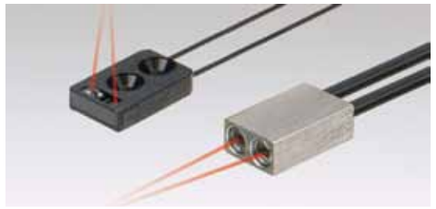
**NF-DC39**

| Value in parenthesis is the Minimum detectable object size. (copper wire) | | | Operation temperature (℃～℃) | Radius (mm) |
|---|---|---|---|---|
| D3RF | | D2RF | BRF | |
| 7-EL 1.5～4 | 3-ST 0～4 | Long 0～4 | 0～4 | −40～60 | R=10 |
| 6-UL 0～4 | 2-FS 0～4 | Std 0～4 | | | |
| 5-PL 0～4 | 1-HS 0～4 | Fast 0～4 | | | |
| 4-LG 0～4 | | | | | |





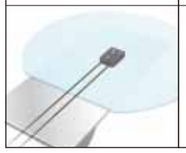
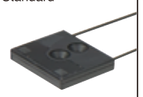


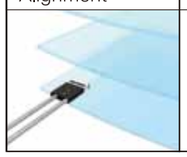


Convergent Beam enables detection of an object at a well defined sensing area.

# Detects glass surface

We have 5 types for detecting existence, 5 types for alignment and one for mapping.
You can choose Bend-tolerance type, Heat resistance type and vacuum resistance type.

| Presence | NF-DC38 | NF-DC39 | NF-DC07 | NF-DH08 | NF-DH06 | NF-DN02 |
|---|---|---|---|---|---|---|
|  | Low cost | | Standard  | Heat resistant 180°C | Heat resistant 300°C | vacuum resistant･Heat resistant 300°C |

| Alignment | NF-DC05 | NF-DC06 | NF-DC04 | NF-DH10 | NF-DH11 |
|---|---|---|---|---|---|
|  | Standard for warp / slant of glass | Flexible for warp / slant of glass | Flexible longer distance | Heat resistant 250°C for warp / slant of glass | Heat resistant 300°C for warp / slant of glass |

| Mapping | NF-DC03 |
|---|---|
| | Standard glass plate of 0.5mm |

# For General purpose

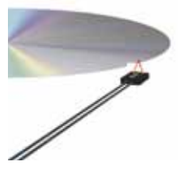
NF-DC09 (head ON)

NF-DC08 (flat ON)

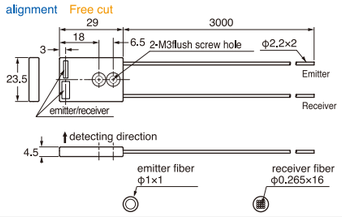
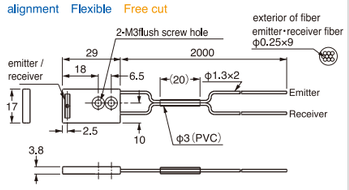
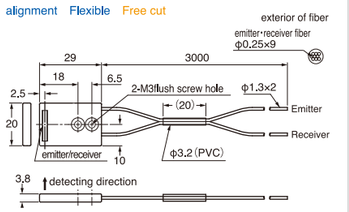
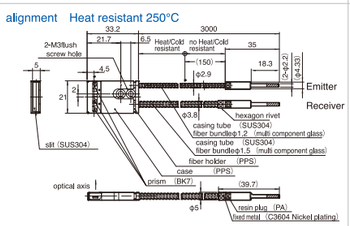
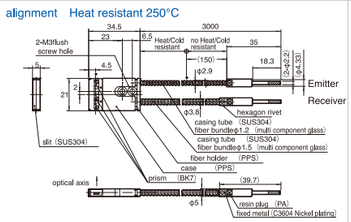
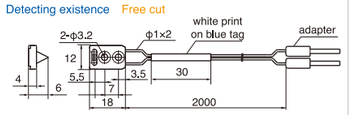
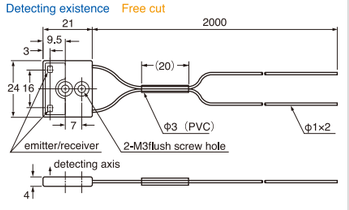
NF-DC39 (flat ON)

Detecting Cap side

Detecting FOUP

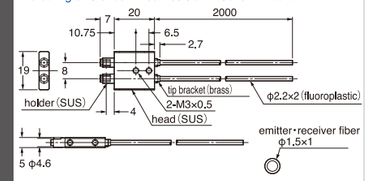
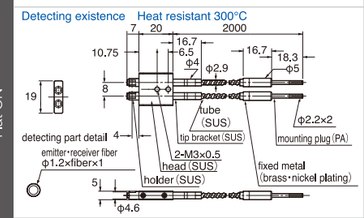
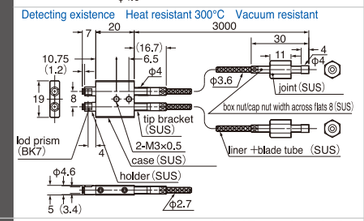
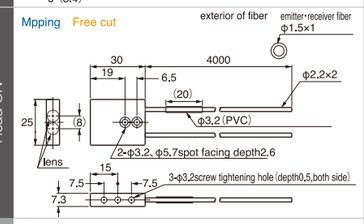
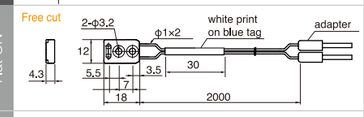
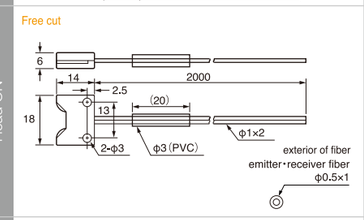
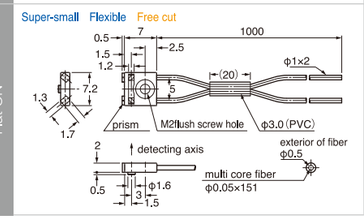
Detecting wafer notch


# Specifications (Detect Glass)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Detect glass / Flat on | alignment Free cut   | 7-EL 3～44 6-UL 4～39 5-PL 4～38 4-LG 4～37 3-ST 4～35 2-FS 6～29 1-HS 9～18 | Long 7～32 Std 10～25 Fast 10～18 | 15 | 0～70 | R=25 | NF-DC05 |
| | alignment Flexible Free cut   | 7-EL 0～23 6-UL 0～23 5-PL 0～22 4-LG 0～22 3-ST 0～21 2-FS 0～20 1-HS 5～13 | Long 0～23 Std 0～17 Fast 0～12 | 15 | 0～70 | R=4 | NF-DC06 |
| | alignment Flexible Free cut   | 7-EL 0～38 6-UL 0～38 5-PL 0～38 4-LG 0～38 3-ST 0～34 2-FS 0～31 1-HS 4～22 | Long 0～36 Std 0～30 Fast 0～15 | N.A. | 0～70 | R=4 | NF-DC04 |
| | alignment Heat resistant 250°C   | 7-EL 2～28 6-UL 2～24 5-PL 2～23 4-LG 3～23 3-ST 3～20 2-FS 3～18 1-HS 4～11 | Long 4～20 Std 4～20 Fast 4～15 | 4～17 | −20～250 (normal temperature side: −20～70) | R=25 | NF-DH10 |
| | alignment Heat resistant 250°C   | 7-EL 2～45 6-UL 3～40 5-PL 3～39 4-LG 3～38 3-ST 4～35 2-FS 6～28 1-HS 8～19 | Long 6～38 Std 7～30 Fast 8～25 | 8～25 | −20～250 normal temperature side: −20～70) | R=25 | NF-DH11 |
| | Detecting existence Free cut   | 7-EL 0～12 6-UL 0.5～12 5-PL 1.5～10 4-LG 1.5～10 | 3-ST 2.5～8 2-FS 3.5～7.5 1-HS 4.5～6 | Long 2～9 Std 4～8 Fast 5～6 | 3.5～7 | −40～60 | R=10 | NF-DC38 |
| | Detecting existence Free cut   | 7-EL 3～16 6-UL 3～14 5-PL 4～14 4-LG 5～14 3-ST 5～13 2-FS 5～11 1-HS 7～8 | Long 4～15 Std 5～12 Fast 7～10 | 7 | −40～60 | R=10 | NF-DC07 |

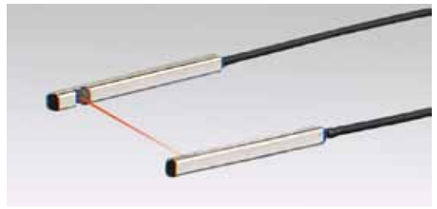
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Detect Glass/General Purpose)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Detect glass / Flat ON | Detecting existence Heat resistant 180°C Free cut   | 7-EL 0～35 6-UL 0～28 5-PL 0～25 4-LG 0～22 3-ST 0～20 2-FS 0～9 1-HS 3～4 | Long 0～20 Std 0～10 Fast 0～8 | 10 | −60～180 | R=25 | NF-DH08 |
| | Detecting existence Heat resistant 300°C   | 7-EL 0～40 6-UL 0～34 5-PL 0～22 4-LG 0～18 3-ST 0～17 2-FS 0～9 1-HS 0～4 | Long 0～15 Std 0～10 Fast 0～8 | 6 | −30～300 または −60～200 | R=25 | NF-DH06 |
| | Detecting existence Heat resistant 300°C Vacuum resistant   | 7-EL 0～22 6-UL 0～12 5-PL 0～11 4-LG 0～9 3-ST 0～7 2-FS 3～4 1-HS N.A. | Long 0～8 Std 2.5～5 Fast N.A. | 3 | −30～300 | R=18 | NF-DN02 |
| Detect glass / Head ON | Mpping Free cut   | 7-EL 2～310 6-UL 3～160 5-PL 4～130 4-LG 5～120 3-ST 5～110 2-FS 10～95 1-HS 12～60 | Long 10～55 Std 10～45 Fast 13～35 | 55 | −40～60 | R=25 | NF-DC03 |
| General purpose / Flat ON | Free cut   | 7-EL 1.5～4 6-UL 0～4 5-PL 0～4 4-LG 0～4 | 3-ST 0～4 2-FS 0～4 1-HS 0～4 | Long 0～4 Std 0～4 Fast 0～4 | 0～4 | −40～60 | R=10 | NF-DC39 |
| General purpose / Head ON | Free cut   | 7-EL 0～15 6-UL 5～12 5-PL 5～11 4-LG 6～11 3-ST 6～10 2-FS 7～9 1-HS 6～7 | Long 4.5～11 Std 4.5～10 Fast 4.5～10 | 6 | −40～70 | R=10 | NF-DC09 |
| Flat ON | Super-small Flexible Free cut   | 7-EL 0～9 6-UL 0～8 5-PL 0～7 4-LG 0～6 3-ST 0～5 2-FS 0～3 1-HS 0～2 | Long 1～7 Std 1～5.5 Fast 1～3 | 3 | −20～60 | R=1 | NF-DC08 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

# NARROW BEAM , WAFER MAPPING

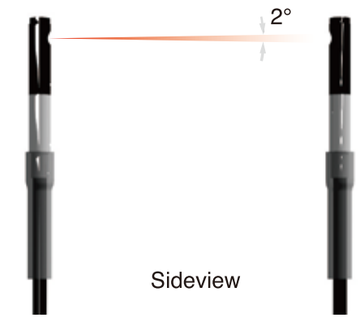


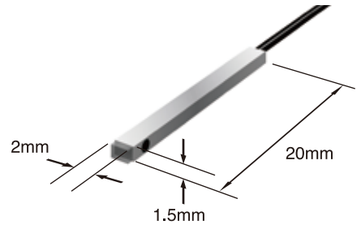
Ultra-narrow aperture light angle provides narrowest beam in a ultra-thin and ultra-compact size. Cross talk is reduced.

## Super narrow beam and super thin type

Super narrow view type: Aperture is 2°max.
Ideal for wafer mapping.
Straight type: NF-TG01
Side type: NF-TG02,03

NF-TG04 features ultra-compact size sensing head (2mm x 1.5mm) and ultra-narrow 3 degree aperture for minimum object detection of 0.02mm diameter.

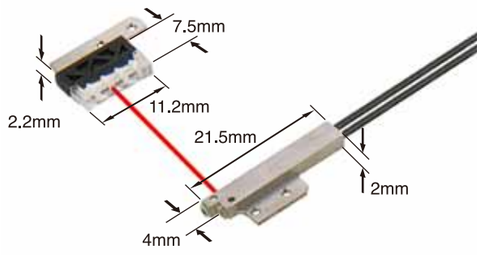



## Retro-reflective and diffuse type

Super thin 2mm height Retro-reflective type enables wafer mapping saving space.

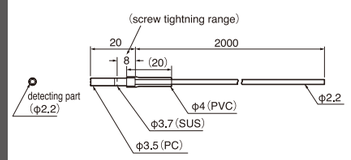
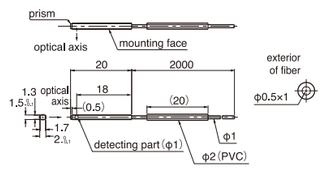
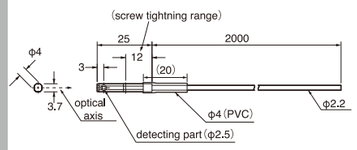
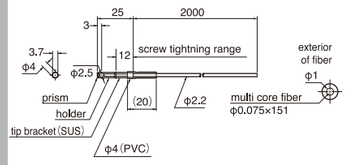
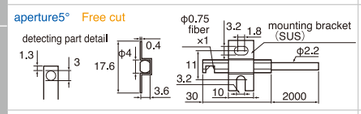
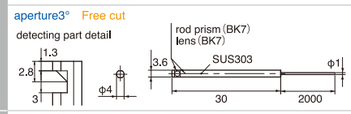
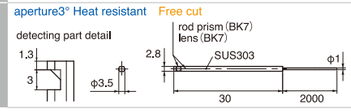
Retro-reflective type
NF-RG01




Diffuse type
NF-DR09

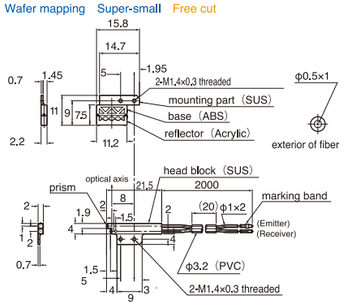
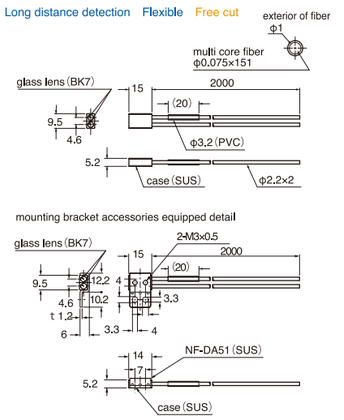
Amplifiers
Various Shapes for mounting
Tight Bend / High-Flex
Various Detecting Modes
Environment-resistant
Liquid
Extension lens
Notes

## Specifications (Thru-beam/Thru-beam Side)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | ϕ3.7 | aperture2° Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,200 3-ST 2,100 2-FS 2,000 1-HS 790 | Long 3,000 Std 2,000 Fast 1,300 | 2,300 | −40～70 | R=25 | NF-TG01 |
| Thru-beam side | 2×1.5 | aperture3° Free cut   | 7-EL 1,000 6-UL 900 5-PL 790 4-LG 690 3-ST 450 2-FS 260 1-HS 90 | Long 500 Std 300 Fast 150 | 220 | −40～55 | R=10 | NF-TG04 |
| | | aperture2° Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 3-ST 2,100 2-FS 1,780 1-HS 510 | Long 2,500 Std 1,600 Fast 800 | 900 | −40～60 | R=25 | NF-TG03 |
| | ϕ4 | aperture2° Flexible Free cut   | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,300 3-ST 2,100 2-FS 1,500 1-HS 520 | Long 2,500 Std 1,600 Fast 800 | 1,000 | −40～55 | R=1 | NF-TG02 |
| | | aperture5° Free cut   | 7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,000 3-ST 2,800 2-FS 2,000 1-HS 1,000 | Long 4,000 Std 3,000 Fast 2,000 | 1,700 | −40～70 | R=25 | NF-TS12 |
| | | aperture3° Free cut   | 7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,000 3-ST 2,000 2-FS 1,000 1-HS 300 | Long 3,000 Std 1,600 Fast 700 | 750 | −40～70 | R=25 | NF-TS22 |
| | ϕ3.5 | aperture3° Heat resistant Free cut   | 7-EL 3,500 6-UL 2,500 5-PL 2,300 4-LG 1,900 3-ST 1,300 2-FS 650 1-HS 200 | Long 1,200 Std 700 Fast 500 | 500 | −40～70 | R=10 | NF-TS22H |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Specifications (Thru-beam Side/Retro Reflective/Diffuse)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Retro reflective 4×2 | Wafer mapping Super-small Free cut   | 7-EL 590 6-UL 550 5-PL 480 4-LG 420 3-ST 270 2-FS 180 1-HS 70 | Long 350 Std 230 Fast 130 | N.A. | −40～60 | R=10 | NF-RG01 |
| Diffuse square | Long distance detection Flexible Free cut   | 7-EL 1,070 6-UL 990 5-PL 880 4-LG 770 3-ST 500 2-FS 310 1-HS 90 | Long 600 Std 380 Fast 200 | 250 | −40～70 | R=1 | NF-DR09 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.







# HEAT RESISTANT(up to130℃)

12 models to choose from featuring thrubeam and diffuse in both head-on and space saving side-view

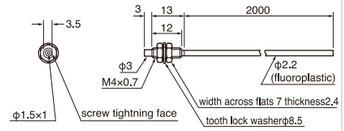
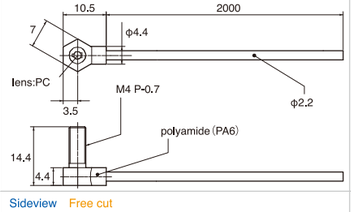
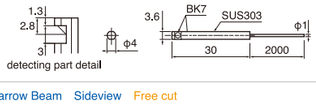
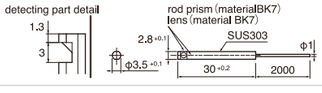
## Space saving

Heat resistant right angle type NF25-TH and NF25-DH help installing in limited space.

Straight type

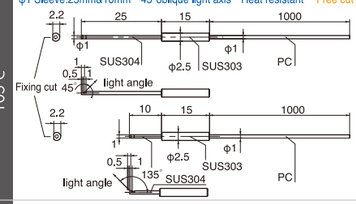
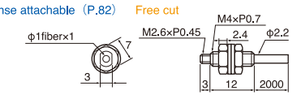
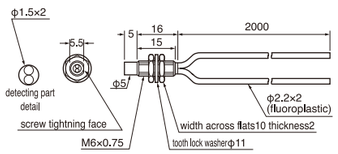
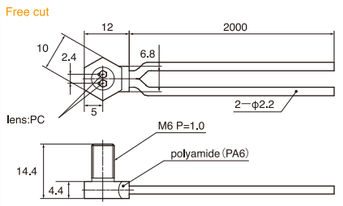
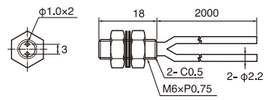
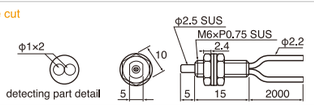
Right angle type

## Specifications (Thru-beam)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam 130℃ | Free cut   | 7-EL 2,100 6-UL 2,070 5-PL 1,800 4-LG 1,530 3-ST 990 2-FS 620 1-HS 200 | Long 1,100 Std 650 Fast 400 | 500 | −60～130 | R=25 | NF-TH17 |
| Thru-beam 105℃ | Nut Free cut   | 7-EL 2,000 6-UL 1,100 5-PL 1,000 4-LG 900 3-ST 600 2-FS 300 1-HS 90 | Long 750 Std 500 Fast 170 | 300 | −40～105 | R=25 | NF25-TH |
| | Sideview Free cut   | 7-EL 3,500 6-UL 2,300 5-PL 2,000 4-LG 1,800 / 3-ST 1,200 2-FS 600 1-HS 170 | Long 1,300 Std 700 Fast 400 | 500 | −40～105 | R=10 | NF-TS22M |
| | Narrow Beam Sideview Free cut   | 7-EL 3,500 6-UL 2,500 5-PL 2,300 4-LG 1,900 / 3-ST 1,300 2-FS 650 1-HS 200 | Long 1,200 Std 700 Fast 500 | 500 | −40～105 | R=10 | NF-TS22H |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH

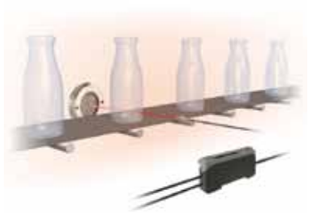
## Specifications (Thru-beam/Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | 105℃ | φ1 Sleeve:25mm&10mm 45°oblique light axis Heat resistant Free cut   | 7-EL 100 6-UL 55 5-PL 50 4-LG 40 3-ST 30 2-FS 10 1-HS 4 | Long 28 Std 20 Fast 15 | 16 | −40～105 | R=10 | NF-TH06 |
| | 100℃ | lense attachable (P.82) Free cut   | 7-EL 2,400 6-UL 1,400 5-PL 1,000 4-LG 900 3-ST 700 2-FS 300 1-HS 100 | Long 700 Std 400 Fast 200 | 300 | −40～100 | R=25 | NF-TH01 |
| Diffuse | 130℃ | Free cut   | 7-EL 720 6-UL 670 5-PL 580 4-LG 510 3-ST 330 2-FS 200 1-HS 63 | Long 350 Std 200 Fast 120 | 200 | −60～130 | R=25 | NF-DH09 |
| | 105℃ | Free cut   | 7-EL 650 6-UL 350 5-PL 280 4-LG 240 3-ST 175 2-FS 100 1-HS 25 | Long 120 Std 80 Fast 25 | 15 | −40～105 | R=25 | NF25-DH |
| | | Free cut   | 7-EL 950 6-UL 500 5-PL 450 4-LG 400 3-ST 250 2-FS 130 1-HS 40 | Long 300 Std 180 Fast 80 | 160 | −40～105 | R=25 | FD-3SD1(100) |
| | 100℃ | Free cut   | 7-EL 850 6-UL 550 5-PL 450 4-LG 375 3-ST 275 2-FS 170 1-HS 55 | Long 250 Std 150 Fast 50 | 110 | −40～100 | R=25 | NF-DH02 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

## Heat resistant reflector SW50

SW50 can be used with heat resistant Retro-reflective fiber unit in high temperature atmosphere.









# HEAT RESISTANT(up to 200℃)

14 models to choose from featuring thrubeam, diffuse and the new "joint type"

## Various selection

We have 14 types of heat resistant, 180~200℃, fiber units.

### Thru-beam (Standard)

| Head view | | | Sideview | | |
|---|---|---|---|---|---|
| NF-TH10 | NF-TH11 | NF-TH02 | NF-TH04S-27V2 | NF-TH05S-A | NF-TS27 |
| Heat resistant 200℃ | Heat resistant 200℃ | Heat resistant 180℃ | Heat resistant 200℃ | Heat resistant 200℃ | Heat resistant 200℃ |
| | | | | | |
| Lens atacchable | Lens atacchable | Free cut | φ1 Sleeve | φ1.5 Sleeve | Aperture2.5° |

### Thru-beam (Joint type)

| Head view | | | Sideview | |
|---|---|---|---|---|
| NF-TH12 | NF-TH13 | NF-TH14 | NF-TH15 | NF-TH16 |
| Heat resistant 200℃ | Heat resistant 200℃ | Heat resistant 200℃ | Heat resistant 200℃ | Heat resistant 200℃ |
| | | | | |
| Free cut | Free cut | Free cut | Free cut | Free cut |

*Freecut only at ordinary temp. part

### Diffuse

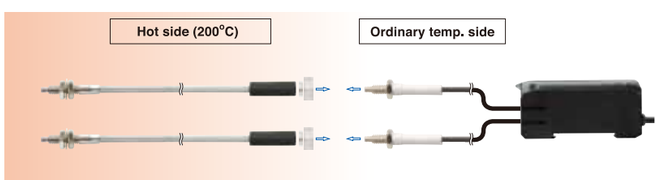
| Coaxial | Standard |
|---|---|
| NF-DH07 | NF-DH01 |
| Heat resistant 200℃ | Heat resistant 180℃ |
| | |
| Metal coated | Free cut |

### Limited Diffuse

| Detect glass |
|---|
| NF-DH08 |
| Heat resistant 180℃ |
| |
| Free cut |

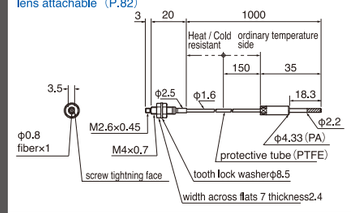
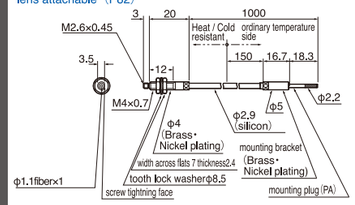
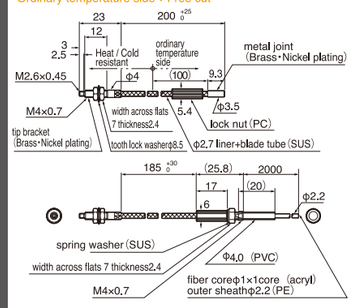
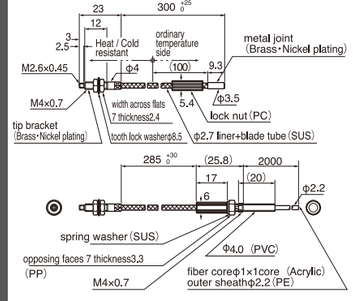
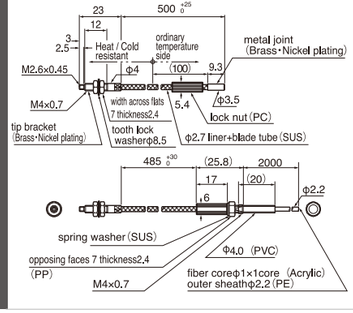
## New concept : Joint type

Heat-resistant fiber section is coupled with a standard cuttable fiber cable providing cut-to-length fiber cable installation.




Also available with heat-resistant side only (minus the standard cuttable fiber)

# Specifications (Thru-beam)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam 200℃ | lens attachable (P.82)<br>  | 7-EL 570<br>6-UL 540<br>5-PL 460<br>4-LG 410<br>3-ST 270<br>2-FS 160<br>1-HS 45 | Long 350<br>Std 180<br>Fast 85 | 110 | −60～200 | R=10 | NF-TH10 |
| | lens attachable (P82)<br>  | 7-EL 1,350<br>6-UL 1,260<br>5-PL 1,130<br>4-LG 990<br>3-ST 630<br>2-FS 360<br>1-HS 110 | Long 750<br>Std 450<br>Fast 220 | 280 | −60～200 | R=25 | NF-TH11 |
| | lens attachable (P.82) Heat proof side：200mm<br>Ordinary temperature side：Free cut<br>  | 7-EL 1,080<br>6-UL 990<br>5-PL 900<br>4-LG 790<br>3-ST 510<br>2-FS 290<br>1-HS 90 | Long 550<br>Std 350<br>Fast 170 | 220 | −60～200 | Heat proof part R=18<br>ordinary temperature part R=25 | NF-TH12 |
| | Heat proof side：300mm<br>Ordinary temperature side：Free cut<br>  | 7-EL 1,080<br>6-UL 990<br>5-PL 900<br>4-LG 790<br>3-ST 510<br>2-FS 290<br>1-HS 90 | Long 550<br>Std 350<br>Fast 170 | 220 | −60～200 | Heat proof part R=18<br>ordinary temperature part R=25 | NF-TH13 |
| | Heat proof side：500mm<br>Ordinary temperature side：Free cut<br>  | 7-EL 1,080<br>6-UL 990<br>5-PL 900<br>4-LG 790<br>3-ST 510<br>2-FS 290<br>1-HS 90 | Long 550<br>Std 350<br>Fast 170 | 220 | −60～200 | Heat proof part R=18<br>ordinary temperature part R=25 | NF-TH14 |

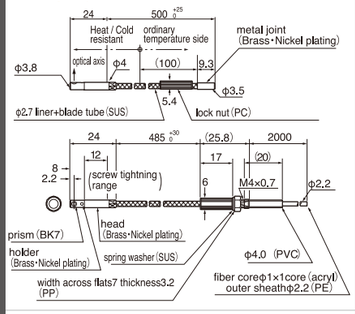
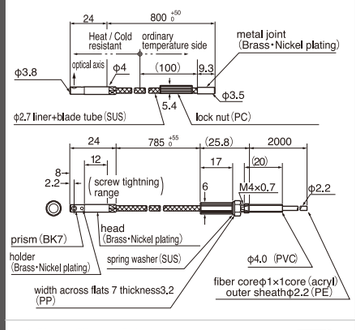
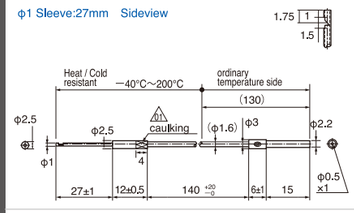
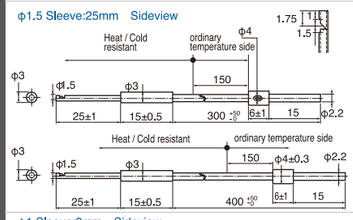
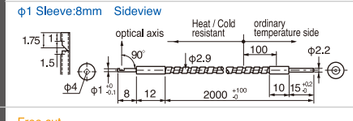
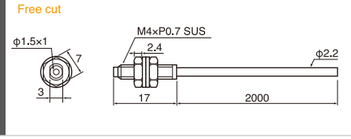
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.





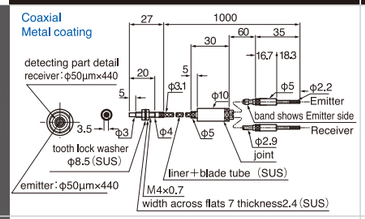
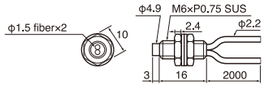
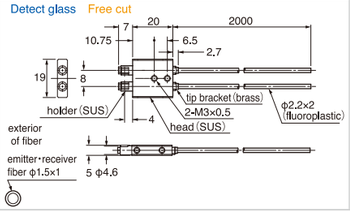


# Specifications (Thru-beam)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam 200℃ | Sideview Heat proof side：500mm<br>Ordinary temperature side：Free cut<br>  | 7-EL 900<br>6-UL 870<br>5-PL 760<br>4-LG 660<br>3-ST 430<br>2-FS 260<br>1-HS 80 | Long 500<br>Std 300<br>Fast 150 | 150 | −60～200 | Heat proof part R=18<br>ordinary temperature part R=25 | NF-TH15 |
| | Sideview Heat proof side：800mm<br>Ordinary temperature side：Free cut<br>  | 7-EL 900<br>6-UL 870<br>5-PL 760<br>4-LG 660<br>3-ST 430<br>2-FS 260<br>1-HS 80 | Long 500<br>Std 300<br>Fast 150 | 150 | −60～200 | Heat proof part R=18<br>ordinary temperature part R=25 | NF-TH16 |
| | φ1 Sleeve:27mm Sideview<br>  | 7-EL 450<br>6-UL 260<br>5-PL 240<br>4-LG 200<br>3-ST 140<br>2-FS 70<br>1-HS 20 | Long 120<br>Std 80<br>Fast 50 | 50 | −60～200 | R=30 | NF-TH04S-27V2 |
| | φ1.5 Sleeve:25mm Sideview<br>  | 7-EL 1,600<br>6-UL 850<br>5-PL 800<br>4-LG 600<br>3-ST 400<br>2-FS 200<br>1-HS 60 | Long 350<br>Std 250<br>Fast 150 | 150 | −60～200 | R=30 | NF-TH05S-A |
| | φ1 Sleeve:8mm Sideview<br>  | 7-EL 300<br>6-UL 160<br>5-PL 150<br>4-LG 100<br>3-ST 90<br>2-FS 40<br>1-HS 14 | Long 125<br>Std 60<br>Fast 30 | 50 | −60～200 | R=50 | NF-TH07 |
| 180℃ | Free cut<br>  | 7-EL 4,000<br>6-UL 2,200<br>5-PL 1,700<br>4-LG 1,500 | 3-ST 1,000<br>2-FS 550<br>1-HS 180 | Long 1,000<br>Std 700<br>Fast 350 | 600 | −60～200 | R=35 | NF-TH02 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Specifications (Diffuse/Limited Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Diffuse | 200℃ | Coaxial Metal coating   | 7-EL 100 6-UL 55 5-PL 50 4-LG 40 3-ST 30 2-FS 10 1-HS 4 | Long 28 Std 20 Fast 15 | 16 | −60～200 | R=25 | NF-DH07 |
| | 180℃ | Free cut   | 7-EL 2,400 6-UL 1,400 5-PL 1,000 4-LG 900 3-ST 700 2-FS 300 1-HS 100 | Long 700 Std 400 Fast 200 | 300 | −60～200 | R=35 | NF-DH01 |
| Limited diffuse | 180℃ | Detect glass Free cut   | 7-EL 720 6-UL 670 5-PL 580 4-LG 510 3-ST 330 2-FS 200 1-HS 63 | Long 350 Std 200 Fast 120 | 200 | −60～200 | R=25 | NF-DH08 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.







# HEAT RESISTANT(200℃~300℃)

## Wide selection of rugged fiber cables for reliable detection in high temperature areas

### Thru-beam, Diffuse, Limited diffuse type

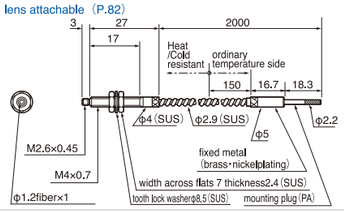
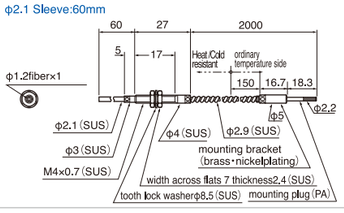
We have 3 thru-beam types, 3 diffuse types and 3 limited diffuse type.

Thru-beam

Diffuse

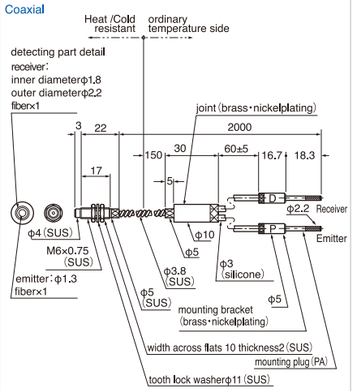
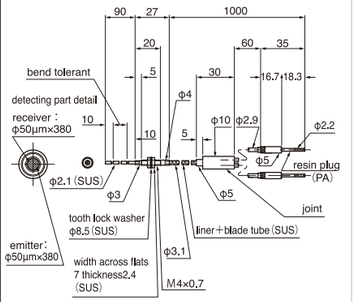
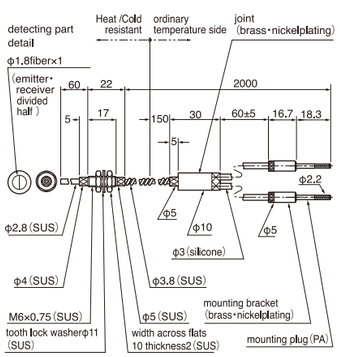
Limited diffuse

## Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | 350℃ | lens attachable (P.82)   | 7-EL 1,440 6-UL 1,350 5-PL 1,240 4-LG 1,080 3-ST 710 2-FS 430 1-HS 130 | Long 750 Std 450 Fast 220 | 300 | −30～350 or −60～200 | R=25 | NF-TH08 |
| | | φ2.1 Sleeve:60mm   | 7-EL 1,350 6-UL 1,260 5-PL 1,120 4-LG 900 3-ST 630 2-FS 410 1-HS 120 | Long 750 Std 450 Fast 220 | 300 | −30～350 or −60～200 | Fiber R=25 Sleeve R=10 | NF-TH09 |

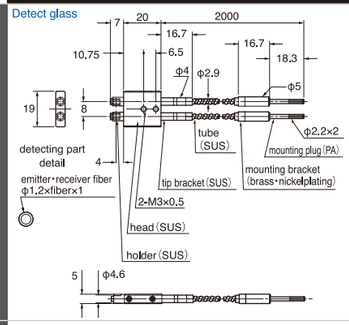
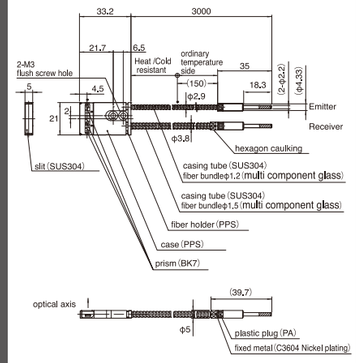
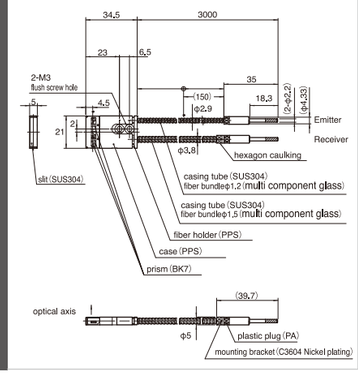
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# Specifications (Diffuse)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Diffuse 350℃ | Coaxial   | 7-EL 940<br>6-UL 890<br>5-PL 770<br>4-LG 670<br>3-ST 440<br>2-FS 190<br>1-HS 50 | Long 650<br>Std 250<br>Fast 80 | 150 | —30～350 or —60～200 | R=25 | NF-DH03 |
| | φ2.1 Sleeve:90mm   | 7-EL 1,110<br>6-UL 1,050<br>5-PL 910<br>4-LG 800<br>3-ST 520<br>2-FS 190<br>1-HS 50 | Long 750<br>Std 250<br>Fast 80 | 200 | —30～350 or —60～200 | Fiber R=25 Sleeve R=10 | NF-DH05 |
| | φ2.8 Sleeve:60mm   | 7-EL 950<br>6-UL 900<br>5-PL 780<br>4-LG 680<br>3-ST 450<br>2-FS 200<br>1-HS 59 | Long 650<br>Std 250<br>Fast 80 | 300 | —30～350 or —60～200 | Fiber R=25 Sleeve R=10 | NF-DH04 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

# Specifications (Limited Diffuse)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Limited diffuse 300℃ | Detect glass   | 7-EL 0～40<br>6-UL 0～34<br>5-PL 0～22<br>4-LG 0～18<br>3-ST 0～17<br>2-FS 0～9<br>1-HS 0～4 | Long 0～15<br>Std 0～10<br>Fast 0～8 | 6 | —30～300 or —60～200 | R=25 | NF-DH06 |
| Limited diffuse 250℃ | Glass plate alignment Flat ON   | 7-EL 2～28<br>6-UL 2～24<br>5-PL 2～23<br>4-LG 3～23<br>3-ST 3～20<br>2-FS 3～18<br>1-HS 4～11 | Long 4～20<br>Std 4～20<br>Fast 4～15 | 4～17 | —20～250 (ordinary temp. —20～70) | R=25 | NF-DH10 |
| | Glass plate alignment Flat ON   | 7-EL 2～45<br>6-UL 3～40<br>5-PL 3～39<br>4-LG 3～38<br>3-ST 4～35<br>2-FS 6～28<br>1-HS 8～19 | Long 6～38<br>Std 7～30<br>Fast 8～25 | 8～25 | —20～250 (ordinary temp. —20～70) | R=25 | NF-DH11 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

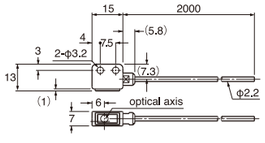
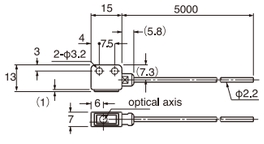
# CHEMICAL RESISTANT

## Fluoroplastic (PFA) sheath provides superior chemical resistance

### High resistance to harsh chemicals

PFA encased fiber sensors are an excellent choice for reliable detection in harsh chemical, extreme temperature, and highly abrasive enviroments. Eight thrubeam and one diffuse models to choose from.

## Specifications (Thru-beam)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | Square | Side ON Free cut  | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,150 3-ST 2,000 2-FS 2,000 1-HS 750 | Long 3,500 Std 2,500 Fast 1,300 | 2,000 | 0～60 | R=25 | NF-TY05 |
| | | Side ON length of fiber：5m Free cut  | 7-EL 3,600 6-UL 3,600 5-PL 3,600 4-LG 3,200 3-ST 2,000 2-FS 1,600 1-HS 550 | Long 3,000 Std 2,000 Fast 1,000 | 1,500 | 0～60 | R=25 | NF-TY05-5 |

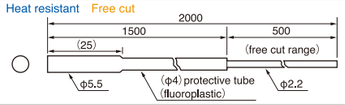
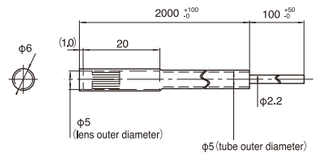
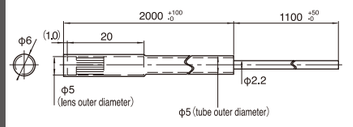
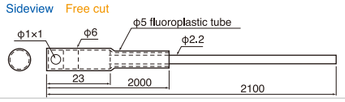
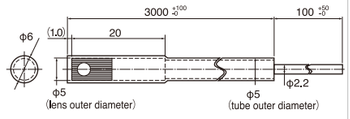
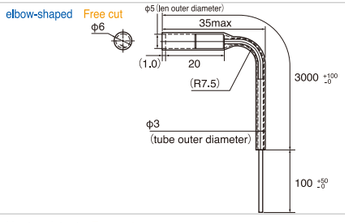
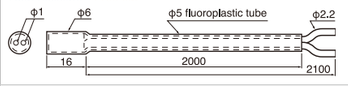
Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH







## Specifications (Limited Diffuse)

| | | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|---|
| Thru-beam | ϕ5.5 | Heat resistant Free cut  | 7-EL 3,600 6-UL 3,600 5-PL 3,300 4-LG 2,880 / 3-ST 1,890 2-FS 1,890 1-HS 660 | Long 3,500 Std 2,300 Fast 1,200 | 2,000 | −40～115 | R=30 | NF-TY04 |
| | ϕ6 | Heat resistant Free cut  | 7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,000 3-ST 2,800 2-FS 2,000 1-HS 700 | Long 3,500 Std 2,500 Fast 1,200 | 2,000 | −40～105 | R=60 | NF-TY01 |
| | | Heat resistant length of fiber：3m Free cut  | 7-EL 4,000 6-UL 4,000 5-PL 4,000 4-LG 3,500 3-ST 3,000 2-FS 1,700 1-HS 500 | Long 2,200 Std 1,300 Fast 550 | 650 | −40～105 | R=60 | NF-TY01-3 |
| | | Sideview Free cut  | 7-EL 4,000 6-UL 3,500 5-PL 2,800 4-LG 2,000 / 3-ST 1,500 2-FS 700 1-HS 200 | Long 1,500 Std 800 Fast 400 | 500 | −40～70 | R=60 | NF-TY02 |
| | | Sideview Free cut  | 7-EL 4,000 6-UL 3,500 5-PL 3,000 4-LG 2,000 3-ST 1,500 2-FS 700 1-HS 200 | Long 1,500 Std 800 Fast 400 | 480 | −40～70 | Fiber R=25 Tube R=60 | NF-TY02-TF3 |
| | | elbow-shaped Free cut  | 7-EL 4,000 6-UL 4,000 5-PL 3,500 4-LG 3,000 3-ST 2,200 2-FS 1,000 1-HS 300 | Long 3,000 Std 1,700 Fast 800 | 900 | −55～70 | Fiber R=20 Tube R=20 | NF-TY03-TF3 |
| Diffuse | ϕ6 | Heat resistant Free cut  | 7-EL 440 6-UL 280 5-PL 250 4-LG 225 / 3-ST 160 2-FS 745 1-HS 85 | Long 100 Std 70 Fast 50 | 45 | −40～100 | R=60 | NF-DY01 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

# VACUUM RESISTANT

## For use in vacuum environments in temperatures up to 300°C

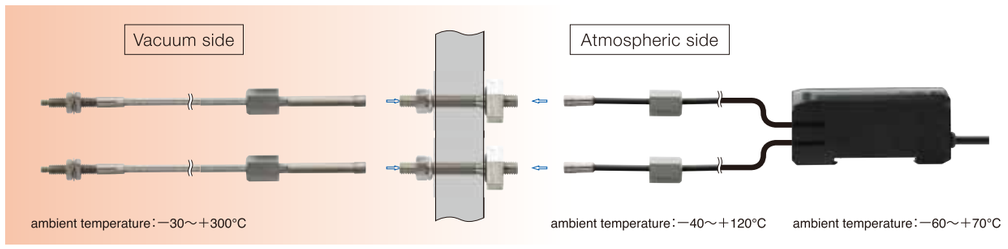
## Thru-beam, Diffuse, Limited diffuse type

Choose from three types of vacuum resistant fibers.
Separate lens are for long distance detection and side view detecton.

Thru-beam
NF-TN01

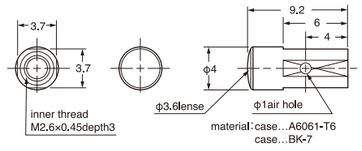
Diffuse
NF-DN01

Limited diffuse
NF-DN02




## Lens for vacuum resistant fiber unit

Lens for long distant detection
NF-TA06

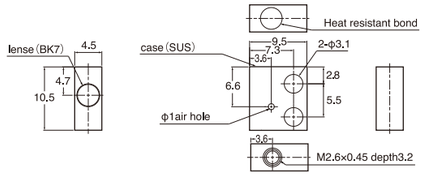



**Sensing distance (unit=mm)**

| D3RF | | D2RF | BRF |
|---|---|---|---|
| 7-EL 3,500 | 3-ST 1,200 | Long 3,500 | 1,000 |
| 6-UL 3,200 | 2-FS 950 | Std 1,500 | |
| 5-PL 2,800 | 1-HS 300 | Fast 900 | |
| 4-LG 2,500 | | | |

ambient temperature:−30～+300°C

Lens for side view detection
NF-TA07 (only for NF-TN01)




**Sensing distance (unit=mm)**

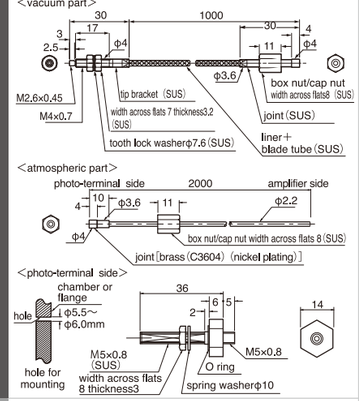
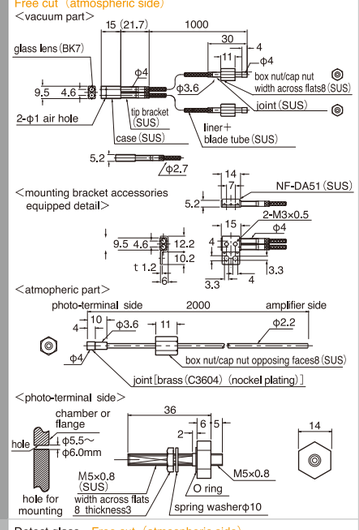
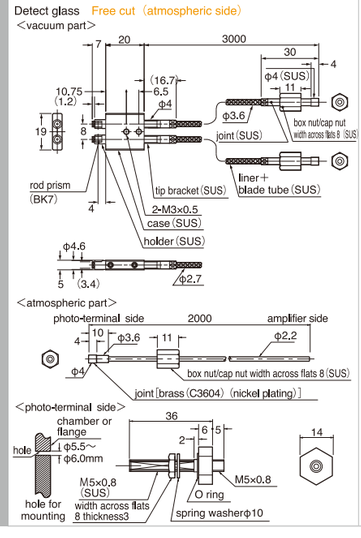
| D3RF | | D2RF | BRF |
|---|---|---|---|
| 7-EL 3,500 | 3-ST 2,300 | Long 3,500 | 1,000 |
| 6-UL 3,200 | 2-FS 1,000 | Std 1,700 | |
| 5-PL 2,800 | 1-HS 350 | Fast 700 | |
| 4-LG 2,500 | | | |

ambient temperature:−30～+300°C





## Specifications (Thru-beam/Diffuse/Limited Diffuse)

| | Sensing head | Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) D3RF | D2RF | BRF | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| Thru-beam | lens attachable Free cut (atmospheric side)<br><vacuum part><br>  <br> | 7-EL 790<br>6-UL 740<br>5-PL 640<br>4-LG 560<br>3-ST 360<br>2-FS 210<br>1-HS 70 | Long 450<br>Std 280<br>Fast 130 | 150 | −30～300 | R=18 | NF-TN01 |
| Diffuse | Free cut (atmospheric side)<br><vacuum part><br>  <br> | 7-EL 470<br>6-UL 450<br>5-PL 390<br>4-LG 340<br>3-ST 220<br>2-FS 135<br>1-HS 41 | Long 5～250<br>Std 5～200<br>Fast 10～70 | 100 | −30～300 | R=18 | NF-DN01 |
| Limited Diffuse | Detect glass Free cut (atmospheric side)<br><vacuum part><br>  <br> | 7-EL 0～22<br>6-UL 0～12<br>5-PL 0～11<br>4-LG 0～9<br>3-ST 0～7<br>2-FS 3～4<br>1-HS N.A. | Long 0～8<br>Std 2.5～5<br>Fast N.A. | 3 | −30～300 | R=18 | NF-DN02 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.
Sensing distance of diffuse type is for 500 x 500mm white paper.

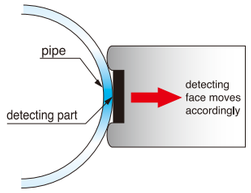
# LIQUID LEVEL & LIQUID LEAK DETECTION

Choose from pipe-mountable or PFA protected contact type for level detecting and compact PFA encased for leak sensing.

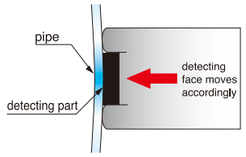
## Liquid level: pipe mount type

Mounts to pipe diameters from 3mm to 80mm in diameter.
NF-DF07 extremely resistant to foam and bubbles.

8mm Dia.




80mm Dia.




## Liquid level: contact type

Unique multistep tip design prevents accumulation of liquid at the tip of the sensor head.

3 types of joint are available;

NF-DA54 for Liquid inflow prevention type

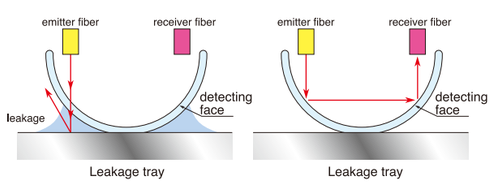
NF-DA55 for Protective tube mounting

NF-DA56 for fiber cable mounting

You can procure ferrule for joint above; NF-DA57

## Leakage type

It detects liquid leakage on the surface of flat pan.




When liquid leaked, the light defuses at the leakage and doesn't get to receiver.

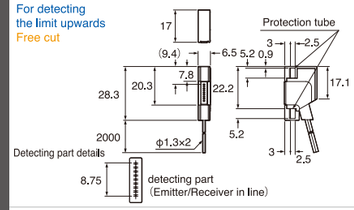
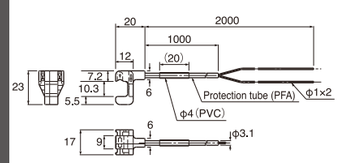
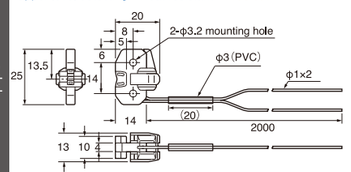
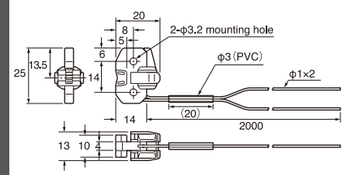
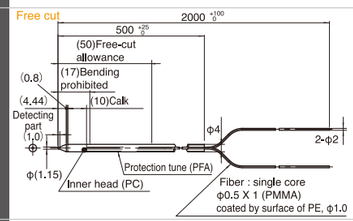
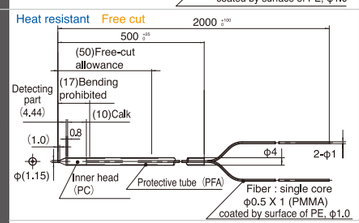
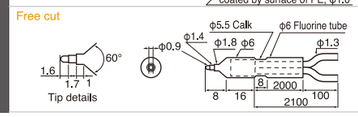
The light reflects at the detecting face and the light comes into receiver.





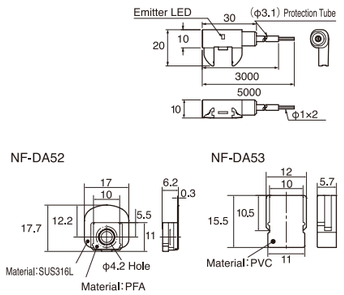


## Specifications (Liquid Level)

| | Sensing head | Sensing conditions | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|
| Liquid level / pipe | For detecting the limit upwards Free cut   | Array type, best for liquid with bubbles. For transparent pipe of the outer diameter bigger than 8mm. | −40～70 | R=10 | NF-DF07 |
| | For detecting the limit downwards Free cut   | For PFA / transparent pipe of the outer diameter between 3 and 10 mm with width of 0.3 – 1.0mm. | −20～60 | protective tube R=20 Bending radius R=4 | NF-TF01 |
| | Upper level detecting Heat resistant Free cut   | Position adjuster gives freedom of installation. For PFA / transparent pipe of the outer diameter between 6 and 26 mm with width of 1.0mm. | −40～100 | R=10 | NF-DF05 |
| | Upper level detecting Heat resistant Free cut   | Position adjuster gives freedom of installation. For PFA / transparent pipe of the outer diameter between 6 and 26 mm with width between of 1.0 and 3.0 mm. | −40～100 | R=10 | NF-DF04 |
| φ4 | Free cut   | Contact type with protection tube of 500mm length (free-cut). Mechanically protect the fiber from liquid ball that accumulates at the tip. | −40～70 | protective tube R=20 fiber R=10 | NF-DF06 |
| | Heat resistant Free cut   | Contact type of heat resistant material up to 105 Celsius Mechanically protect the fiber from liquid ball that accumulates at the tip. Protection tube : Fluorine 500mm, free-cut | −40～105 | protective tube R=20 fiber R=10 | NF-DF08 |
| φ6 | Free cut   | Contact type with protection tube of 2,000mm length (free-cut). Mechanically protect the fiber from liquid ball that accumulates at the tip. | −40～70 | R=60 | NF-DF03 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Specifications (Leakage Detect)

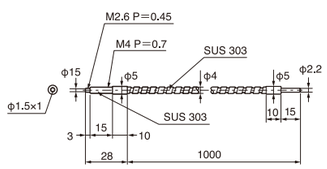
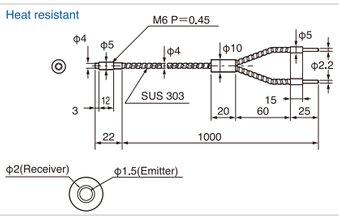
| | Sensing head | Sensing conditions | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|
| Leakage detect / Square | Free cut   | Corresponds to SEMI S2<br>Requires fixture for installation;<br>NF-DA52 (SUS)<br>NF-DA53 (PVC) | −20～50 | protective tube R=20<br>fiber R=4 | NF-DW02 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH.

## Detection of water

Fiber cables for use with Optex IR type amplifers for reliable detection of water in clear containers

## Specifications (Thru-beam/Diffuse)

| | | Sensing head | Sensing distance (unit-mm) by Infrared-type Amplifiers | | Operation temperature (℃～℃) | Radius (mm) | Part Number |
|---|---|---|---|---|---|---|---|
| | | | D3IF series (by operating mode) | BIF series | | | |
| Thru-beam | M4 | Heat resistant   | 7-EL 650<br>6-UL 350<br>5-PL 300<br>4-LG 250<br>3-ST 230<br>2-FS 150<br>1-HS 60 | 100 | −40～200 | R=25 | NF-TW01 |
| Diffuse | M6 | Heat resistant   | 7-EL 280<br>6-UL 125<br>5-PL 110<br>4-LG 100<br>3-ST 85<br>2-FS 45<br>1-HS 20 | 30 | −40～200 | R=25 | NF-DW01 |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH
Sensing distance of diffuse type is for 500 x 500mm white paper.

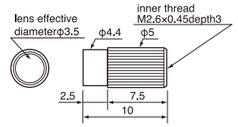
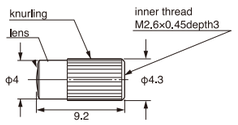
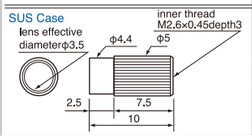
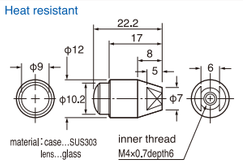
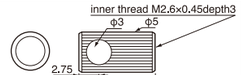
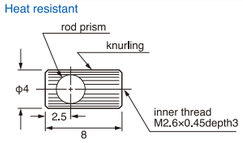




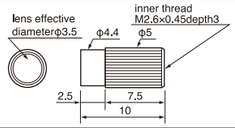
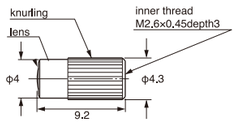
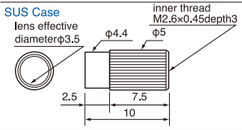
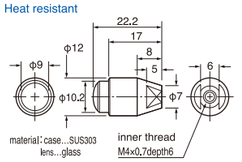
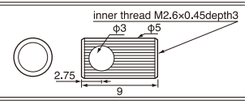
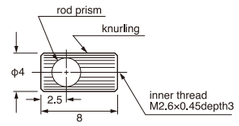


# LENS FOR THRU-BEAM FIBERS

Straight and 90 degree add-on lenses for increasing sensing distances

| | Dimentions (mm) | Applicable fiber cable | D3RF Sensing distance(mm) 7-EL | 6-UL | 5-PL | 4-LG | 3-ST | 2-FS | 1HS | Operation temperature (℃～℃) | Part number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Long distance |   | NF-TB01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,500 | 800 | −40～100 | NF-TA01 |
| | | NF-TB02 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,800 | | |
| | | NF-TB06 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,500 | | |
| | | NF-TJ01 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 750 | | |
| | | NF-TR01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,800 | | |
| | | NF-TK77 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | | |
| | | NF-TH01 | 4,000 | 4,000 | 3,200 | 2,700 | 2,500 | 1,400 | 500 | | |
| | Heat resistant   | NF-TB01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | 360 | −40～350 | NF-TA03 |
| | | NF-TB02 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,200 | | |
| | | NF-TB06 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,200 | | |
| | | NF-TJ01 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 600 | | |
| | | NF-TR01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | 800 | | |
| | | NF-TK77 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | 600 | | |
| | | NF-TH01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | 1,200 | | |
| | | NF-TH08 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | 800 | | |
| | | NF-TH10 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 750 | | |
| | | NF-TH11 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 1,000 | | |
| | SUS Case   | NF-TB01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,500 | 800 | −40～100 | NF-TA01S |
| | | NF-TB02 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,800 | | |
| | | NF-TB06 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,500 | | |
| | | NF-TJ01 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 650 | | |
| | | NF-TR01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 1,800 | | |
| | | NF-TK77 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2,000 | | |
| | | NF-TH01 | 4,000 | 4,000 | 3,200 | 2,700 | 2,500 | 1,400 | 500 | | |
| Super Long distance | Heat resistant   | NF-TB01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | −60～350 | NF-TA04 |
| | | NF-TB02 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TB06 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TJ01 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | | |
| | | NF-TR01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TK77 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TH01 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TH08 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | | |
| | | NF-TH10 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | | |
| | | NF-TH11 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | | |
| Side view |   | NF-TB01 | 3,600 | 2,500 | 2,000 | 1,600 | 1,200 | 650 | 200 | −40～70 | NF-TA02 |
| | | NF-TB02 | 4,000 | 3,500 | 3,000 | 2,400 | 1,800 | 1,000 | 300 | | |
| | | NF-TJ01 | 4,000 | 1,900 | 1,600 | 1,500 | 950 | 600 | 200 | | |
| | | NF-TR01 | 4,000 | 3,300 | 2,400 | 2,000 | 1,500 | 900 | 200 | | |
| | | NF-TK77 | 4,000 | 3,500 | 3,000 | 2,400 | 1,800 | 950 | 300 | | |
| | Heat resistant   | NF-TB01 | 4,000 | 2,400 | 2,300 | 2,000 | 1,200 | 800 | 250 | −60～300 | NF-TA05 |
| | | NF-TB02 | 4,000 | 2,400 | 2,300 | 2,000 | 1,200 | 800 | 250 | | |
| | | NF-TJ01 | 4,000 | 1,900 | 1,700 | 1,500 | 950 | 600 | 200 | | |
| | | NF-TR01 | 4,000 | 1,700 | 1,600 | 1,300 | 850 | 550 | 160 | | |
| | | NF-TK77 | 4,000 | 1,900 | 1,700 | 1,500 | 950 | 600 | 200 | | |
| | | NF-TH01 | 4,000 | 1,500 | 1,300 | 1,200 | 800 | 450 | 160 | | |
| | | NF-TH08 | 4,000 | 1,600 | 1,500 | 1,200 | 800 | 550 | 170 | | |
| | | NF-TH10 | 2,000 | 1,100 | 1,000 | 850 | 600 | 300 | 100 | | |
| | | NF-TH11 | 4,000 | 1,400 | 1,200 | 1,100 | 700 | 400 | 150 | | |

Operating humidity is 35~85%RH. Please use in 0~40℃ when it's 85%RH

| | Dimentions (mm) | Applicable fiber cable | Sensing distance(mm) | | | | Operation temperature (℃～℃) | Part number |
|---|---|---|---|---|---|---|---|---|
| | | | D2RF | | | BRF | | |
| | | | Long | Std | Fast | | | |
| Long distance |  | NF-TB01 | 3,500 | 3,500 | 1,500 | 3,000 | −40～100 | NF-TA01 |
| | | NF-TB02 | 3,500 | 3,500 | 1,500 | 3,500 | | |
| | | NF-TB06 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TJ01 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TR01 | 3,500 | 3,500 | 3,000 | 3,000 | | |
| | | NF-TK77 | 3,500 | 3,500 | 3,000 | 3,500 | | |
| | | NF-TH01 | 3,500 | 3,500 | 2,500 | 3,500 | | |
| | Heat resistant<br>  | NF-TB01 | 3,500 | 3,500 | 600 | 3,500 | −40～350 | NF-TA03 |
| | | NF-TB02 | 3,500 | 3,500 | 3,000 | 3,500 | | |
| | | NF-TB06 | 3,500 | 3,500 | 2,800 | 3,500 | | |
| | | NF-TJ01 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TR01 | 3,500 | 3,500 | 2,000 | 2,500 | | |
| | | NF-TK77 | 3,500 | 3,500 | 1,700 | 3,500 | | |
| | | NF-TH01 | 3,500 | 3,500 | 2,700 | 3,500 | | |
| | | NF-TH08 | 3,500 | 3,500 | 1,900 | 2,100 | | |
| | | NF-TH10 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TH11 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | SUS Case<br>  | NF-TB01 | 3,500 | 3,500 | 1,500 | 3,000 | −40～100 | NF-TA01S |
| | | NF-TB02 | 3,500 | 3,500 | 1,500 | 3,500 | | |
| | | NF-TB06 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TJ01 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TR01 | 3,500 | 3,500 | 3,000 | 3,000 | | |
| | | NF-TK77 | 3,500 | 3,500 | 3,000 | 3,500 | | |
| | | NF-TH01 | 3,500 | 3,500 | 2,500 | 3,500 | | |
| Super Long distance | Heat resistant<br>  | NF-TB01 | 3,500 | 3,500 | 3,500 | 3,500 | −60～350 | NF-TA04 |
| | | NF-TB02 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TB06 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TJ01 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TR01 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TK77 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TH01 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TH08 | 3,500 | 3,500 | 3,500 | 3,500 | | |
| | | NF-TH10 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| | | NF-TH11 | 1,500 | 1,500 | 1,500 | 1,500 | | |
| Side view |  | NF-TB01 | 1,500 | 800 | 400 | 600 | −40～70 | NF-TA02 |
| | | NF-TB02 | 1,500 | 1,000 | 450 | 600 | | |
| | | NF-TJ01 | 1,500 | 800 | 450 | 500 | | |
| | | NF-TR01 | 1,000 | 700 | 450 | 500 | | |
| | | NF-TK77 | 1,500 | 800 | 450 | 600 | | |
| | Heat resistant<br>  | NF-TB01 | 1,800 | 900 | 400 | 500 | −60～300 | NF-TA05 |
| | | NF-TB02 | 1,800 | 900 | 400 | 500 | | |
| | | NF-TJ01 | 1,300 | 600 | 300 | 400 | | |
| | | NF-TR01 | 1,100 | 600 | 250 | 350 | | |
| | | NF-TK77 | 1,300 | 600 | 300 | 400 | | |
| | | NF-TH01 | 1,000 | 500 | 250 | 400 | | |
| | | NF-TH08 | 1,100 | 600 | 250 | 350 | | |
| | | NF-TH10 | 700 | 300 | 180 | 300 | | |
| | | NF-TH11 | 900 | 500 | 250 | 350 | | |

Operating humidity is 35~85%RH. Please use in 0~40°C when it's 85%RH





# WARNINGS

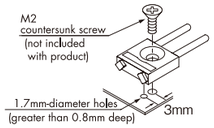
Please use this product correctly.
Do Not use this product for personnel protection.

# Mounting

## Mounting Fibers With Positioning Bosses

### NF-DC08

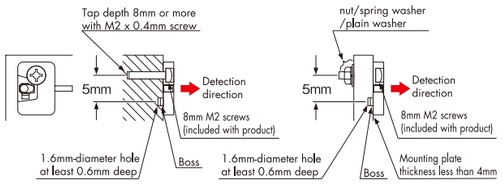
Use M2 countersunk screws (not included with this product).
The boss insertion holes on the bottom surface need to be 1.7mm in diameter and at least 0.8mm deep.




### NF-TE01/NF-DE01 (Flat-On Type)

When screwing a tap into the attachment

When using the attached screws and nuts

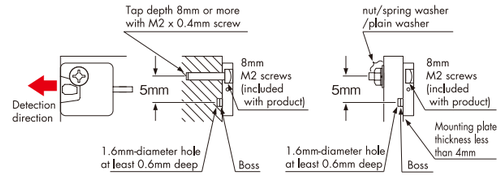



(Note 1): The NF-TE01 is pictured above. NF-DE01 is mounted in the same way.
(Note 2): Through beam fibers have the same dimensions. Be aware of the positions of the screw holes and boss holes when mounting fibers.

### NF-TE02/NF-DE02 (Head-On Type)

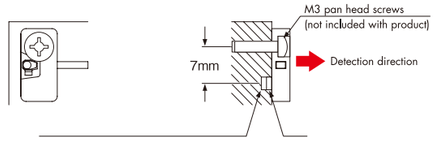
When screwing a tap into the attachment

When using the attached screws and nuts



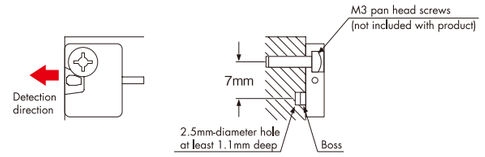

(Note 1): The NF-TE02 is pictured above. NF-DE02 is mounted in the same way.
(Note 2): Through beam fibers have the same dimensions. Be aware of the positions of the screw holes and boss holes when mounting fibers.

### NF-TE03/NF-DE03 (Flat-On Type)




(Note 1): The NF-TE03 is pictured above. NF-DE03 is mounted in the same way.
(Note 2): Through beam fibers have the same dimensions. Be aware of the positions of the screw holes and boss holes when mounting fibers.

### NF-TE04/NF-DE04 (Head-On Type)

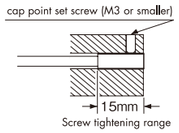



(Note 1): The NF-TE04 is pictured above. NF-DE04 is mounted in the same way.
(Note 2): Through beam fibers have the same dimensions. Be aware of the positions of the screw holes and boss holes when mounting fibers.

## Mounting NF-DR09/ -RR01

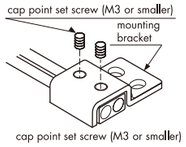
### When not using mounting bracket NF-DA51 (included with this product)

Screw set screws within 15mm of the tip of the metal head.



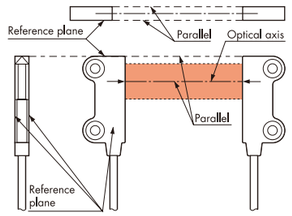

### When using mounting bracket NF-DA51 (included with this product)

You can mount the heads without using set screws.
If you use set screws, mount the heads with M3 cup-point set screws.




## Mounting Through beam Screen Fibers (NF-TZ07/-TZ08/-TZ09/-TZ10)

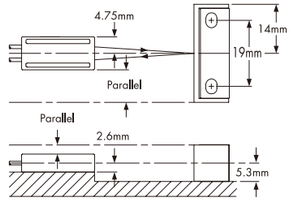
Please take care when mounting this product because its aperture angle is extremely small, and there are cases where the fibers do not transmit light because of the way they were mounted.
As shown in the diagram below, determine a reference plane, make sure the optical axis is aligned properly, and mount the receiving and emitting fibers so that they are parallel to the reference plane.



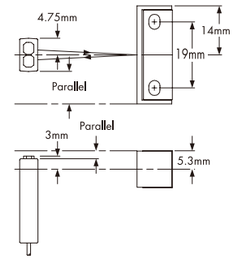

## Mounting NF-RB01/-RB02

This product's aperture angle is extremely small, and there are cases where the fibers do not transmit light because of the way they were mounted.
As shown in the diagrams below, mount the fiber heads and reflectors so that their centers align with one another. Make sure that the optical axis is aligned properly.

### Head-On Type/NF-RB01

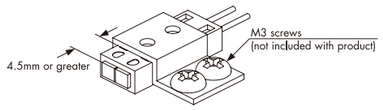



### Side-On Type/NF-RB02



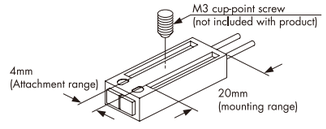

#### When mounting fiber bracket

Attach fiber bracket to side-on type fibers such that they do not touch the detectors.
If you use fiber bracket, you can mount fibers without using M3 set screws.




#### When mounting with M3 cup-point set screws

Mount the fibers with M3 cup-point set screws within the mounting ranges shown in the diagram below.

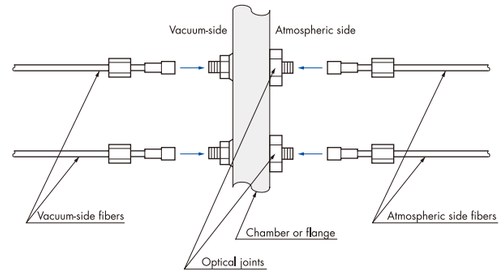



### A Note About NF-RB01/-RB02

Detection results may vary between 0 and 20mm from the detection surface when detecting transparent objects.

## Mounting Vacuum-Resistant Fibers (NF-TN01/-TF02)

### The Structure of Vacuum-Resistant Fibers

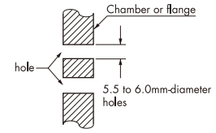



Leak: 1.33x10-10Pa•m3/s [He] or lower

### Mounting

① Drill two holes into the vacuum chamber (or flange) wall.

(Note 1): Make the holes 5.5 to 6.0mm in diameter.




② Mount NF-VN02 optical joints to the vacuum chamber wall.
You must attach the O-ring included with this product, and make sure that the O-ring is on the outside of the vacuum chamber.




③ Mount NF-VN01 fiber bracket to the NF-VN02 optical joint at atomospheric side.

(Note 1): Tighten the nut well.
If the nut is loose, there may be a gap, and the detection distance will drop.

④ Mount the vacuum fiber nut to NF-VN02 optical joint at vacuum side.

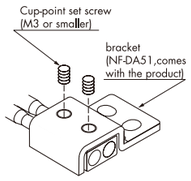
(Note 1): Tighten the nut well.
If the nut is loose, there may be a gap, and the detection distance will drop.

⑤ Mount the tip of the vacuum-side fiber.

### For NF-DN01

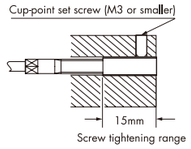
#### When using bracket

Use cup-point set screws (M3 or smaller) to mount the bracket.
You can mount the head without using cup-point set screws by attaching the bracket to the steel head.



When not using brackets

Use cup-point set screws (M3 or smaller) for mounting within 15mm of the tip of the head as shown in the diagram to the right.



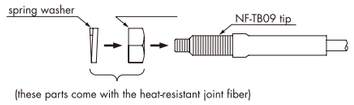

## Mounting Heat-Resistant Joint Fibers (NF-TH12/-TH13/-TH14/-TH15/-TH16)

### Connecting heat-resistant joint fibers to ordinary-temperature side fibers (NF-TB09)

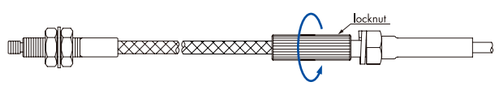
To connect heat-resistant joint fibers to NF-TB09, follow the instructions below.

Instructions

① Attach the plastic nut that comes with the heat-resistant fiber and spring washer to the tip of NF-TB09, pushing them back as far as they will go.

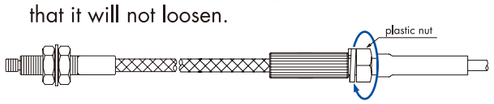



② Attach the heat-resistant joint fiber to the NB-TB09 with a locknut.




(Note 1): Do not screw up the locknut against the plastic nut.

③ Screw up the plastic nut against the locknut so that it will not loosen.




### When mounting connecting parts to the mounting plate

To mount the parts that connect the heat-resistant joint fiber and NF-TB09 to the mounting plate with metal nuts, follow the instructions below.
The mounting plate thickness needs to be 1mm or thinner.

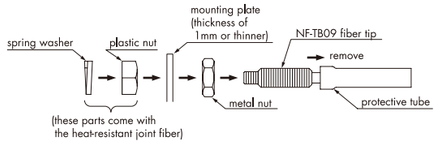
Instructions

① Remove the protective tube from NF-TB09, attach the metal nut to the tip of the fiber and move it down to the fiber part.

② Insert the tip of the fiber through the mounting plate.

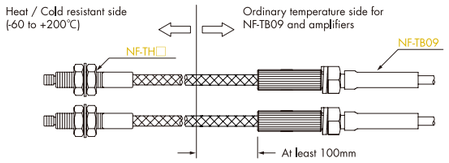
③ Follow the instructions from <Connecting heat-resistant joint fibers to NF-TB09> to connect the heat-resistant joint fiber to NF-TB09.

④ Tighten the metal nut from the first step of these instructions against the mounting plate.




### Operating Temperature

Keep the heat-resistant joint fiber at least 100mm from the boundary of the ordinary-temperature side in order to protect NF-TB09 and amplifiers.



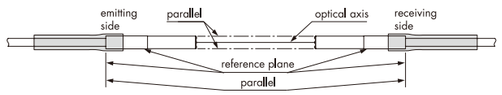

## Mounting Narrow Beam/Wafer Mapping Fibers (NF-TG01/-TG02/-TG03/-TG04)

Please take care when mounting this product because its aperture angle is extremely small, and there are cases where the fibers do not transmit light because of the way they were mounted.

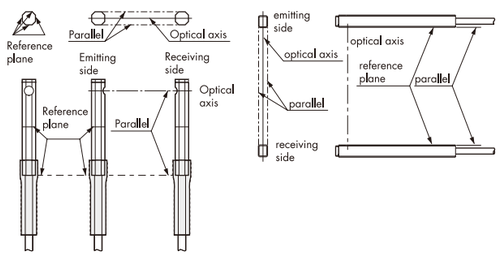
### Through beam Type

As shown in the diagram below, determine a reference plane, make sure the optical axis is aligned properly, and mount the receiving and emitting fibers so that they are parallel to the reference plane.

NF-TG01




NF-TG02/-TG03/-TG04



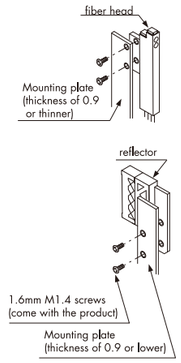




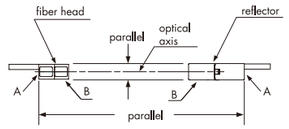



### Reflective Type

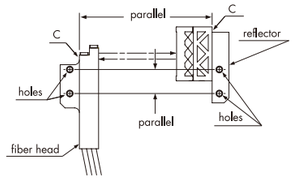
Use 1.6mm M1.4 screws to mount the fiber head and reflector to the mounting plate as shown in the diagram on the right. The mounting plate needs to have a thickness of 0.9mm or thinner.
Use a thread lock compound to tighten screws when mounting them in places with vibrations or shocks.
Attach the parts so that the holes for the fiber head and reflector are parallel to one another and such that parts A, B and C are each parallel as shown in the diagrams below.




### Overhead View

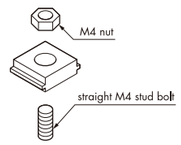



### Side View

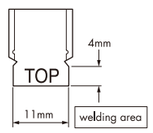



## Mounting Leak Detection Fibers (NF-DW02)

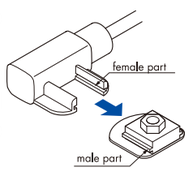
If you are using an SUS bracket, thread a welded M4 stud bolt through the hole on the bracket and attach an M4 nut (not included with this product).




If you are using a PVC bracket, glue it to the mounting surface such that the side with “TOP” etched into it is facing up and glue it within the welding area as shown in the diagram on the right.

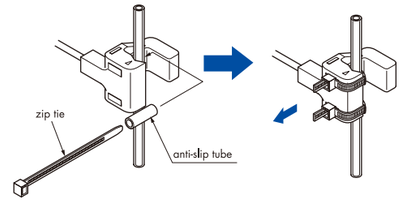



Slide the male part of the bracket attached to the steel case into the female part on the fiber until you hear them click.

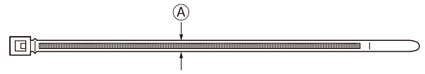



## Mounting Pipe-Mounted Fluid Level Detection Fibers (NF-TF01)

Use zip ties and anti-slip tubes to mount the clamp to the pipe as shown in the diagram below.
Use two zip ties on the upper and lower part of the clamp to attach it securely to the pipe. Cut off the extra part of the zip ties that stick out.

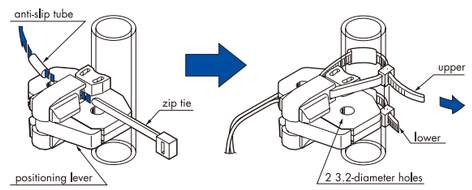



We recommend using zip ties of a thickness 2.5mm or smaller as shown in the diagram below.

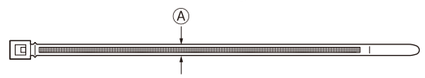



## Mounting Pipe-Mounted Fluid Level Detection Fibers (NF-DF04/-DF05)

Use zip ties and anti-slip tubes to mount the clamp to the pipe as shown in the diagram below. Make sure that the positioning lever is in the closed position as shown below when you mount the clamp. Use two zip ties on the upper and lower part of the clamp to attach it securely to the pipe. Cut off the extra part of the zip ties that stick out.




We recommend using zip ties of a thickness 2.5mm or smaller as shown in the diagram below.



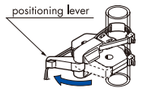

You must use M3 screws, plain washers and spring washers when using the holes for mounting.
(These parts are not included with this product)

### Positioning Pipe-Mounted Fluid Level Detection Fibers

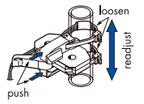
You can easily readjust the attachment position when using zip ties to mount this product.

## How to Adjust Position

① Pull the positioning lever open, in the direction of the arrow.




② Push the moveable part in the direction of the arrow, loosen the zip tie, and readjust the mounting position.

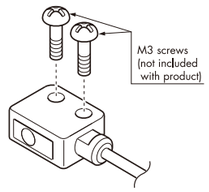



③ Close the positioning lever so that it will not loosen.

(Note 1) : You must reset the sensitivity after readjusting the mounting position.
(Note 2) : The positioning lever is for readjusting the position on this device, not for tightening the zip ties. Tightening the zip ties while the positioning lever is open and then closing the lever will damage the fibers.

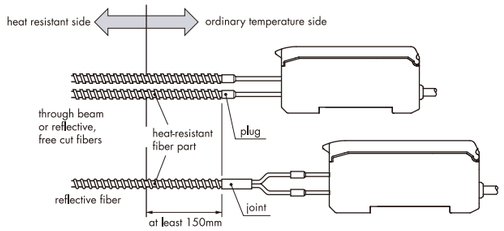
## Mounting Chemical-Resistant Angled-Head Fibers (NF-TY05)

Use M3 screws and tighten them to torques of 0.3Nm or smaller.




## Caution for Heat-Resistant Fibers

Keep the heat-resistant fiber part at least 150mm from the boundary of the ordinary-temperature zone as shown below in order to protect amplifiers.



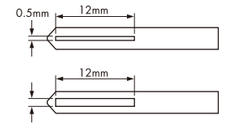

Do not directly expose amplifiers to radiation heat or hot air.
The metal bracket on the tip of the heat-resistant fiber (up to 350℃) and stainless steel sheath may change color when used at high temperatures, but this does not affect their detection capability.

## Notes about Adhesive Slits Included With NF-TZ07/-TZ08 /-TZ09/-TZ10

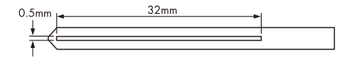
There are two types of slits that come with these products (the slit that comes with the NF-TZ07/ -TZ08 is one of them). These slits help detecting tiny objects and prevent saturation when using the fibers at close range. However, applying adhesive slits shortens the detection distance.
Align the pointed end of the adhesive slit to the top of the fiber and apply it as shown in the diagram below.

### Adhesive Slits (come with products)

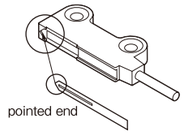
NF-TZ09/-TZ10




NF-TZ07/-TZ08




### How to Apply Adhesive Slits

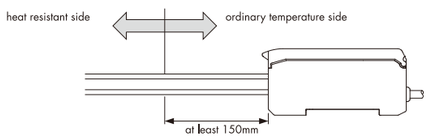



## Notes about NF-TY01(-□) /-TY02(-□)/-TY03-TF03/-TY04 /-TY05(-□)/-DY01(-□)

Do not use these products with the chemicals listed below.
Fused alkali metals (sodium, potassium, lithium, etc.), fluorine gas (F2), ClF3, OF2 (even in its gaseous state) and other chemicals that may erode PFA. Hydrofluoric acid at high temperatures, nitric acid, chlorine and other chemicals with high permeability.

## Mounting Chemical-Resistant Angled-Head Fibers (NF-TY05)

Keep the heat-resistant fiber part at least 150mm from the boundary of the ordinary-temperature zone as shown below in order to protect amplifiers.




Do not directly expose amplifiers to radiation heat or hot air.

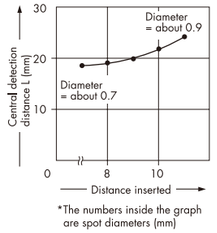


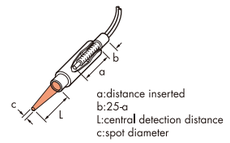




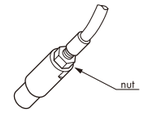
## Notes about NF-DA06

You can adjust the spot diameter and detection distance by changing the amount of fibers inserted, but if you jam the fibers in too far, the tip of the fibers will become separated from the lens.

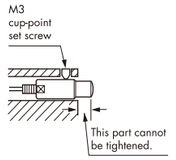



Tighten the fiber nut after setting the fiber and NF-DA06 in place in order to fix them so that they do not move because of vibrations, etc.

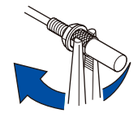



Use M3 cup-point set screws to mount NF-DA06 if you want to use set screws.



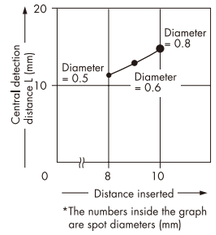

## Notes about NF-DA01/-DA02 /-DA03/-DA04/-DA05

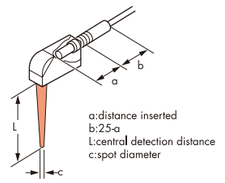
Insert fibers into NF-DA01/ -DA02/ -DA03/ -DA04/ -DA05 as far as they will go.



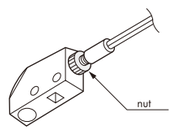
## Notes about NF-DA07

You can adjust the spot diameter and detection distance by changing the amount of fibers inserted.




Tighten the nut after setting the fiber and NF-DA07 in place in order to fix them so that they do not move because of vibrations, etc.




## Notes about Leak/Fluid Level /Chemical-Resistant Fibers

To clean NF-DW02, use a soft cloth to wipe away all liquid on the head and bracket. Be sure to check for condensation on the detector.

If the fibers on NF-DW02/ -TF01 are too short, the detector may not receive the correct amounts of light and may not be able to detect consistently.

Use the bracket designed especially for the NF-DW02 to insure proper mounting and reliable detection. If you ue a PVC bracket on a black mat background the sensing could become unreliable because of poor reflection.

Be careful not to damage exterior of the fibers when you cut the protective tubes.

Only set NF-DW02 sensitivity after mounting the completely dry head to the bracket and attaching the fibers to the amplifier. Adjusting the fiber connection or position after adjusting sensitivity changes the amount of light that enters and causes inconsistent detection.
If you altered fiber connection or position while cleaning the device, make sure to adjust amplifier sensitivity.

The amount of light may decrease when the device is used for long periods of time at high temperature and humidity.

Liquids that are not compatible with NF-DW02 head material (PFA) may cause air bubbles to flood the detector. This causes inconsistent detection, or makes consistent detection take more time. Test the liquid you are examining before beginning.

Make sure that the NF-DW02 bracket does not have any scratches, dirt or grime, or deformities when you clean it.

Water droplets on the detection surface may affect its detection capability. Avoid using this device in places where it can come into direct contact with water.
Remember to check for condensation on the outside of pipes.

There are some opaque or viscous liquids that NF-TF01/ -DF04/ -DF05 cannot consistently detect.

Be sure that the mounting of the NF-TF01/ -DF04/ DF05 is tight. A loose mounting can cause unreliable detection.
Be sure to use the anti-slip tube that comes with the product when attaching to the pipe and tighten securely.

For consistent detection with NF-TF01, set amplifier sensitivity after attaching fibers while there is no liquid inside the pipe. You must reset sensitivity if you have adjusted the fibers on the pipe and have changed their position.

NF-DF04/ -DF05 cannot detect properly on opaque pipes.

Attach the NF-DF04/ -DF05 detector firmly to the pipe. It will malfunction if it is not attached firmly.

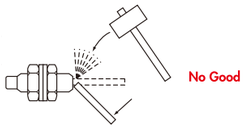
NF-DF04/ -DF05 is not water- or chemical-resistant. Do not use it in places where it may come into direct contact with water or chemicals.

Water droplets on the NF-DF04/ -DF05 detection surface, water droplets that run into the pipe, and air bubbles will affect detection. Check for condensation on the outside of pipes.

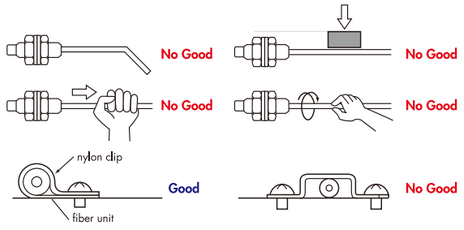
# General Precautions

## Precautions for Fiber Units

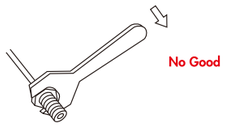
1. Do not hit the detection head surface against anything or damage it in any other way.



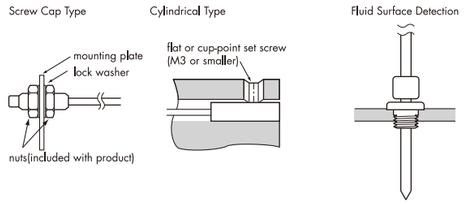

2. Do not bend or twist the fiber head or use too much force to move it.




3. Do not apply too much torque to the sensor head or use tools that were not designed for the nuts.




4. Mount sensor heads according to the type of fiber as shown in the diagrams below.

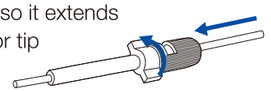



5. Cut the tips of cuttable fiber units with special fiber cutters before attaching fiber amplifier when needed.

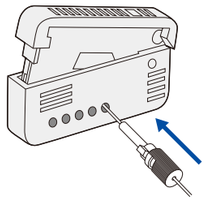
## Precautions for Fiber Cutters

1. Cutting Instructions

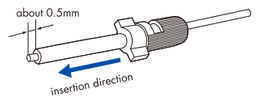
① Insert the fiber cable so it extends beyond the connector tip as shown. Twist the back knurled cap until the cap locks into place.



② Insert the fiber into the fiber cutter and cut it.

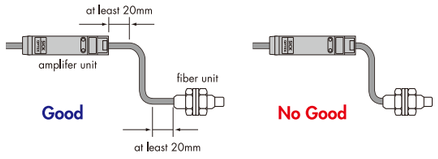


③ The diagram on the right shows a properly-cut fiber.




2. Make the fiber unit bending radius greater than the allowable bending radius. Bending it too much shortens the detection distance.

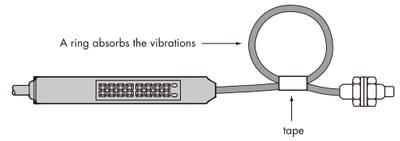
3. Leave some straight line near the insertion part and the tip of the fiber unit.




4. The detection distance may drop 20% or so because of the cut surface of the fiber or the connection with the amplifier. We recommend using the device at or below 80% of the detection distance on the spec.

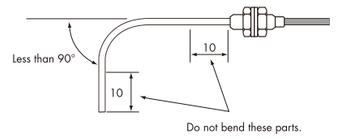
5. In places with a lot of vibrations, mount the fiber unit so that it does not vibrate. Pay special attention that the vibrations do not reach the connection between the fibers and amplifier.

6. Use the following method to soften fiber head vibrations.




7. Do not use fiber units that are not protected by fluoroplastic in environments with organic solvents.

8. Do not bend the tip or the base of the sleeve.



DISPLACEMENT SENSOR

# DISPLACEMENT SENSOR

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.


| | |
|---|---|
| Lineup | 231 |
| CD5 series | 235 |
| CD4 series | 253 |
| CD33 series | 265 |
| CD3 series | 274 |
| CD1 series | 277 |
| UQ1 | 280 |

# CD SERIES LINE UP

## CD5 series

**Sensor head**

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution |
|---|---|---|---|---|---|
| **CD5-L25** | Narrow | IEC Class 2<br>FDA CLASS II | 25<br>25±1 | ±0.08% F.S. | 0.02μm |
| **CD5-LW25** | Wide | | | | |
| **CD5-30** | Narrow<br>Specular mode | | 23.6 26.1 28.6<br>26.1±2.5 | ±0.08% F.S. | 0.1μm |
| **CD5-W30** | Wide<br>Specular mode | | | | |
| **CD5-30** | Narrow | | 25 30 35<br>30±5 | ±0.08% F.S. | 0.2μm |
| **CD5-W30** | Wide | | | | |
| **CD5-85** | Narrow<br>Specular mode | | 72.3 82.3 92.3<br>82.3±10 | ±0.08% F.S. | 0.5μm |
| **CD5-W85** | Wide<br>Specular mode | | | | |
| **CD5-85** | Narrow | | 65 85 105<br>85±20 | ±0.05% F.S. | 1μm |
| **CD5-W85** | Wide | | | | |
| **CD5-W350** | Wide | | 250 350 450<br>350±100 | ±0.08% F.S. | 5μm |
| **CD5-W500** | Wide | | 300 500 700<br>500±200 | ±0.08% F.S. | 10μm |
| **CD5-W2000** | Wide | IEC Class 3R<br>FDA CLASS IIIa | 1500 2000 2500<br>2000±500 | ±0.1% F.S. | 30μm |

**Controller**

| Model | Number of connected sensor heads | Output | Sensor heads |
|---|---|---|---|
| **CD5A-N** | Max. 3pcs | ±10V / F.S., 4-20mA / F.S.<br>RS-232C, USB | CD5 series heads |
| **CD5A-P** | | | |

When you trade the CD5-L25 and CD5-30 internationally, please confirm laws and regulations of the country that ratifies “Wassenaar Arrangement”.
We can provide a version of the displacement sensor that conforms to the “Wassenaar arrangement”. Please contact distributors in your country.







## CD4 series

**Sensor head**

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution |
|---|---|---|---|---|---|
| **CD4-30** | Regular | Class 2 (IEC/JIS), CLASS II (FDA) | 25 30 35<br>30±5 | ±0.1% F.S. | 1μm |
| **CD4-30-3R** | High power | Class 3R (IEC/JIS), CLASS IIIa (FDA) | | | |
| **CD4-85** | Regular | Class 2 (IEC/JIS), CLASS II (FDA) | 65 85 105<br>85±20 | | 3μm |
| **CD4-85-3R** | High power | Class 3R (IEC/JIS), CLASS IIIa (FDA) | | | |
| **CD4-350** | Regular | Class 2 (IEC/JIS), CLASS II (FDA) | 250 350 450<br>350±100 | | 40μm |
| **CD4-350-3R** | High power | Class 3R (IEC/JIS), CLASS IIIa (FDA) | | | |

| Model | Type | Light source | Measuring range | Linearity | Resolution |
|---|---|---|---|---|---|
| **CD4L-25** | Specular | Class 1 (IEC/JIS) CLASS II (FDA) Laser,<br>650nm, Max 390 μW | 25<br>25±1 | ±0.1% F.S. | 0.1μm |

**Controller**

| Model | Number of connected sensor heads | Output | Sensor heads |
|---|---|---|---|
| **CD4A-N** | Max. 2pcs | ±5V / F.S., 4-20mA / F.S.<br>RS-232C | CD4 series heads |
| **CD4A-P** | | | |
| **CD4A-LN** | | | CD4L-25 series heads |
| **CD4A-LP** | | | |

# CD33 series

**Diffuse type**

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution Fast | Resolution Other |
|---|---|---|---|---|---|---|
| **CD33-30□□** | Cable | IEC Class 2<br>FDA CLASS II | 26 30 34 30±4 | ±0.1% F.S. | 4μm | 2μm |
| **CD33-30C□□** | Connector | | | | | |
| **CD33-50□□** | Cable | | 40 50 60 50±10 | | 8μm | 5μm |
| **CD33-50C□□** | Connector | | | | | |
| **CD33-85□□** | Cable | | 65 85 105 85±20 | | 15μm | 10μm |
| **CD33-85C□□** | Connector | | | | | |
| **CD33-120□□** | Cable | | 60 120 180 120±60 | | 45μm | 30μm |
| **CD33-120C□□** | Connector | | | | | |
| **CD33-250□□** | Cable | | 100 250 400 250±150 | | 75μm | 100μm |
| **CD33-250C□□** | Connector | | | | | |

※ Product code : CD33-■■NV (N=NPN, V=Voltage Output 0-10V), CD33-■■PV (P=PNP, V=Voltage Output 0-10V),
CD33-■■CNV (N=NPN, V=Voltage Output 0-10V), CD33-■■CPV (P=PNP, V=Voltage Output 0-10V),
CD33-■■NA (N=NPN, A=Current Output 4-20mA), CD33-■■PA (P=PNP, A=Current Output 4-20mA)
CD33-■■CNA (N=NPN, A=Current Output 4-20mA), CD33-■■CPA (P=PNP, A=Current Output 4-20mA)
CD33-■■N-422 (N=NPN, 422=RS422 Ⅰ / F), CD33-■■P_422 (P=PNP, 422=RS422 Ⅰ / F)
CD33-■■CN-422 (N=NPN, 422=RS422 Ⅰ / F), CD33-■■CP_422 (P=PNP, 422=RS422 Ⅰ / F)

**Specular type**

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution |
|---|---|---|---|---|---|
| **CD33-L30□□** | Cable | IEC Class 1<br>FDA CLASS II | 24.3 26.3 28.3 26.3±2 | ±0.2% F.S. | 1μm |
| **CD33-L30C□□** | Connector | | | | |
| **CD33-L50□□** | Cable | | 42.3 47.3 52.3 47.3±5 | ±0.2% F.S. | 2.5μm |
| **CD33-L50C□□** | Connector | | | | |
| **CD33-L85□□** | Cable | | 72.9 82.9 92.9 82.9±10 | ±0.2% F.S. | 5μm |
| **CD33-L85C□□** | Connector | | | | |

※ Product code : CD33-L■■NV (N=NPN, V=Voltage Output 0-10V), CD33-L■■PV (P=PNP, V=Voltage Output 0-10V),
CD33-L■■CNV (N=NPN, V=Voltage Output 0-10V), CD33-L■■CPV (P=PNP, V=Voltage Output 0-10V),
CD33-L■■NA (N=NPN, A=Current Output 4-20mA), CD33-L■■PA (P=PNP, A=Current Output 4-20mA)
CD33-L■■CNA (N=NPN, A=Current Output 4-20mA), CD33-L■■CPA (P=PNP, A=Current Output 4-20mA)
CD33-L■■N-422 (N=NPN, 422=RS422 Ⅰ / F), CD33-L■■P-422 (P=PNP, 422=RS422 Ⅰ / F)
CD33-L■■CN-422 (N=NPN, 422=RS422 Ⅰ / F), CD33-L■■CP-422 (P=PNP, 422=RS422 Ⅰ / F)







# CD3 series

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution ※1 |
|---|---|---|---|---|---|
| **CD3-30□** | Cable | Class 2 Laser,<br>650nm, Max 1mW | 26 30 34 30±4 | ±1% F.S. | 4μm |
| **CD3-30C□** | Connector | | | | |
| **CD3-50□** | Cable | | 40 50 60 50±10 | ±1% F.S. | 10μm |
| **CD3-50C□** | Connector | | | | |
| **CD3-80□** | Cable | | 65 80 95 80±15 | ±1% F.S. | 10μm |
| **CD3-80C□** | Connector | | | | |
| **CD3-100□** | Cable | | 60 100 140 100±40 | ±1% F.S. | 30μm |
| **CD3-100C□** | Connector | | | | |
| **CD3-250□** | Cable | | 100 250 400 250±150 | ±1.5% F.S. (up to 250mm)<br>±2.5% F.S. (up to 400mm) | 150μm |
| **CD3-250C□** | Connector | | | | |

※ Product code : CD3-■■N (N=NPN), CD3-■■CN (N=NPN), CD3-■■P (P=PNP), CD3-■■CP (P=PNP)
※1. Unit : Micron. Under AUTO sensitivity. White ceramic as an object

# CD1 series

| Model | Type | Light source | Measuring range (mm) | Linearity | Resolution ※1 100ms | Resolution ※1 10ms | Resolution ※1 1ms |
|---|---|---|---|---|---|---|---|
| **CD1-30□** | Cable | Class 2 Laser,<br>650nm, Max 3.3mW | 26 30 34 30±4 | ±2% F.S. | 1 | 3 | 10 |
| **CD1-30C□** | Connector | | | | | | |
| **CD1-50□** | Cable | | 40 50 60 50±10 | ±1% F.S. | 3 | 10 | 30 |
| **CD1-50C□** | Connector | | | | | | |
| **CD1-100□** | Cable | | 65 100 135 100±35 | ±2% F.S. | 15 | 50 | 150 |
| **CD1-100C□** | Connector | | | | | | |
| **CD1-130□** | Cable | | 80 130 180 130±50 | ±3.5% F.S. | 20 | 70 | 200 |
| **CD1-130C□** | Connector | | | | | | |
| **CD1-250□** | Cable | | 100 250 400 250±150 | ±5% F.S. | 150 | 500 | 1500 |
| **CD1-250C□** | Connector | | | | | | |

※ Product code : CD1-■■N (N=NPN), CD1-■■CN (N=NPN), CD1-■■P (P=PNP), CD1-■■CP (P=PNP)
※1. Unit : Micron. Under AUTO sensitivity. White ceramic as an object

# CD5 series

## World's longest sensing distance of 2 meter with fine linearity of ± 0.1% F.S.

- Best-in-class resolution (0.02μm) of CD5L-25
- Best-in-class linearity (0.05% F.S.) of CD5-85
- Multiple calculations, one controller supports 3 heads simultaneously.
- Sensing heads can function without controller (Patent pending). Direct connection to PC is possible via RS-422.





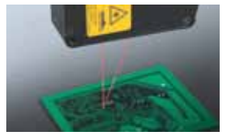


# SENSORHEAD VARIATION

### CD5-30 (Narrow spot)
### CD5-W30 (Wide spot)

**Short distance**

5 times better resolution than conventional model



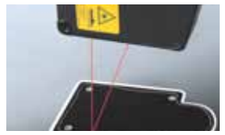
Diffuse type
Measurement range : 30 ±5mm
Resolution : 0.2 μm
Linearity : ±0.08% F.S.

Specular mode
Measurement range : 26.1 ±2.5m
Resolution : 0.1 μm
Linearity : ±0.08% F.S.

### CD5-85 (Narrow spot)
### CD5-W85 (Wide spot)

**Middle distance**

Highest level of linearity in this class



Diffuse type
Measurement range : 85 ±20mm
Resolution : 1 μm
Linearity : ±0.05% F.S.

Specular mode
Measurement range : 82.3 ±10mr
Resolution : 0.5 μm
Linearity : ±0.08% F.S.

### CD5-W350 (Wide spot)

**Long distance**

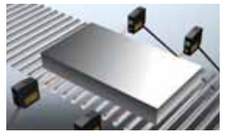
High accuracy & stability by wide spot

Diffuse type
Measurement range : 350 ±100mm
Resolution : 5 μm
Linearity : ±0.08% F.S.

### CD5-W500 (Wide spot)

**Super long distance**

Highest level of accuracy for this range

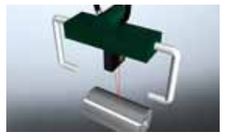


Diffuse type
Measurement range : 500 ±200mm
Resolution : 10 μm
Linearity : ±0.08% F.S.

### CD5-W2000 (Wide spot)

**Ultra long distance**

This longest range in the industry

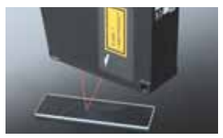


Diffuse type
Measurement range : 2000 ±500mm
Resolution : 30 μm
Linearity : ±0.1% F.S.

### CD5-L25 (Narrow spot)
### CD5-LW25 (Wide spot)

**For transparent and specular objects**

Measurement of glass thickness is available



Specular type
Measurement range : 25 ±1mm
Resolution : 0.02 μm
Linearity : ±0.08% F.S.

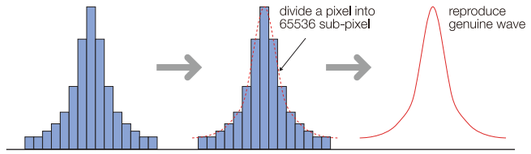
# CD5 SENSOR HEADS

## The CD5 series uses OPTEX FA's original design cutting edge technology to achieve high accuracy measurement

Digital sub-pixel processing

### Accurate profile reproduction

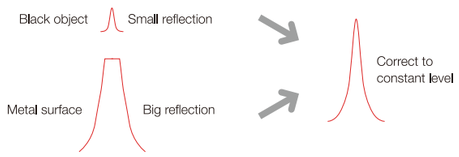
The linearity has been improved to more than twice that of a conventional product by digital sub-pixel processing. This divides one pixel into 65536 sub-pixels.




High resolution electronic shutter

### Automatic level correction

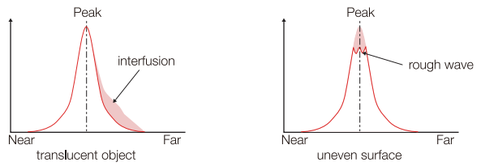
A high resolution electronic shutter that can be controlled to 1/485th of the sampling period helps to insure stable peak level detection even when unstable surface conditions exist.




For uneven and varied luster object

### Original algorithm

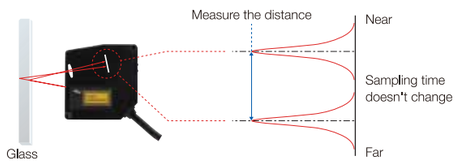
Even if the object is translucent or its surface is uneven, it can detect the position of the true peak thanks to the original Optex designed algorithm.




Standalone operation - no controller required

### Reliable glass thickness measurement

The Specular type CD5-L25/CD5-LW25 can detect both the surface of glass and measure the thickness without being connected to the controller.




### Control unit UQ1 series to connect sensor head to MITSUBISHI PLC MELSEC-Q series directly

UQ1-01 enables easy connection of CD5 and MITSUBISHI PLC MELSEC-Q series. UQ1 setup the sensor head automatically. You don't have to have big ladder proglam.

→P280



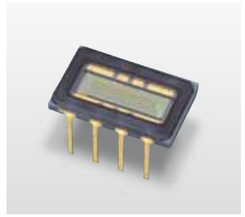




High accuracy, high speed, high sensitivity

### High sensitivity linear image sensor

The CD5 series offers 5 times higher accuracy and 10 times higher speed than a conventional product.



Low aberration lens

### "Multi-CLD" lens

Newly developed lens used in the receiver projects a clear image on the image sensor with very little aberration.

Multi-CLD: Multi Combined Low Dispersion

High speed and high accuracy

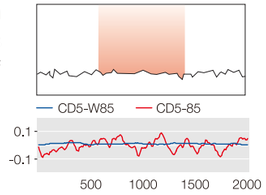
### High speed processing unit

The newly developed processing unit is able to process the measurement data at high speed. It is also able to correct for any distortion and accurately compensates for variations in the readings.

Highly stable linearity

### Wide spot type

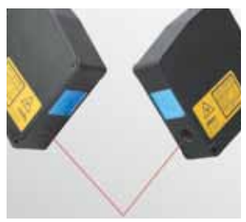
The wide spot type can measure rough surfaces with a high degree of linearity and stability.




Cross-talk prevention

### Preventing cross-talk (world's first)

The newly developed cross-talk prevention function eliminates interference between sensors even when the beams are crossing or are mounted close together.



Sampling period will be 6 times longer

Water resistance

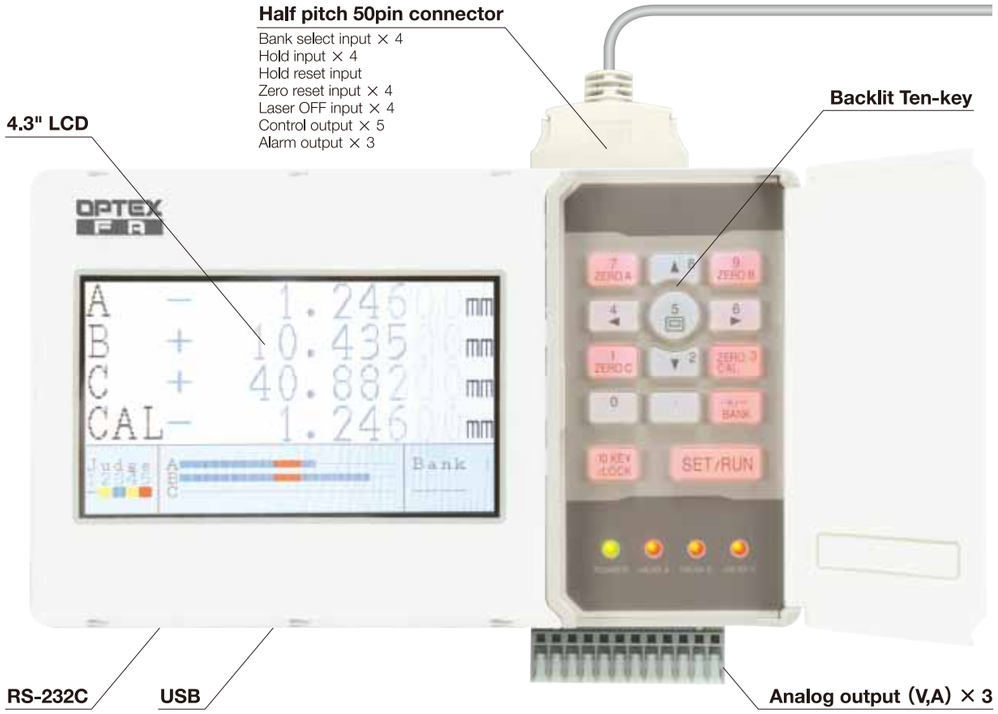
### IP67

The CD5 series has an IP67 rating not only at the sensor body but also on the extension cable connector. Additional countermeasures to protect the cable from water are not required.

Note: Water droplets on the optical part may cause faulty readings and problems with the measurement.

# CD5 CONTROLLERS

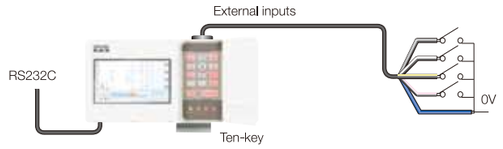
## Multiple interface for PC, PLC, etc.




Multiple SETUP is available

### 16 Banks for SETUP

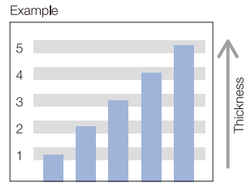
You can setup 16 sets of measurement parameter for 16 application. Bank is changed by Ten-key, external inputs and RS-232C communication.




Effective for sorting

### 5 Outputs have individual threshold

5 Outputs that have individual threshold, upper and lower limit, is available. This is effective for sorting application.




Wave monitoring without PC or external monitor

### Wave monitoring function

You can monitor the wave form and verify if the sensor head and object position are correct by using the wave monitoring function.

Easy SETUP

### Backlit Ten-key

Backlit Ten-key display panel shows which keys are active.

Multi measurement with one controller

### 3 heads multi calculation (world's first)

Up to three sensor heads can be connected to one controller unit. Calculation with result from three heads is available that can be used to solve various applications

- Levelness
- Contortion
- Warpage
- Level difference
- Thickness
- Shifting

Easy SETUP

### Backlit Ten-key and display guide

Setup of basic sensor parameter and calibration are easily done by Backlit ten-key and display. Backlit ten-key panel shows which keys are active.

From remote place

### Up to 50m

Controller can be located up to a maximum distance of 50m from the sensor head. By interconnecting the cable DSL-1212-G05M.

Controllable from PC remotely

### USB and RS-232C

Controller has USB and RS-232C port so that you can controll sensor heads effectively and flexibly.

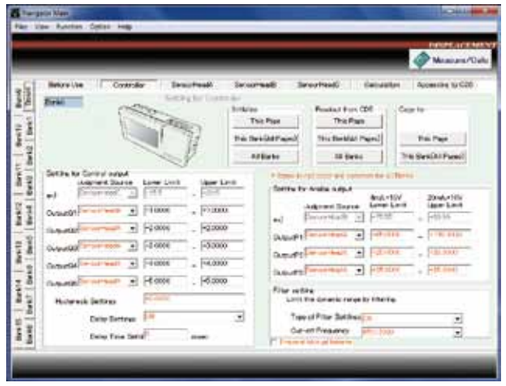
# CD5-SFT

## PC Software Sensor Navigator for CD5

### Setting of Controller

Following parameters related to the controller can be set.

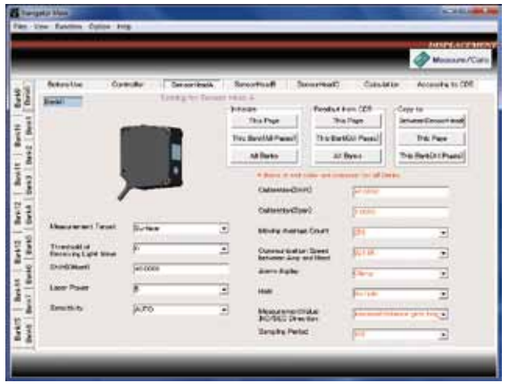
- Initializing controller
- Read out setup parameters from the controller
- Copying setup parameters of sensor head
- Upper/Lower limit of control output
- Setup parameters of analog output
- Hysteresis
- Filter setting
- Preventing interference



### Setting of Sensor Head A～C

Following parameters related to the sensor head can be set.

- Initializing controller
- Read out setup parameters from the controller
- Copying setup parameters of sensor head
- Copying setup parameters of controller
- Measurement target
- Threshold of receiving light wave
- Shift (offset)
- Laser power
- Sensitivity
- Calibration (shift / span)
- Moving averaging count
- Communication speed (Sensor head - Controller)
- Display when alarming
- Hold
- Increasing/Decreasing direction of the value
- Sampling speed (period)









### Setting of Calculation

You can setup how to calculate using measurement result of three sensor heads.

Formula= W ± X ± Y ± Z

W, X, Y and Z are set as fixed value K, measurement result of three sensor head A, B and C. ± is set as “+” or “-”.

| | |
|---|---|
| Fixed value K | Shift / Offset |
| Hold | Initializing calculation |

### Parameter transferring

You can transfer setup parameters to sensor heads and the controller.

Compatible Operating system and Hardware for Sensor Navigator

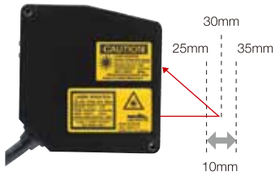
| | |
|---|---|
| **CPU** | Intel Core2Duo or higher |
| **OS** | Windows XP / Windows Vista / Windows 7 |
| **Main memory** | 512MB min. |
| **Display resolution** | XGA:1024 * 768 SXGA:1280 * 1024 |
| **HDD free space** | 40M Byte or more (other storage capacity is needed for logging accordingly) |
| **Interface** | USB1.1 or higher |

・Windows is registered trademark of Microsoft Corporation
・Intel and Core2Duo is registered trademark of Intel Corporation

# SYSTEM PART NUMBERS

## Sensorhead

**CD5-30** **CD5-W30** Short range : 30 ±5mm

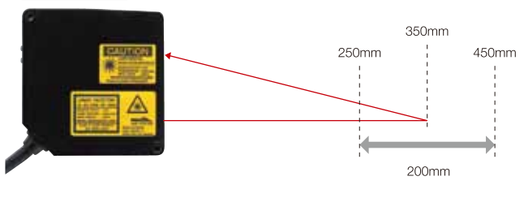



**CD5-L25** **CD5-LW25** Specular type : 25 ±1mm

**CD5-85** **CD5-W85** Middle range : 85 ±20mm

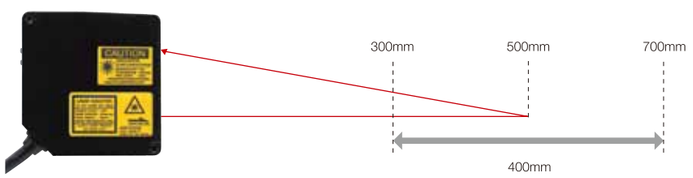
**CD5-30** **CD5-W30** Specular mode : 26.1 ±2.5mm

**CD5-W350** Long range : 350 ±100mm

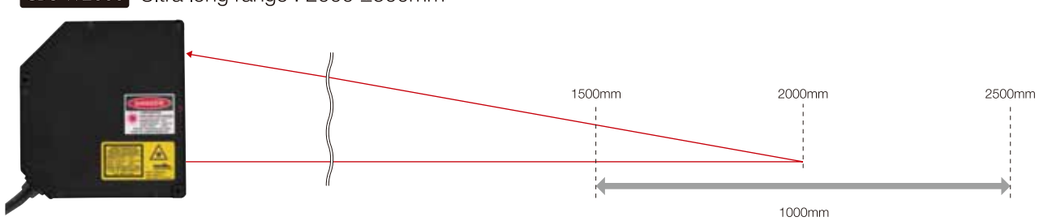



**CD5-85** **CD5-W85** Specular mode : 82.3 ±10mm

**CD5-W500** Super long range : 500 ±200mm




**CD5-W2000** Ultra long range : 2000 ±500mm










## Controller

**Model No. : CD5A-N(NPN), CD5A-P(PNP)**
Type : CD5 controller
Description : Controller unit for CD5 system with 4.3" TFT LCD and Backlit Ten-key
Interface : Analog output NPN input/output, RS-232C, USB

## Option

### Cable for sensor head and controller

**DSL-1212-G02M** : 2m
Cable for sensor head to connect controller that can be connected in serial up to 50m

**DSL-1212-G05M** : 5m
Cable for sensor head to connect controller that can be connected in serial up to 50m

### I/O Connector cable

**IO-EXP-AOD5** : 3m
IEEE1284 half pitch 50pin

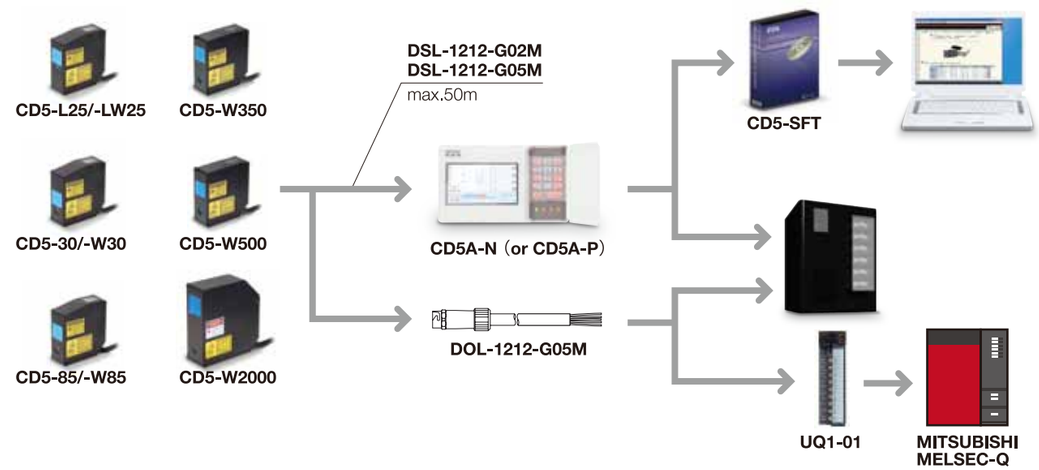
### Cable for sensor head

**DOL-1212-G05M** : 5m
Cable for sensor head when use without controller

### Sensor navigator

**CD5-SFT** : Software for PC

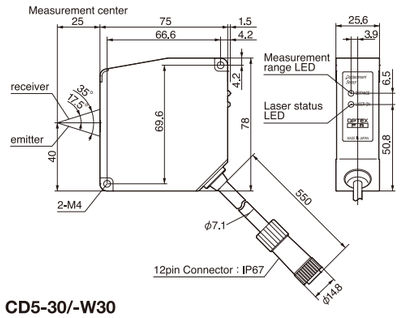
## System configuration example



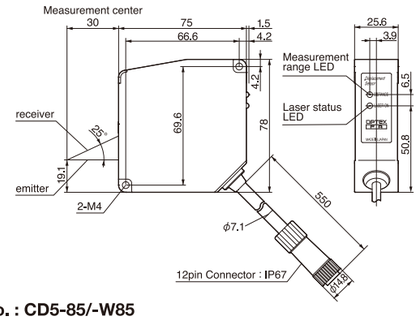
# DIMENSIONS

## Sensor head

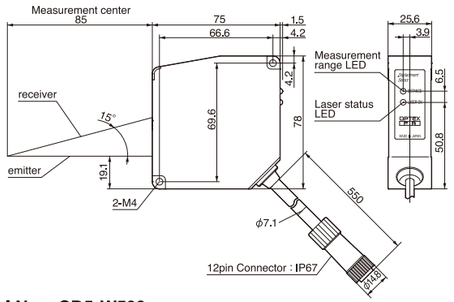
**Model No. : CD5-L25/-LW25 (Specular type)**



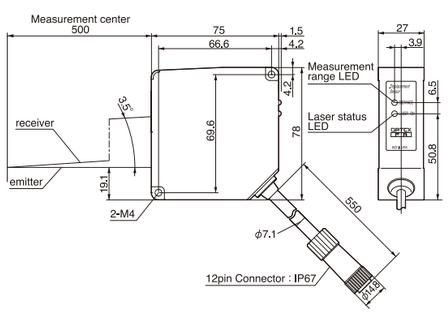

**Model No. : CD5-30/-W30**



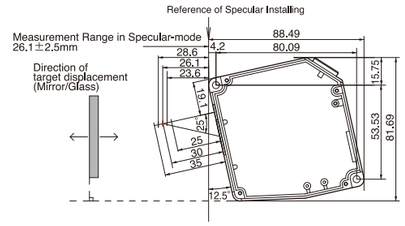

**Model No. : CD5-85/-W85**



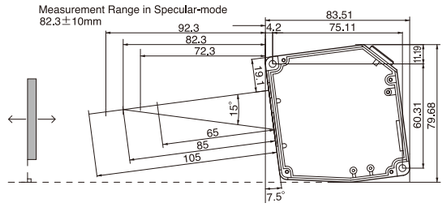

**Model No. : CD5-W500**



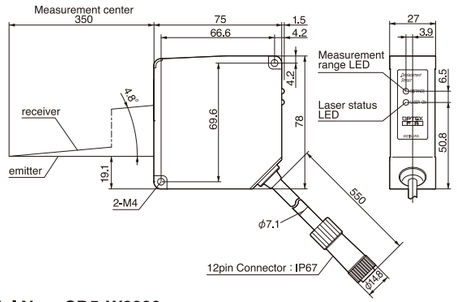

**Model No. : CD5-30 / W30 (Specular mode)**



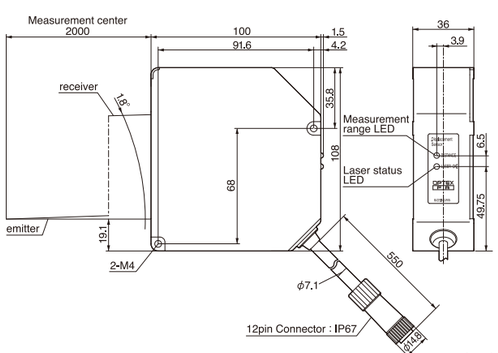

**Model No. : CD5-85 / W85 (Specular mode)**




**Model No. : CD5-W350**



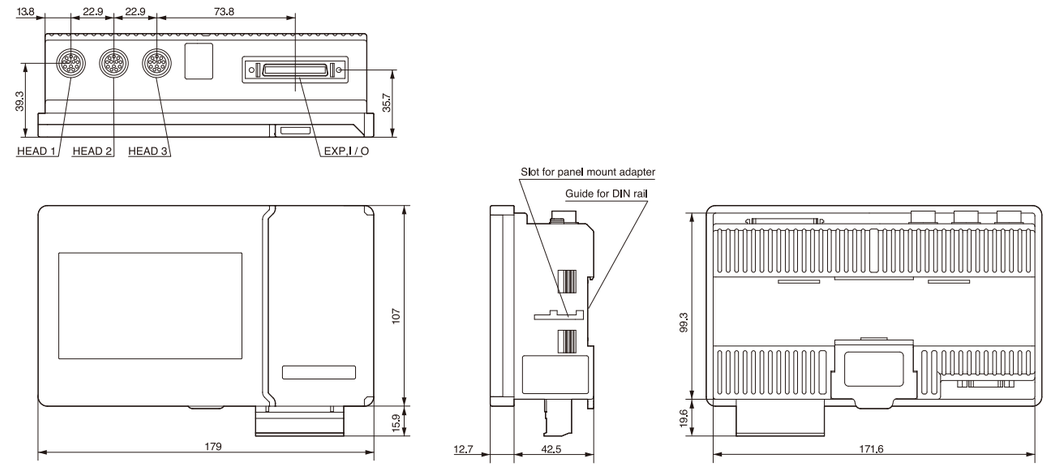

**Model No. : CD5-W2000**




(mm)

## Controller

**Model No. : CD5A-N(-P) common in NPN and PNP types**




(mm)

## Accessories

### Control unit UQ1

**Model No.: UQ1-01**

: Control unit for CD5 sensor head to connect to Mitsubishi PLC MELSEC-Q series directly.

→ P280

# SPECIFICATIONS

## Sensor head

| Model | | CD5-L25 | CD5-LW25 | CD5-30 | | CD5-W30 | |
|---|---|---|---|---|---|---|---|
| **Optical method** | | Specular reflection | | Diffuse reflection | Specular mode | Diffuse reflection | Specular mode |
| **Measurement dist.** | | 25mm | | 30mm | 26.1mm | 30mm | 26.1mm |
| **Measurement range** | | ±1mmn | | ±5mm | ±2.5mm | ±5mm | ±2.5mm |
| **Light source** | | Red laser diode | | | | | |
| | | Wavelength 650nm / Maximum output 390μW | | Wavelength 650nm / Maximum output 1mW | | Wavelength 658nm / Maximum output 1mW | |
| **Laser class** | **IEC/JIS** | Class 1 | | Class 2 | | | |
| | **FDA** | CLASSII | | | | | |
| **Spot size** (*1) | | Appx.25×35μm | Appx.100×700μm | Appx.30×100μm | | Appx.260×1,000μm | |
| **Light receiving element** | | Linear image sensor | | | | | |
| **Linearity** | | ±0.08%F.S. | | | | | |
| **Resolution** (*2) | | 0.02μm | | 0.2μm | 0.1μm | 0.2μm | 0.1μm |
| **Sampling period** (*3) | | 100 / 200 / 400 / 800 / 1600 / 3200μs Setup to be done through the controller (CD5A series) | | | | | |
| **Temperature drift** (*4) | | ±0.01% F.S. / ℃ | ±0.05% F.S. / ℃ | ±0.01% F.S. / ℃ | | | |
| **Serial I/F** | | RS-422 9.6k to 1843.2kbps | | | | | |
| **Supply voltage** | | 12 - 24VDC ±10% or from controller (CD5A series) | | | | | |
| **Indicator** | | Laser emission indicator : Green (ON during laser emission)<br>Distance indicator : Orange (Lights around center) Distance indicator : Green (Lights at the far side)<br>Distance indicator : Red (Lights at the near side) Distance indicator : Alternative Red / Green(Out of range) | | | | | |
| **Protection category** | | IP67 (Including connecting part) | | | | | |
| **Operating temp / humidity** | | −10 to +50℃ (No condensation) / 35% to 85%RH | | | | | |
| **Storage temp / humidity** | | −20 to +60℃ (No condensation) / 35% to 85%RH | | | | | |
| **Ambient illuminance** | | Max. 3,000lx (Surface illuminance, incandescent lamp) | | | | | |
| **Vibration resistance** | | 10 to 55Hz Double amplitude 1.5mm 2 h per XYZ axes | | | | | |
| **Shock resistance** | | 50G (500m/S²) X,Y,Z 3times | | | | | |
| **Cable extension** | | Up to 50 m using an optional extension cable (unbundled) | | | | | |
| **Material** | | Sensor head housing : Diecast aluminum cover of emitting / receiving part : Glass | | | | | |
| **Weight** | | Appx. 250 g (Including cable) | | | | | |

〈Measurement condition〉

Unless otherwise designated, measurement condition is as follows. Using special controller / operating temperature, 23℃ (ordinary temperature) / supply voltage, 24 V DC / sampling period : 100μs (CD5-W350 / -W500 / -W2000 : 800μs) 256 times in average / center / standard testing object (specular reflection: evaporated aluminum mirror, diffuse reflection: white ceramic) / digital measured value.

*1 Defined with center strength 1/e² (13.5%) at the center. There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object close to the detection area.
*2 4096 times in average. Other conditions are same as the above condition.
*3 Default setting of sampling period is as follows.
CD5-□□25～□85 :100μs
CD5-W350～W2000 :800μs
*4 The typical value in the above condition.







## Sensor head

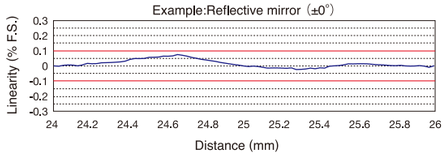
| Model | | CD5-85 | | CD5-W85 | | CD5-W350 | CD5-W500 | CD5-W2000 |
|---|---|---|---|---|---|---|---|---|
| **Optical method** | | Diffuse reflection | Specular mode | Diffuse reflection | Specular mode | Diffuse reflection | | |
| **Measurement dist.** | | 85mm | 82.3mm | 85mm | 82.3mm | 350mm | 500mm | 2000mm |
| **Measurement range** | | ±20mm | ±10mm | ±20mm | ±10mm | ±100mm | ±200mm | ±500mm |
| **Light source** | | Red Laser Diode | | | | | | |
| | | Wavelength 650nm / Maximum output 1mW | | Wavelength 658nm / Maximum output 1mW | | | | Wavelength 658nm / Maximum output 5mW |
| **Laser class** | **IEC/JIS** | Class 2 | | | | | | Class 3R |
| | **FDA** | CLASSII | | | | | | CLASS IIIa |
| **Spot size** (*1) (μm) | | Appx.70×29 | | Appx.260×1200 | | Appx.700×2,400 | Appx.1,000×3,700 | Appx.2,100×7,800 |
| **Light receiving element** | | Linear image sensor | | | | | | |
| **Linearity** | | ±0.05% F.S. | ±0.08% F.S. | ±0.05% F.S. | ±0.08% F.S. | ±0.08% F.S. | ±0.08% F.S. | ±0.1% F.S. |
| **Resolution** (*2) | | 1μm | 0.5μm | 1μm | 0.5μm | 5μm | 10μm | 30μm |
| **Sampling period** (*3) | | 100 / 200 / 400 / 800 / 1600 / 3200μs Setup to be done through the controller (CD5A series) | | | | | | |
| **Temperature drift** (*4) | | ±0.01% F.S. / ℃ | | | | | | ±0.05% F.S. / ℃ |
| **Serial I/F** | | RS-422 9.6k to 843.2kbps | | | | | | |
| **Supply voltage** | | 12 - 24VDC ±10% or from controller (CD5A series) | | | | | | |
| **Indicator** | | Laser emission indicator : Green (ON during laser emission)<br>Distance indicator : Orange (Lights around center) Distance indicator : Green (Lights at the far side)<br>Distance indicator : Red (Lights at the near side) Distance indicator : Alternative Red / Green(Out of range) | | | | | | |
| **Protection category** | | IP67 (Including connecting part) | | | | | | |
| **Operating temp / humidity** | | −10 to +50℃ (No condensation) / 35% to 85%RH | | | | | | |
| **Storage temp / humidity** | | −20 to +60℃ (No condensation) / 35% to 85%RH | | | | | | |
| **Ambient illuminance** | | Max. 3,000lx (Surface illuminance, Incandescent lamp) | | | | | | |
| **Vibration resistance** | | 10 to 55Hz Double amplitude 1.5mm 2 h per XYZ axes | | | | | | |
| **Shock resistance** | | 50G (500m/s²) X,Y,Z 3times | | | | | | |
| **Cable extension** | | Up to 50 m using an optional extension cable (unbundled) | | | | | | |
| **Material** | | Sensor head housing : Diecast aluminum cover of emitting / receiving part : Glass | | | | | | |
| **Weight** | | Appx. 250 g (Including cable) | | | | | | Appx. 450 g (Including cable) |

## Controller

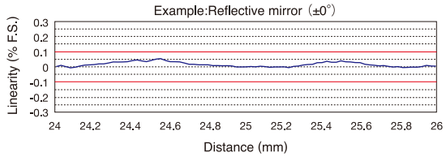
| Model | CD5A-N (NPN input / output type) | CD5A-P (PNP input / output type) |
|---|---|---|
| **Number of heads** | Max. 3pcs | |
| **Supply voltage** | 12 - 24VDC ±10% | |
| **Power consumption** | 350mA / 24VDC(When connected with 3 sensor heads. Including analog current output) | |
| **Temp drift** | ±0.01% F.S. / °C | |
| **Interface** | RS232 / USB | |
| **Analog output** | Voltage output ± 10V / F.S. (Output impedance 100Ω) Current output 4 to 20mA / F.S. (Load impedance max.300Ω) | |
| **Alarm output** | NPN open collector | PNP open collector |
| | Max. 100mA / 24V DC (residual voltage max. 1.8V) Turns ON when the sensor head fails in measurement. | |
| **Control output** | NPN open collector | PNP open collector |
| | Max. 100mA / 24V DC (residual voltage max. 1.8V) HI / LO setting for each line and hysteresis setting are available. | |
| **Bank select input** | Turns ON when connected to GND | Turns ON when connected to 12 - 24VDC |
| | 16 banks selectable | |
| **Hold input** | Turns ON when connected to GND | Turns ON when connected to 12 - 24VDC |
| | Measurement value holding (selectable in the menu) | |
| **Zero reset input** | Turns ON when connected to GND | Turns ON when connected to 12 - 24VDC |
| | Zero reset of Head A measurement value / Head B measurement value / Head C measurement value / Calculation value is available. | |
| **Laser off input** | Turns ON when connected to GND | Turns ON when connected to 12 - 24VDC |
| | Laser shutoff of Head A / Head B / Head C is available. | |
| **Optional features** | Calculation setting (calculation formula, measurement value increase / decrease direction, value of K, shift), hold settings, filter setting (filter, cut-off frequency), memory bank setting, RS232 setting, memory copying function, measurement value display digit number setting, display brightness setting, key illumination setting | |
| **Display** | 4.3" TFT LCD | |
| **Protection category** | IP20 | |
| **Operating temp / humidity** | −10 to +50°C (No condensation) / 35 to 85% RH | |
| **Storage temp / humidity** | −20 to +60°C (No condensation) / 35 to 85% RH | |
| **Vibration resistance** | 10 to 55Hz, Double amplitude 1.5mm, 2h for XYZ axes | |
| **Shock resistance** | 20G(196m/s²) , 3 times for XYZ axes | |
| **Material** | Chassis: Polycarbonate, connection terminals : Nylon 66 | |
| **Weight** | Approx. 550 g (Including connection terminals) | |

# LINEARITY (Typical example data)

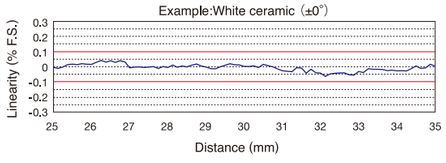
**Model No. : CD5-L25**



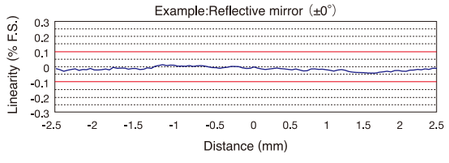

**Model No. : CD5-LW25**



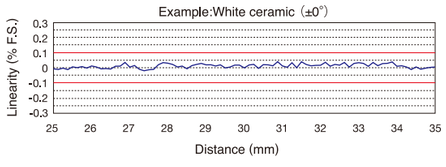

**Model No. : CD5-30**



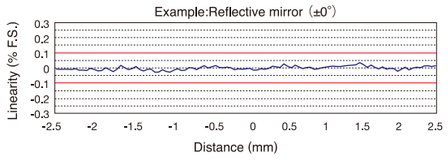

**Model No. : CD5-30 (Specular mode)**



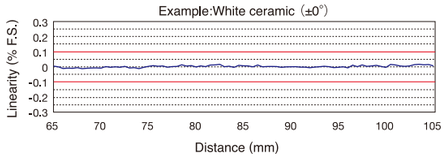

**Model No. : CD5-W30**



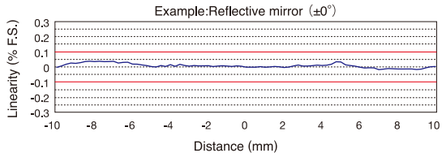

**Model No. : CD5-W30 (Specular mode)**



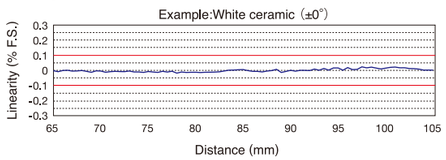

**Model No. : CD5-85**



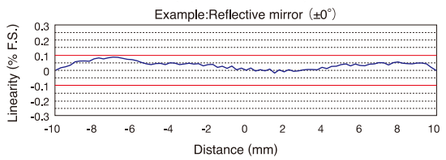

**Model No. : CD5-85 (Specular mode)**



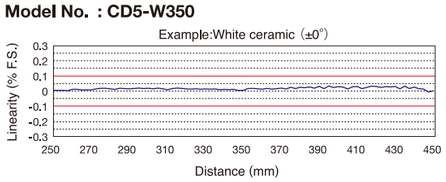

**Model No. : CD5-W85**



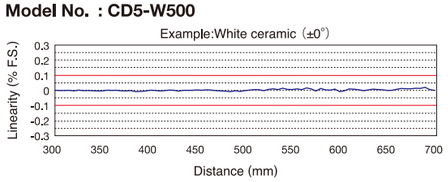

**Model No. : CD5-85 (Specular mode)**



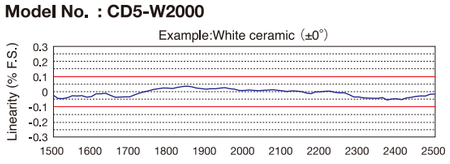

**Model No. : CD5-W350**




**Model No. : CD5-W500**




**Model No. : CD5-W2000**



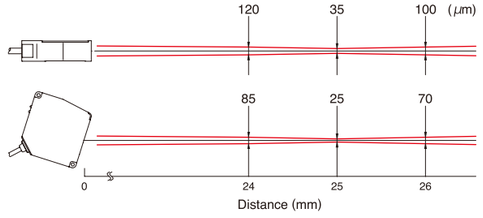




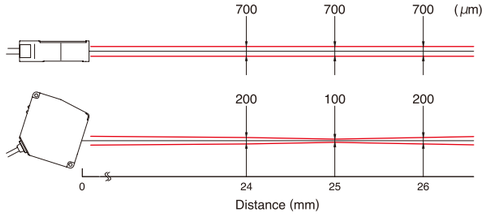



# SPOT SIZE

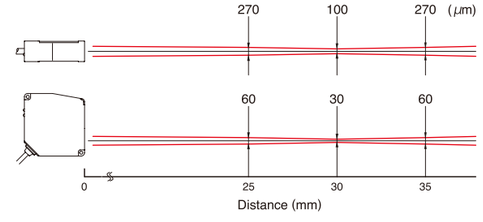
**Model No. : CD5-L25**



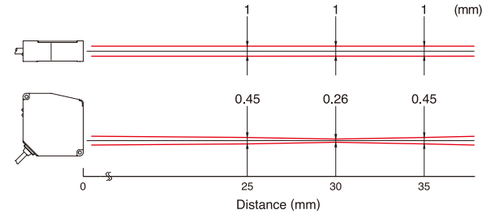

**Model No. : CD5-LW25**




**Model No. : CD5-30**




**Model No. : CD5-W30**



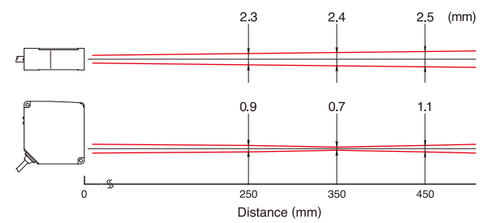

**Model No. : CD5-85**



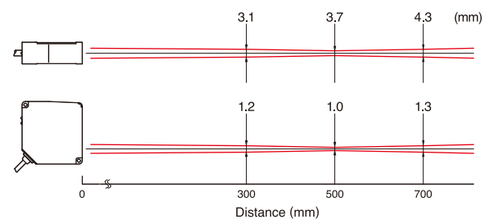

**Model No. : CD5-W85**



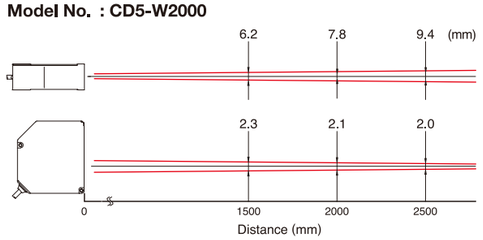

**Model No. : CD5-W350**




**Model No. : CD5-W500**

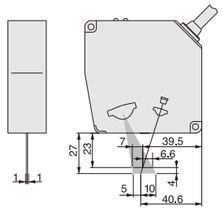



**Model No. : CD5-W2000**

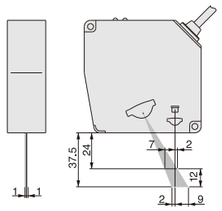


# INTERFERENCE AREA

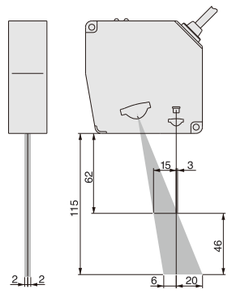
**Model No. : CD5-L25**



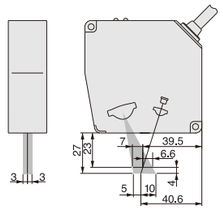

**Model No. : CD5-30**



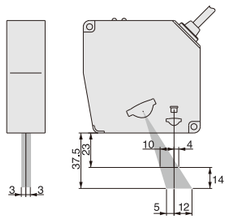

**Model No. : CD5-85**



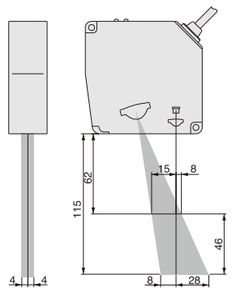

**Model No. : CD5-LW25**



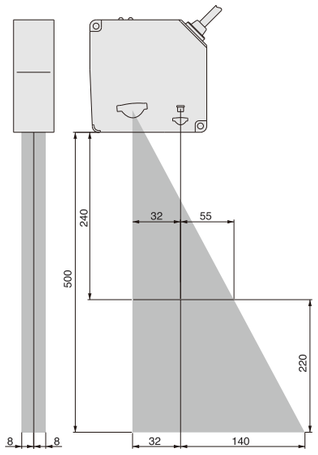

**Model No. : CD5-W30**



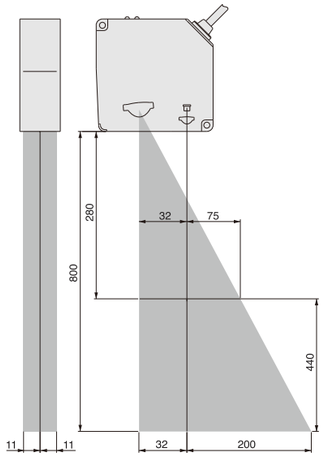

**Model No. : CD5-W85**



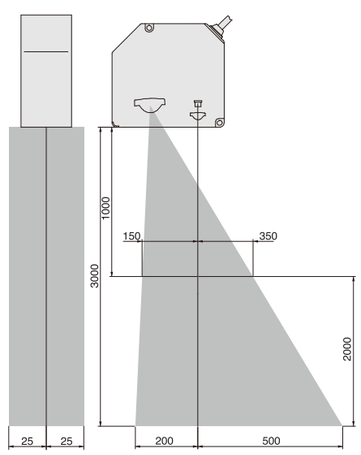

**Model No. : CD5-W350**




**Model No. : CD5-W500**




**Model No. : CD5-W2000**




(mm)

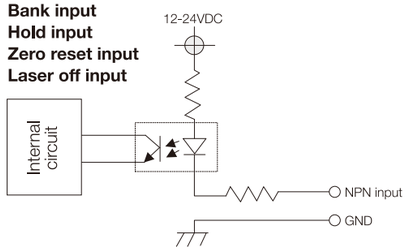




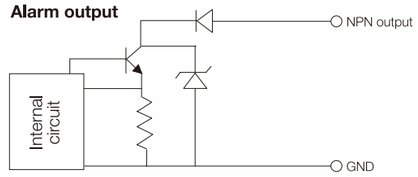


# INPUT / OUTPUT DIAGRAMS

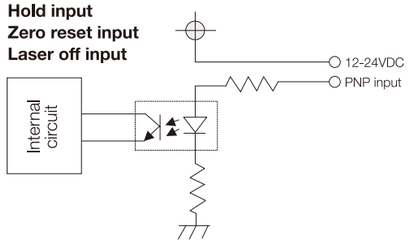
**NPN model**
**Bank input**
**Hold input**
**Zero reset input**
**Laser off input**



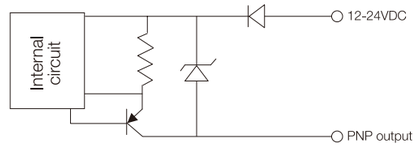

**NPN model**
**Control output**
**Alarm output**



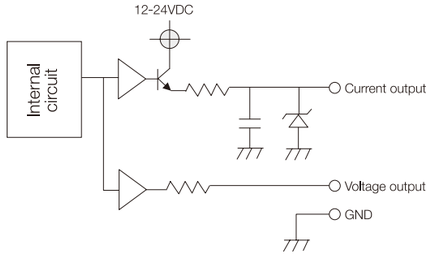

**PNP model**
**Bank input**
**Hold input**
**Zero reset input**
**Laser off input**




**PNP model**
**Control output**
**Alarm output**




**Analog output**



# CD4 series

## CD4 Series with linear image sensor and electronic shutter provides accurate measurement.

- Laser displacement sensor features easy setup and operation.
- High accuracy of 0.1μm resolution and ±0.1% F.S. linearity. (Specular Type)
- Specular type (CD4L-25) optics that are ideal for glass sensing.

# SENSORHEAD VARIATION

### 〈For general use〉

Regular type

**CD4-30** (IEC Class 2「FDA CLASS II」Type)
**CD4-30-3R** (High power Class 3R Type)

**Short distance**
Tire inspection

Measurement range : 30 ±5mm
Resolution : 1 μm
Linearity : ±0.1% F.S.

Regular type

**CD4-85** (IEC Class 2「FDA CLASS II」Type)
**CD4-85-3R** (High power Class 3R Type)

**Middle distance**
Checking clear package of IC mounted on PCB

Measurement range : 85 ±20mm
Resolution : 3 μm
Linearity : ±0.1% F.S.

Regular type

**CD4-350** (IEC Class 2「FDA CLASS II」Type)
**CD4-350-3R** (High power Class 3R Type)

**Long distance**
Monitoring the die cast

Measurement range : 350 ±100mm
Resolution : 40 μm
Linearity : ±0.1% F.S.

### 〈For glass material〉

Specular type

**CD4L-25** (IEC Class 1「FDA CLASS II」Type)

**Specular type**
Monitoring warping sagging of glass plate

Measurement range : 25 ±1mm
Resolution : 0.1 μm
Linearity : ±0.1% F.S.

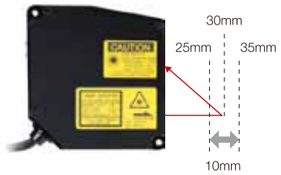
# CD4 SENSOR HEADS

## CD4 Series laser displacement sensor with linear image sensor and electronic shutter provides accurate measurement.

### Measuring range

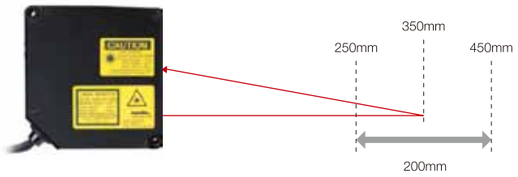
**〈General use〉**

CD4-30
CD4-30-3R
Short range : 30 ±5mm




CD4-85
CD4-85-3R
Middle range : 85 ±20mm

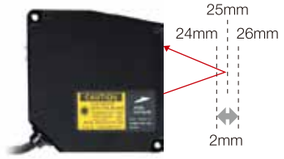
CD4-350
CD4-350-3R
Long range : 350 ±100mm




**〈Glass material〉**

CD4I-25 Specular type : 25 ±1mm

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




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

CD4-30 CD4-85 CD4-350

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

### Class 3R - High power types

CD4-30-3R CD4-85-3R CD4-350-3R

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.

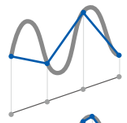
### Class 1 (IEC/JIS) CLASS II (FDA) laser product

CD4L-25

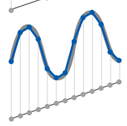
CD4L-25 is registered to CDRH. (Center of devices and radiological health)

### High speed sampling rate

The CD4 Displacement sensor has a 100$\mu$sec. 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.

# CD4 CONTROLLERS

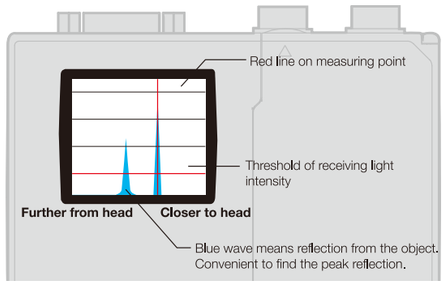
## The CD4 controller is easy to operate with simple pushbutton setup and an LCD display to verify / change the settings.

### 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.

### Light intensity monitor (For CD4L-25 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.




### Ten formulas of calculation

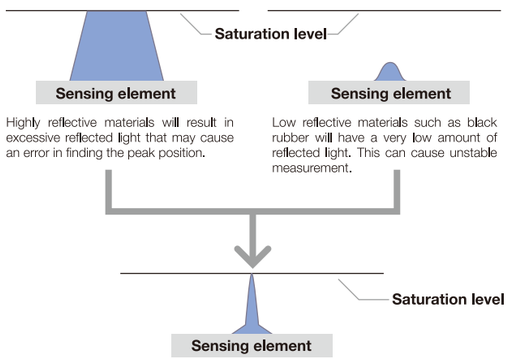
| | |
|---|---|
| A | Sensor head A |
| B | Sensor head B |
| A+B | Adding of A and B |
| A-B | Gap between A and B |
| -A-B | Reverse of A+B |
| K-A-B | K = distance between sensors. Good for measuring thickness. |
| K+A+B | K = Offset value |
| K+A-B | K = Offset value |
| K+A | Offset the sensor A.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

### 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).




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

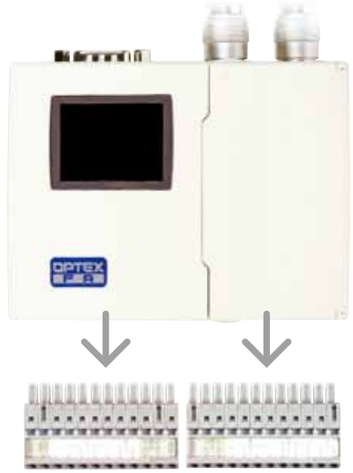
| | |
|---|---|
| Communication method | RS-232C |
| Transmission type | Asynchronous |
| Baud rate | 9600/19200/38400/115200 bps |
| Transmission code | ASCII |
| Data length | 7/8 bit |
| Stop bit length | 1 bit |
| Parity check | Nil/Ever number/Odd number |
| Data classification | STX・ETX |

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

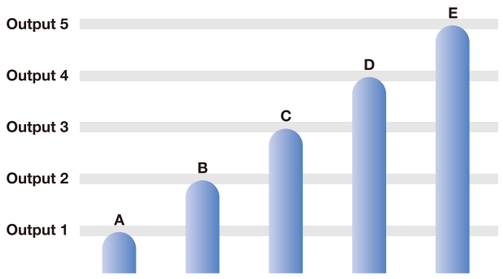
High / Low pass filters are built into the CD4 controller. A low pass filter will help to reduce any sudden changes in the measurement while the high pass filter will eliminate slow gradual changes.



Easy disconnection of QD type.

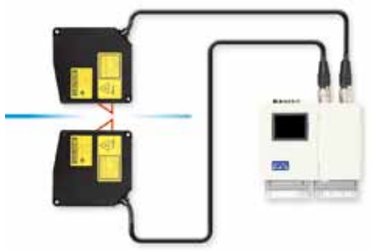
### 5 Independent outputs are available

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

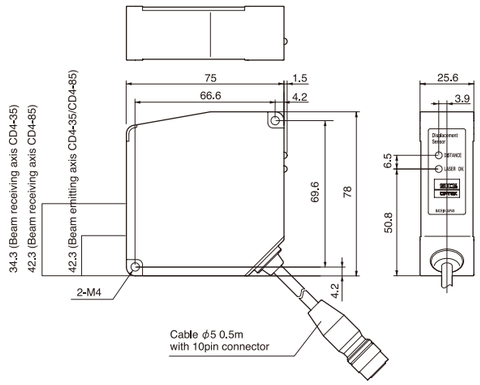
Therefore it computes for the purpose of measuring thickness, width, etc.
Independent measurement from each head is possible as well. Any combination of measurement heads (30, 85, 350) can be used together.



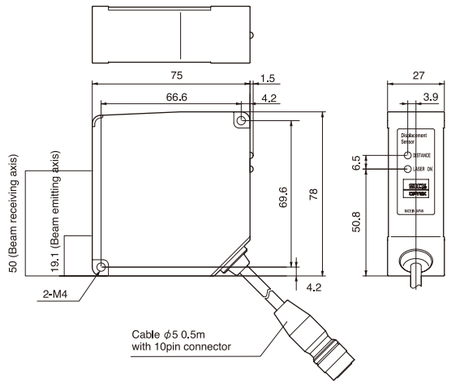
# DIMENSIONS

## CD4 series sensor head

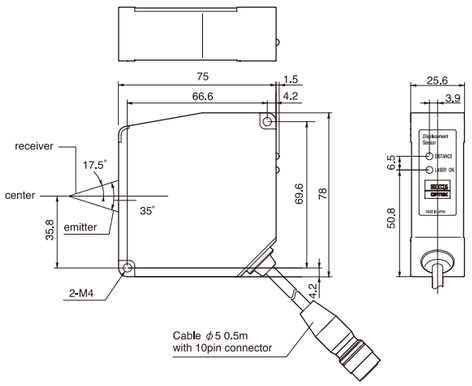
**Model No. : CD4-30/-30-3R/-85/-85-3R**




**Model No. : CD4-350/-350-3R**




## CD4L-25 Sensor head

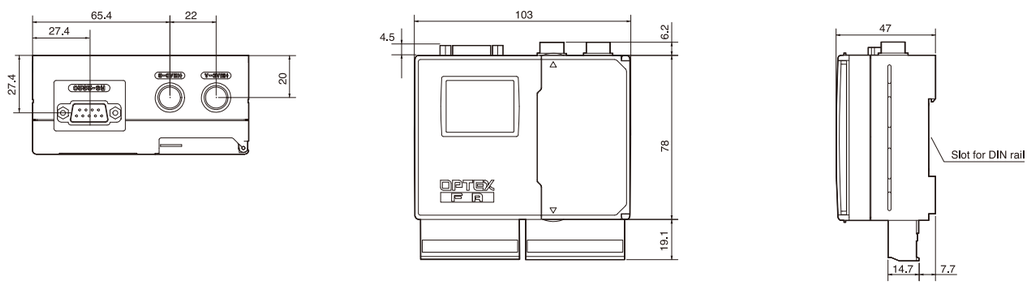



## Cable

**Model No. : CD4CN-S-ROBOT**
: Extension 2m cable to connect the sensor head

**Model No. : CD4CN-5S-ROBOT**
: Extension 5m cable to connect the sensor head

## Controller




(mm)







# SPECIFICATIONS

## CD4 series

| Model | 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 |
| Measurement 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% F.S. | | |
| Resolution | (*3) | 1μm | 3μm | 40μm |
| Supply voltage | | Supplied by CD4A-N / P controller | | |
| Temp drift | | ±0.01% F.S. / ˚C | | |
| Laser emission indicator | | Green = Laser emission | | |
| Measurement indicator | | Red = In range, closer than center 5% of measurement range (0 to 45%)<br>Orange = Within ±5% of the center of the measuring range<br>Green = In range, farther than center 5% of measurement range (55 to 100%)<br>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 (500m/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.

## CD4L-25

| Model | CD4L-25 |
|---|---|
| Measurement range | 25 ±1mm |
| Light source | Class 1 (IEC / JIS) CLASS II (FDA) Laser, 650nm, max 390 μW |
| Spot size (*1) | 25×35 μm |
| Linearity (*2) | ± 0.1% F.S. |
| Resolution (*3) | 0.1 μm |
| Supply voltage | Supplied by CD4A-LN/LP controller |
| Temp drift | ±0.01% F.S. / ˚C |
| Laser emission indicator | Green = Laser emission |
| Measurement indicator | Red = In range, closer than center 5% of measurement range (0 to 45%)<br>Orange = Within ±5% of the center of the measuring range<br>Green = In range, farther than center 5% of measurement range (55 to 100%)<br>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 (500m/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: evaporated aluminum mirror. 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.

## Controller

| Model | | CD4A-N / -LN (NPN output type) | CD4A-P / -LP (PNP output type) |
|---|---|---|---|
| **Number of heads** | | Max.2 pcs | |
| **Sampling period** | | 100μs | |
| **Supply voltage** | | 12 - 24VDC ±10% | |
| **Power consumption** | | 270mA / 24VDC (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 ±5V / F.S. (Output impedance 100Ω, resolution 1mV) | |
| | **ANG** (mA) [A] [B] | Current output 4 to 20mA / F.S. (Load impedance 300Ω, resolution 1.5μA) | |
| **Alarm output** | **ALM A,ALM B** | NPN open collector | PNP open collector |
| | | Max. 100mA / 24VDC (residual voltage Max. 1.8V) Turns ON when the sensor head fails in measurement. | |
| **Control output** | **JDGE 1 to 5** | NPN open collector | PNP open collector |
| | | Max. 100mA / 24VDC (residual voltage Max. 1.8V) | |
| | | 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 - 24VDC |
| | | 8 banks selectable | |
| **Hold input** | **HOLD A, HOLD B, HOLD RST** | ON when connected to GND | ON when connected to 12 - 24VDC |
| | | 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 - 24VDC |
| | | 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 / humidity** | | −10 to +45˚C (Non-condensing) / 35 to 85% RH | |
| **Storange temp / humidity** | | −20 to +60˚C / 35 to 85% RH | |
| **Vibration resistance** | | 10 to 55Hz, Double amplitude 1.5mm, 2h for XYZ axis | |
| **Shock resistance** | | 20G (196m/s²) | |
| **Material** | | Chassis: Polycarbonate, Connection terminals: Nylon 66 | |
| **Weight** | | 240g (including connection terminals) | |



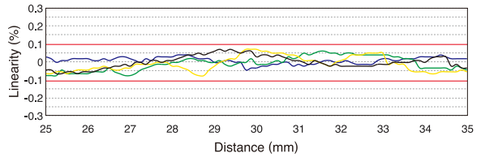




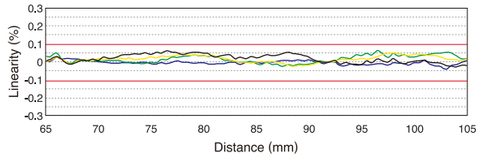
# LINEARITY (Typical example data)

## CD4 series : by material

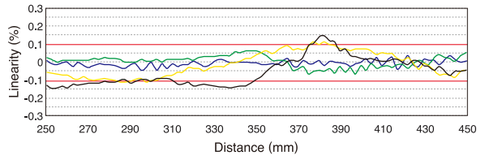
**Model No. : CD4-30 / CD4-30-3R**

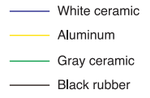



**Model No. : CD4-85 / CD4-85-3R**

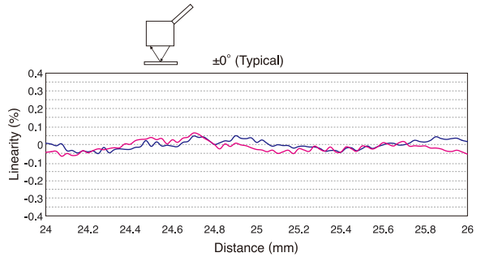


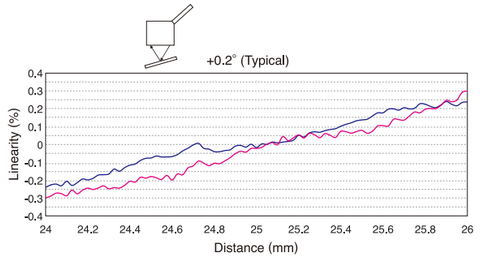

**Model No. : CD4-350 / CD4-350-3R**

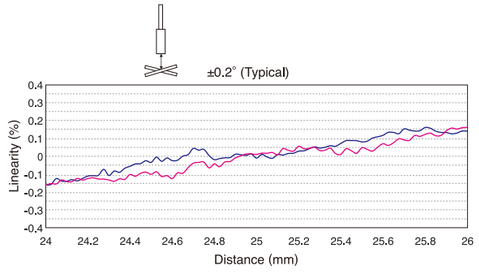


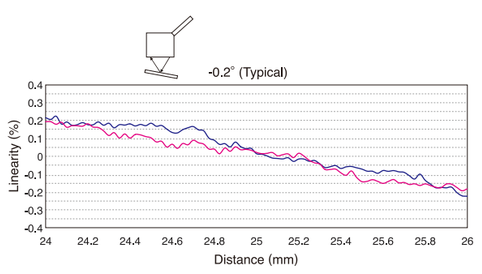




## CD4L-25 : by angle



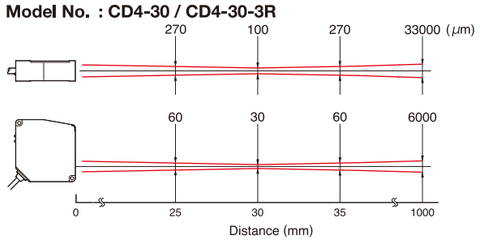



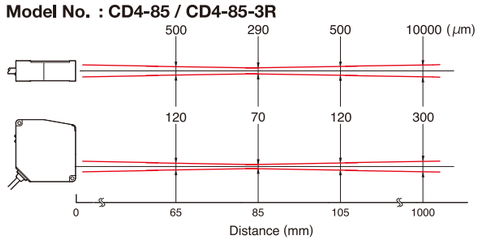
# SPOT SIZE

## CD4 series

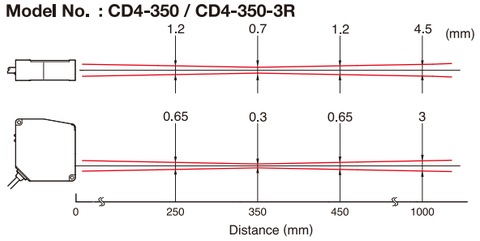
**Model No. : CD4-30 / CD4-30-3R**



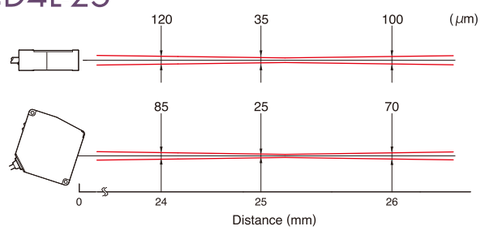

**Model No. : CD4-85 / CD4-85-3R**




**Model No. : CD4-350 / CD4-350-3R**



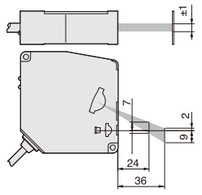

## CD4L-25



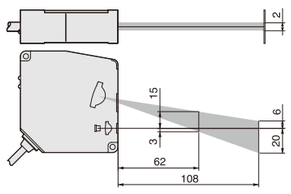

# INTERFERENCE AREA

## CD4 series

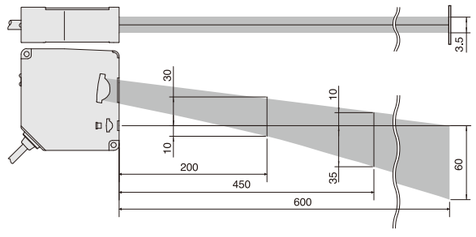
**Model No. : CD4-30/CD4-30-3R**



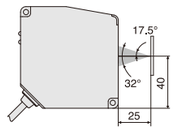

**Model No. : CD4-85/CD4-85-3R**




**Model No. : CD4-350/CD4-350-3R**



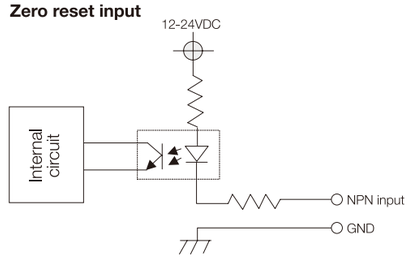

## CD4L-25



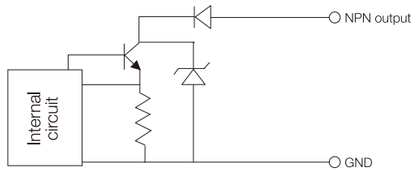

(mm)

# INPUT / OUTPUT DIAGRAMS

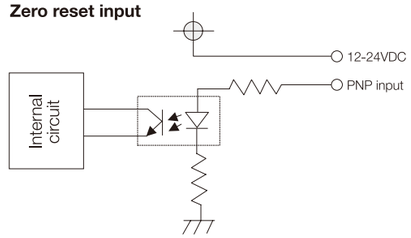
**NPN model bank input**
**Hold input**
**Zero reset input**



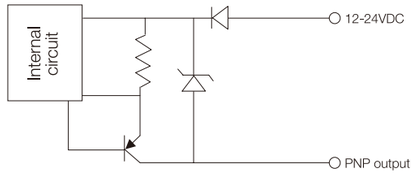

**NPN model**
**control output**
**Alarm output**



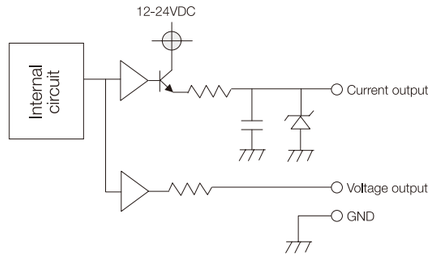

**PNP model bank input**
**Hold input**
**Zero reset input**




**NPN model**
**control output**
**Alarm output**




**Analog output (A/B)**



# CD33 series

## CMOS sensor with ±0.1% F.S. linearity packed in a half-palm size, ideal for built-in use with OEM machines.

- Available is CD33-L a Specular Types for high reflection and transparent object even in RS422 serial communications.
- Just connect UQ1-02 to build data logging system to Mitsubishi PLC without any I/F, logging unit and ladder program.
- Analogue output (4-20mA or 0-10V) + 2 control outputs
  Stand-alone design capable of direct operation without controller







# LINEUP

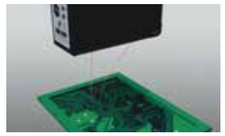
Diffuse type

## CD33-30

**30mm distance type**

Warping / Sagging of PC board

Measurement range : 30 ±4mm
Resolution : 4μm (Fast mode)
Linearity : ±0.1% F.S.

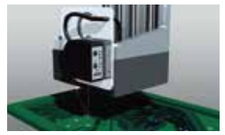


## CD33-50

**50mm distance type**

Height of components on the board

Measurement range : 50 ±10mm
Resolution : 8μm (Fast mode)
Linearity : ±0.1% F.S.



## CD33-85

**85mm distance type**

Joint of rubber sheet

Measurement range : 85 ±20mm
Resolution : 15μm (Fast mode)
Linearity : ±0.1% F.S.

## CD33-120

**120mm distance type**

Loosen rubber sheet

Measurement range : 120 ±60mm
Resolution : 45μm (Fast mode)
Linearity : ±0.1% F.S.

## CD33-250

**250mm distance type**

Checking tire

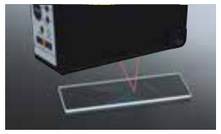
Measurement range : 250 ±150mm
Resolution : 100μm (Fast mode)
Linearity : ±0.3% F.S.

Specular type

## CD33-L30

**26.3mm distance type**

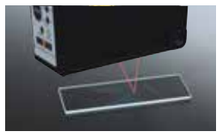
Measurement range : 26.3 ±2mm
Resolution : 1 μm
Linearity : ±0.2% F.S.



## CD33-L50

**47.3mm distance type**

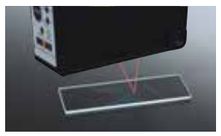
Measurement range : 47.3 ±5mm
Resolution : 2.5 μm
Linearity : ±0.2% F.S.



## CD33-L85

**82.9mm distance type**

Measurement range : 82.9 ±10mm
Resolution : 5 μm
Linearity : ±0.2% F.S.



Application example for specular type
Measurement of glass thickness is available

**Product code**

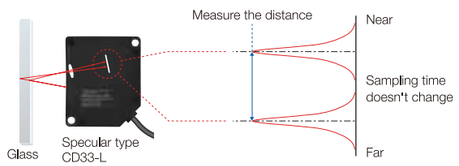
- CD33-□□**NV** (N=NPN, V=0-10V)
- CD33-□□**PV** (P=PNP, V=0-10V)
- CD33-□□**NA** (N=NPN, A=4-20mA)
- CD33-□□**PA** (P=PNP, A=4-20mA)
- CD33-□□□**N**-422 (N=NPN, 422=RS422 I/F)
- CD33-□□□**P**-422 (P=PNP, 422=RS422 I/F)

# CD33 ADVANCED TECHNOLOGY

## The CD33 series is a function rich CMOS laser displacement sensor designed in an ultra-compact housing RS-422 type is available for digital connection

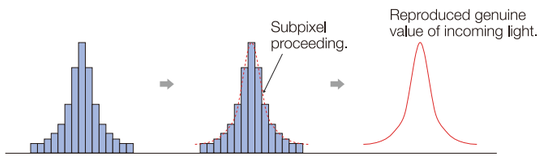
### Reliable glass thickness measurement

The Specular type CD33-L** can detect both surface of glass and measure the thickness.



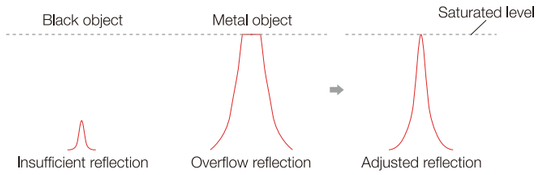

### Digital subpixel processing

Subpixel processing divides one pixel into small pieces that enables accurate measurement by reproducing genuine value of incoming light.




### High resolution electronic shutter

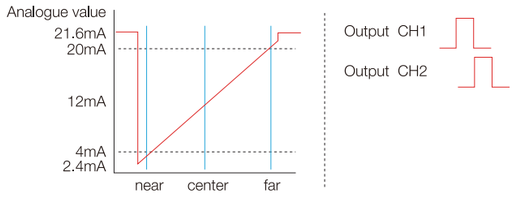
High resolution electronic shutter controls to keeps a constant level according to reflection.
This function enables stable peak level detection even when unstable surface conditions exist.



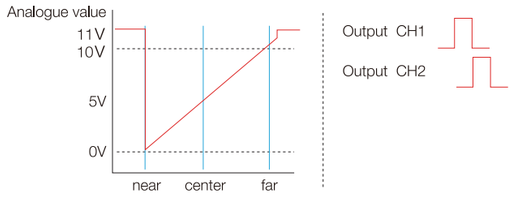

### Easy-to-select models between voltage and current output.

It is common today for sensors to be very complicated requiring long set-up times and many buttons to operate.
The CD33 focuses on easier set-up by separating voltage and current output models into two types.

**4-20mA output + 2CH outputs**




**0-10V output + 2CH outputs**










### Ideal for robot mounting

Ideal for mounting on robot cylinder thanks to compact dimensions and the light 65g weight. IP67 water tightness is also secured.

### Control unit UQ1 series to connect sensor head to PLC MELSEC-Q series directly

UQ1-02 enables easy connection of CD33 and PLC MELSEC-Q series. UQ1 setup the sensor head automatically.You don't have to have big ladder proglam.

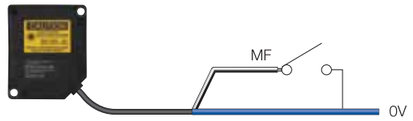
→ P280

### 2CH outputs enables individual setting of measurement range.

Highly accurate comparator output capable of identifying 12$\mu$m (with CD33-30 types). Hysteresis is just 0.15% F.S.

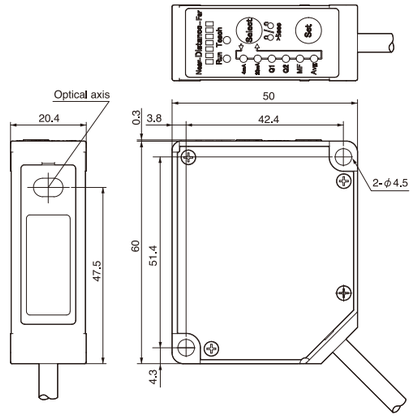
### MF (Multi Function) input for further convenience.

The programmable remote MF input can be set to one of the following: Laser o , External teach, Hold, or One-shot trigger.

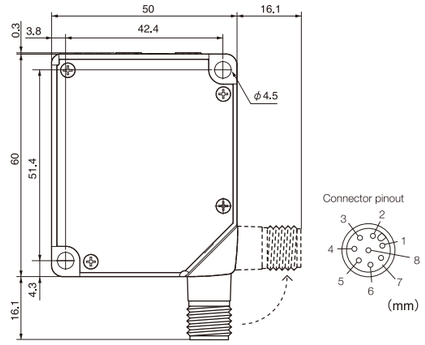


# DIMENSIONS

## Cable type

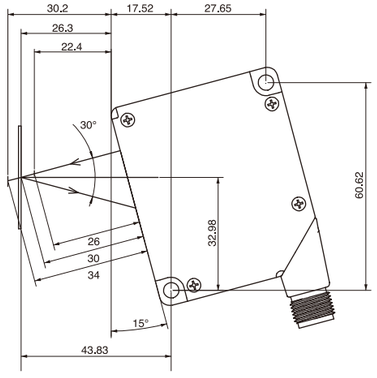



## M12 Connector type

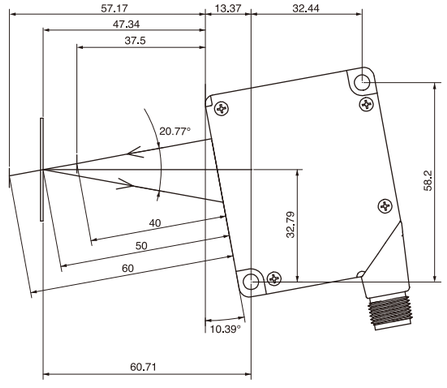



## Mounting of specular type

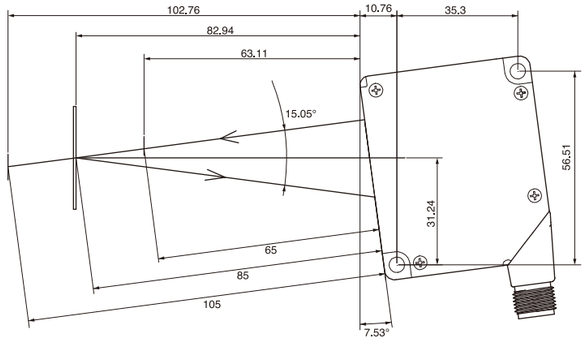
**Model No.: CD33-L30**




**Model No.: CD33-L50**




**Model No.: CD33-L85**

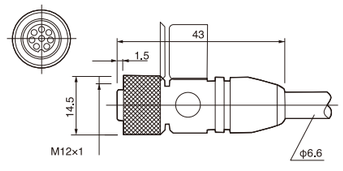



## Accessories

### Cable

**Model No. : DOL-1208-G02MF**
: 2m extension cable (unbundled)

**Model No. : DOL-1208-G05MF**
: 5m extension cable (unbundled)










# SPECIFICATIONS

## Diffuse type

| Model | | | | | | | |
|---|---|---|---|---|---|---|---|
| Model | Cable type | 2control output | CD33-30N / P | CD33-50N / P | CD33-85N / P | CD33-120N / P | CD33-250N / P |
| | | 2control output + Analog 4-20mA | CD33-30NA / PA | CD33-50NA / PA | CD33-85NA / PA | CD33-120NA / PA | CD33-250NA / PA |
| | | 2control output + Analog 0-10V | CD33-30NV / PV | CD33-50NV / PV | CD33-85NV / PV | CD33-120NV / PV | CD33-250NV / PV |
| | | 1control output + RS422 | CD33-30N-422<br>CD33-30P-422 | CD33-50N-422<br>CD33-50P-422 | CD33-85N-422<br>CD33-85P-422 | CD33-120N-422<br>CD33-120P-422 | CD33-250N-422<br>CD33-250P-422 |
| | Connector type | 2control output | CD33-30CN / CP | CD33-50CN / CP | CD33-85CN / CP | CD33-120CN / CP | CD33-250CN / CP |
| | | 2control output + Analog 4-20mA | CD33-30CNA / CPA | CD33-50CNA / CPA | CD33-85CNA / CPA | CD33-120CNA / CPA | CD33-250CNA / CPA |
| | | 2control output + Analog 0-10V | CD33-30CNV / CPV | CD33-50CNV / CPV | CD33-85CNV / CPV | CD33-120CNV / CPV | CD33-250CNV / CPV |
| | | 1control output + RS422 | CD33-30CN-422<br>CD33-30CP-422 | CD33-50CN-422<br>CD33-50CP-422 | CD33-85CN-422<br>CD33-85CP-422 | CD33-120CN-422<br>CD33-120CP-422 | CD33-250CN-422<br>CD33-250CP-422 |
| **Control output** | | | N = NPN output, P = PNP output | | | | |
| **Measurement range** | | | 30±4mm | 50±10mm | 85±20mm | 120±60mm | 250±150mm |
| **Full scale** | | | 8mm | 20mm | 40mm | 120mm | 300mm |
| **Light source** | | | Red laser diode (wave length 655nm) | | | | |
| **Peak power** | | | 1mW max. | | | | |
| **IEC/JIS Class** | | | Class 2 | | | | |
| **FDA CLASS** | | | CLASS II | | | | |
| **Spot size (approx.volume)** (*1) | **Near** | | 0.15×0.15mm | 0.6×1.2mm | 0.9×1.5mm | 1.2×1.8mm | 1.5×2.5mm |
| | **Middle** | | 0.1×0.1mm | 0.5×1.0mm | 0.75×1.25mm | 1.0×1.5mm | 1.75×3.5mm |
| | **Far** | | 0.15×0.15mm | 0.4×0.9mm | 0.6×1.0mm | 0.5×0.8mm | 2.0×4.5mm |
| **Linearity** (*2) | | | ±0.1% F.S. | | | | ±0.3% F.S. |
| **Resolution**(*3) | **Fast** | | 4μm | 8μm | 15μm | 45μm | 100μm |
| | **Other** | | 2μm | 5μm | 10μm | 30μm | 75μm |
| **Temp drift** | | | ±0.08%F.S. / ℃ | | | | |
| **Response time** (*4) | **Fast** | | 1ms+ selecting sensitivity (averaging : 1) | | | | 1.5ms+ selecting sensitivity (averaging : 1) |
| | **Standard** | | 8.5ms+ selecting sensitivity (averaging : 16) | | | | 13ms+ selecting sensitivity (averaging : 16) |
| | **High resolution** | | 32.5ms+ selecting sensitivity (averaging : 64) | | | | 49ms+ selecting sensitivity (averaging : 64) |
| | **Selecting sensitivity** | | 4ms max. | | | | |
| **Indicators** | **Distance indicator** | | bar graph LED | | | | |
| | **Output indicator** | | ON status : Orange | | | | |
| **Protection category** | | | IP67 | | | | |
| **Operating temp / humidity** | | | −10～+45℃ / 35～85%RH (No condensation or freezing) | | | | |
| **Storage temp / humidity** | | | −20～+60℃ / 35～95%RH (No condensation or freezing) | | | | |
| **Ambient illuminance** | | | Sun light : 10,000lx max. Incandescent lamp : 3,000lx max. | | | | |
| **Vibration resistance** | | | 10 to 55 Hz, Double amplitude 1.5 mm, 2 h for XYZ axis | | | | |
| **Shock resistance** | | | 50G (500m/s²) | | | | |
| **Cable extension** | | | Up to 10m using an optional extension cable | | | | |
| **Material** | | | PBT (Case) PMMA (Front window) | | | | |
| **Weight** | **Cable type** | | approx.65g (without cable) | | | | |
| | **Connector type** | | approx.70g | | | | |

| Model | | 2 Control output | + Analog 4-20mA | + Analog 0-10V | 1 Control output + RS422 |
|---|---|---|---|---|---|
| **Supply voltage** | | 12 - 24VDC (-5%, +10%) | | 18 - 24VDC (-5%, +10%) | 12 - 24VDC (-5%, +10%) |
| **Current consumption** | | max. 55mA (24VDC) | max. 85mA (24VDC) | max. 55mA (24VDC) | |
| **Output** | **Control output 1** | NPN / PNP open collector 100mA max. / 30VDC (residual voltage max. 1.8V) | | | — |
| | **Control output 2** | NPN / PNP open collector 100mA max. / 30VDC (residual voltage max. 1.8V) | | | |
| | **Analog output** | — | 4-20mA | 0-10V | — |
| **Interface** | | — | | | RS422 |
| **Cable type** | | Dia : 5mm 5core 2m AWG24 (PVC) | Dia : 5mm 6core 2m AWG24 (PVC) | | Dia : 5mm 8core 2m AWG24 (PVC) |
| **Connector type** | | M12 8pin | | | |

*1 Defined with center strength 1/e²(13.5%). There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object around the targets.
*2 Averaging : 64(High resolution), Object : white ceramic.
*3 Middle of measuring range, Object : white ceramic.
*4 Response time : response time plus selecting sensitivity time.

## Specular type

| Model | | | | | |
|---|---|---|---|---|---|
| | Cable type | 2control output + Analog 4-20mA | CD33-L30NA / PA | CD33-L50NA / PA | CD33-L85NA / PA |
| | | 2control output + Analog 0-10V | CD33-L30NV / PV | CD33-L50NV / PV | CD33-L85NV / PV |
| | | 1control output + RS422 | CD33-L30N-422 / P-422 | CD33-L50N-422 / P-422 | CD33-L85N-422 / P-422 |
| | Connector type | 2control output + Analog 4-20mA | CD33-L30CNA / CPA | CD33-L50CNA / CPA | CD33-L85CNA / CPA |
| | | 2control output + Analog 0-10V | CD33-L30CNV / CPV | CD33-L50CNV / CPV | CD33-L85CNV / CPV |
| | | 1control output + RS422 | CD33-L30CN-422 / CP-422 | CD33-L50CN-422 / CP-422 | CD33-L85CN-422 / CP-422 |

| | | | | |
|---|---|---|---|---|
| **Control output** | | N = NPN open collector, P = PNP open collector | | |
| **Measurement range** | | 26.3±2mm | 47.3±5mm | 82.9±10mm |
| **Full scale** | | 4mm | 10mm | 20mm |
| **Light source** | | Red laser diode, 655nm | | |
| **Peak power** | | 390μW max. | | |
| **IEC/JIS Class** | | Class 1 | | |
| **FDA CLASS** | | CLASS II | | |
| **Spot size (approx.volume)** (*1) | **Near** | 0.15×0.15mm | | |
| | **Middle** | 0.1×0.1mm | | |
| | **Far** | 0.15×0.15mm | | |
| **Linearity** (*2) | | ±0.2% F.S. | | |
| **Resolution**(*3) | | 1μm | 2.5μm | 5μm |
| **Temp drift** | | ±0.08%F.S. / ℃ | | |
| **Response time** (*4) | **Fast** | 1ms+ selecting sensitivity (averaging : 1) | | |
| | **Standard** | 8.5ms+ selecting sensitivity (averaging : 16) | | |
| | **High resolution** | 32.5ms+ selecting sensitivity (averaging : 64) | | |
| | **Selecting sensitivity** | 4ms max. | | |
| **Indicators** | **Distance indicator** | bar graph LED | | |
| | **Output indicator** | ON status : Orange | | |
| **Protection category** | | IP67 | | |
| **Operating temp / humidity** | | −10～+45℃ / 35～85%RH (without condensing) | | |
| **Storage temp / humidity** | | −20～+60℃ / 35～95%RH (without condensing) | | |
| **Ambient illuminance** | | Incandescent lamp : 3,000lx max. | | |
| **Vibration resistance** | | 10 to 55 Hz, Double amplitude 1.5 mm, 2 h for XYZ axis | | |
| **Shock resistance** | | 50G (500m/s²) XYZ 3times | | |
| **Cable extension** | | Up to 10m using an optional extension cable | | |
| **Material** | | PBT (Case) PMMA (Front window) | | |
| **Weight** | **Cable type** | approx.65g (without cable) | | |
| | **Connector type** | approx.70g | | |

*1 Defined with center strength 1/e²(13.5%). There may be leak light other than the specified spot size. The sensor may be affected when there is a highly reflective object around the targets.
*2 Averaging : 64 (High resolution), Object : evaporated aluminum mirror.
*3 Middle of measuring range, Object : evaporated aluminum mirror.
*4 Response time : response time plus selecting sensitivity time.

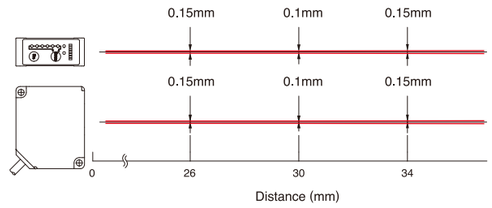




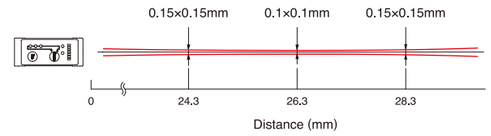


# SPOT SIZE

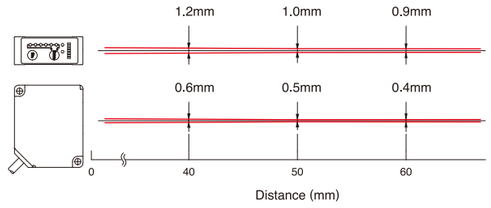
**Model No. : CD33-30N□**



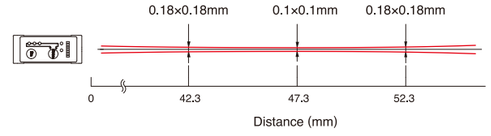

**Model No. : CD33-L30N-422**



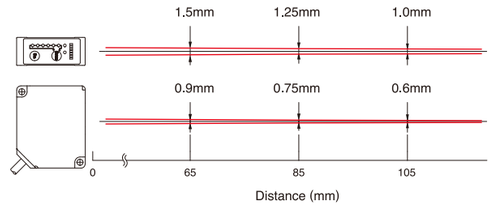

**Model No. : CD33-50N□**



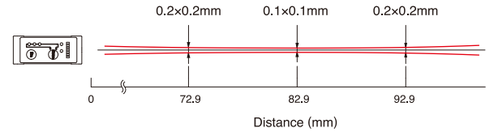

**Model No. : CD33-L50N-422**



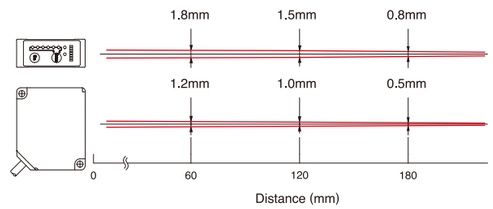

**Model No. : CD33-85N□**



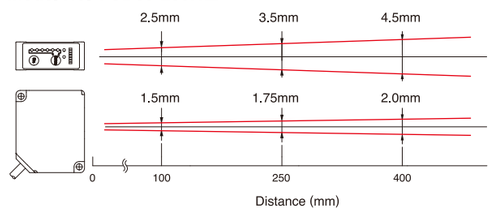

**Model No. : CD33-L85N-422**




**Model No. : CD33-120N□**

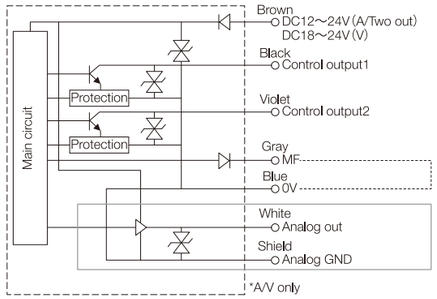



**Model No. : CD33-250N□**

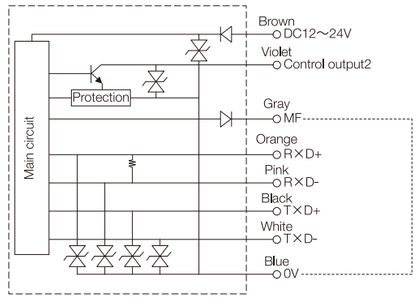


# INPUT / OUTPUT DIAGRAMS

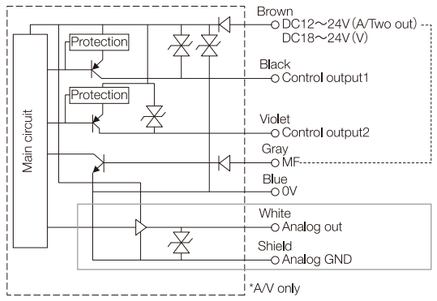
**NPN type (Analogue / Voltage dual)**



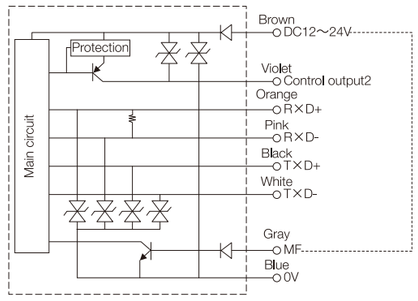

**NPN type (RS422)**



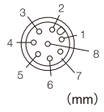

**PNP type (Analogue / Voltage dual)**




**PNP type (RS422)**




Connector pinout




(mm)







# CD3 series

- CMOS Image sensor for high accuracy displacement laser.
- 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.

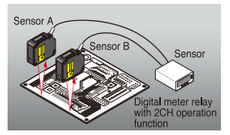
# LINEUP

## CD3-30

**30mm type**

Warp detection of PC board

Measurement range : 30 ±4mm
Resolution : 2 μm (When averaging of 256 times)
Linearity : ±1% F.S.

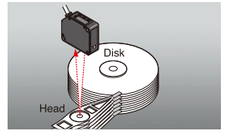


## CD3-50

**50mm type**

Warp detection of HDD assy and actuator

Measurement range : 50 ±10mm
Resolution : 8 μm (When averaging of 256 times)
Linearity : ±1% F.S.

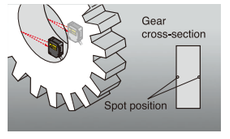


## CD3-80

**80mm type**

Interior diameter of gear

Measurement range : 80 ±15mm
Resolution : 8 μm (When averaging of 256 times)
Linearity : ±1% F.S.

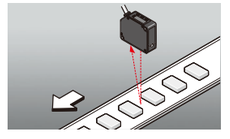


## CD3-100

**100mm type**

Measurement of product thickness

Measurement range : 100 ±40mm
Resolution : 30 μm (When averaging of 256 time)
Linearity : ±1% F.S.



## CD3-250

**250mm type**

Monitoring die cast

Measurement range : 250 ±150mm
Resolution : 100 μm (When averaging of 256 time)
Linearity : ±1.5% F.S. (100 to 250mm)
±2.5% F.S. (251 to 400mm)

# CD3 ADVANCED TECHNOLOGY

## Simple pushbutton teach, and easy-to-view digital panel.

### 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**

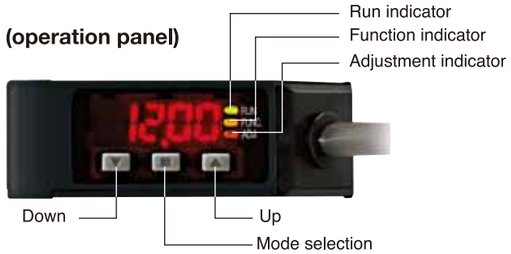
Actual distance between sensor and object as below.

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

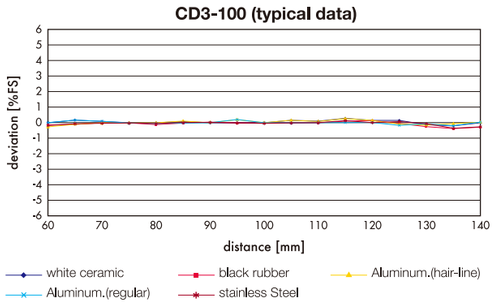
Remarks : The border between the near / far limit and

**output indicator**

**(operation panel)**




### Stable measurement of both highly reflective polished surfaces as well as non reflective material such as black rubber.




### 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**

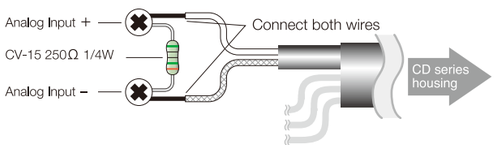
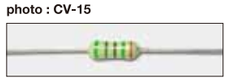
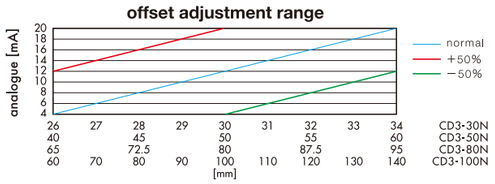



**photo : CV-15**



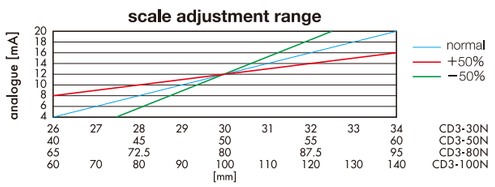
### Offset

The Offset Function shifts the analog output value in either the positive or the negative direction. This is adjustable within ±50% of the rated distance of the sensor.




### Span adjustment

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




### 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.

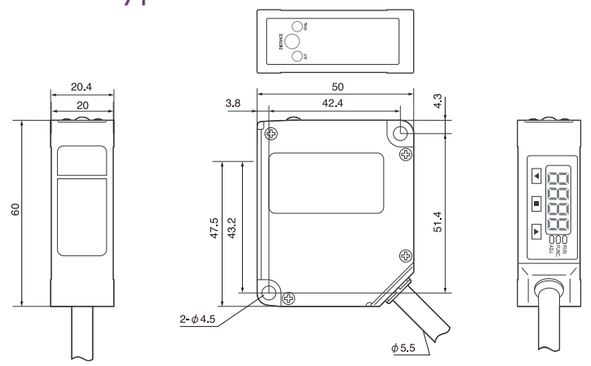




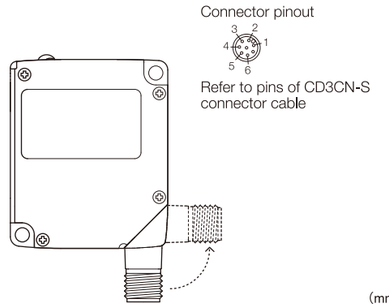


# DIMENSIONS

## Cable type




## M12 Connector type




(mm)

# SPECIFICATIONS

| Model | 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 / P |
| **Transistor output** | | N = NPN output, P = PNP output | | | | |
| **Measurement range** | | 30 ±4mm | 50 ±10mm | 80 ±15mm | 100 ±40mm | 250 ±150mm |
| **Full scale** | | 8mm | 20mm | 30mm | 80mm | 300mm |
| **Light source** | | Class 2 Laser, 650nm, max 1mW | | | | |
| **Min spot size** | | ϕ0.5 mm | ϕ0.8 mm | 1×1.5mm | 1×1.5mm | 3×1.5mm |
| **Supply voltage** | | 12 - 24VDC (−5 to +10%) | | | | |
| **Sensitivity adjustment** | | Nominal value 1-20, or AUTO | | | | |
| **Power consumption** | | Max 120mA (12VDC), 80mA (24VDC), 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 | 2000 |
| **(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% F.S. | | | | ±1.5%F.S. (up to 250mm)<br>±2.5%F.S. (up to 400mm) |
| **Temp drift** | | ±0.08% F.S. / Celsius | | | | |
| **Response time** | | Max 2.2ms (at fixed sensitivity between 1-20 ),Max 15ms (at auto sensitivity) | | | | |
| **Sampling rate** | | 500μs | | | | |
| **Analogue output** | | 4-20 mA | | | | |
| **Control output** | | NPN or PNP, Max 100mA/24VDC, 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<br>*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 / 500VDC | | | | |
| **Material** | | Zinc diecast | | | | |
| **Protection category** | | IP67 | | | | |
| **Conformity** | | CE | | | | |
| **Warm-up time** | | 30 minutes | | | | |
| **Weight** | | Approx.130g (Without cable) | | | | |

# CD1 series

- Compact design ideal for built-in use with OEM machines.
- Versatility from 30 ±4mm to 250 ±150mm distance.
- If a display and signal control is needed both the digital and analog output of the CD1 can be connected to a digital panel meter.

## LINEUP

### CD1-30

**30mm distance type**

Sorting of mechanical parts

Measurement range : 30 ±4mm
Resolution : 1 μm (Responce speed 100msec)
Linearity : ±2% F.S.

### CD1-50

**50mm distance type**

Level check of food package

Measurement range : 50 ±10mm
Resolution : 3 μm (Responce speed 100msec)
Linearity : ±1% F.S.

### CD1-100

**100mm distance type**

Height of components on the board

Measurement range : 100 ±35mm
Resolution : 15 μm (Responce speed 100msec)
Linearity : ±2% F.S.

### CD1-130

**130mm distance type**

Cap of bottled beverage

Measurement range : 130 ±50mm
Resolution : 20 μm (Responce speed 100msec)
Linearity : ±3.5% F.S.

### CD1-250

**250mm distance type**

Doubled part of black rubber sheet

Measurement range : 250 ±150mm
Resolution : 150 μm (Responce speed 100msec)
Linearity : ±5% F.S.

# CD1 ADVANCED TECHNOLOGY

## All the basic functions packed in a half-plam size, ideal for OEM use.

### Teach-in system

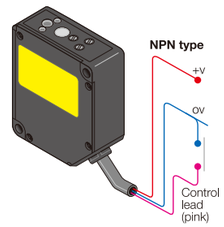
The CD1 is simple to setup and easy to operate.
It is not necessary to make manual adjustments to the sensor, just push the button.

### All-in-one solution

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

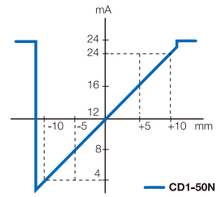
### Remote teaching input

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.




### Dual output - Digital On/Off and analog

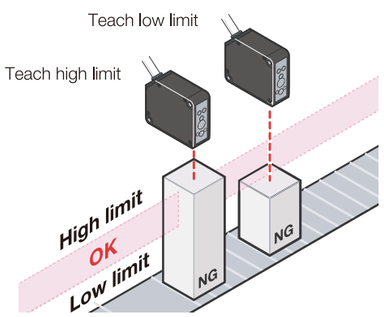
There is a choice of NPN or PNP transistor for the control output, choose the model number based on the desired type.
The 4 to 20 mA analog output is standard on both types.




### 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.




### Class 2 laser product

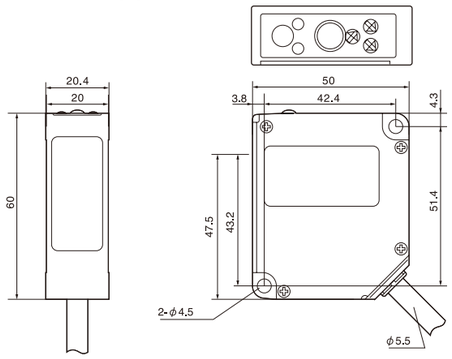
Classified to Class 2 laser, 650mm, max 1mW.

### IP67 rating

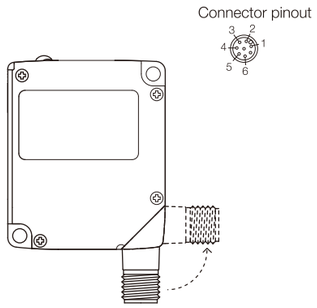
This stand-alone unit is protected with IP67 design.

# DIMENSIONS

## Cable type




## M12 Connector type




(mm)

# SPECIFICATIONS

| Model | 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 | | | | |
| **Measurement range** | | 30 ±4mm | 50 ±10mm | 100 ±35mm | 130 ±50mm | 250 ±150mm |
| **Full scale** | | 8mm | 20mm | 70mm | 100mm | 300mm |
| **Light source** | | Class 2 laser, 650nm, max 3.3mW | | | | |
| **Spot size** | | φ0.1mm | φ0.5mm | 0.5×1.2 mm | 0.5×1.5 mm | 0.8×1.2 mm |
| **Supply voltage** | | 12 - 24VDC (–5 to +10%) | | | | |
| **Power consumption** | | Max 120mA (12VDC), 75mA (24VDC), 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% F.S. | ±1% F.S. | ±2% F.S. | ±3.5% F.S. | ±5% F.S. |
| **Temp drift** | | ±0.02% F.S. / Celsius | | | | |
| **Response time** | | 100msec / 10msec / 1msec selectable | | | | |
| **Sensitivity adjustment** | | SET / FIX / AUTO | | | | |
| **Analogue output** | | 4-20mA | | | | |
| **Control output** | | NPN or PNP, Max 100mA / 30VDC, Residual voltage max 1.8V | | | | |
| **Distance indicator** | | Red = Near, Orange = Middle, Green = Far, Red / Green = Error<br>*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°C to +40°C | | | | |
| **Operating humidity** | | 35% to 95% RH | | | | |
| **Material** | | Zinc diecast | | | | |
| **Protection category** | | IP67 | | | | |
| **Conformity** | | CE | | | | |
| **Warm-up time** | | 30 minutes | | | | |
| **Weight** | | Approx.130g (Without cable) | | | | |







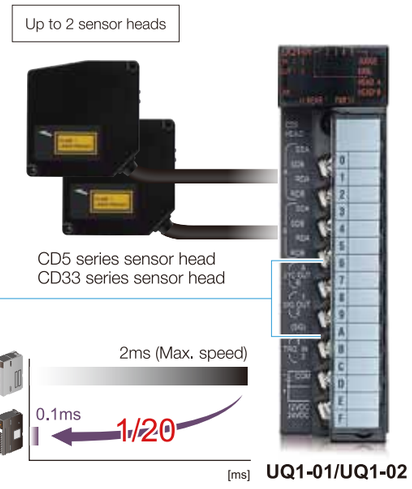
# UQ-1

## Enables easy connection of displacement sensors and Mitsubishi PLC MELSEC-Q series

## High speed process by 3 NEW feature

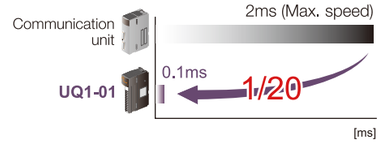
### No load on the CPU

The unit gets measured data from the sensor automatically and updates calculation result and control output in 100μs (Max. speed)
These process are done by the unit itself so there is no load on the CPU.



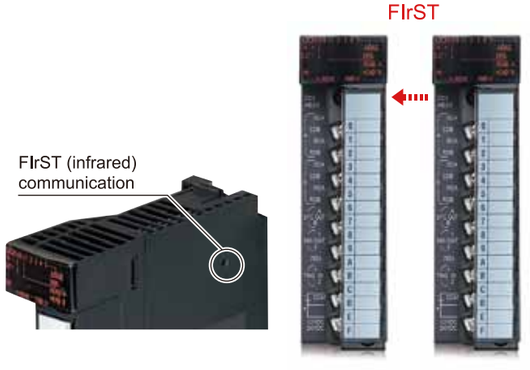

### Up to 100μs (Max. speed)

Response speed: 100μs (Max. speed)
independent of scan time of sequencer CPU and it's realized by having I/O terminal (2 for each) on the unit.




### High speed original infrared communication "FIrST"

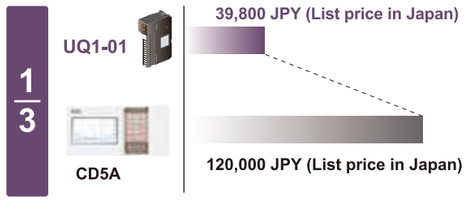
UQ1 units can communicate through "FIrST" infrared communication which was originally developed for the UQ1 series.
It can calculate using data from the CD5/CD33 sensor head connected to another UQ1 units in 100μs (Max. speed). * Max. speed of UQ1-02 is 500μs



# One third of the cost needed for conventional solution (UQ1-01 + CD5)

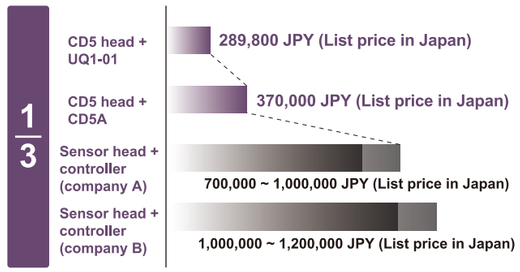
## Comparing with standard controller

One third of standard controller (CD5A) cost.




## Comparing with competitor solution

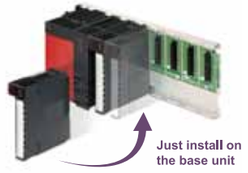
The CD5 series Sensor head along with the UQ1 controller is a very cost effective solution and is typically a 1/3 the price of conventional Laser measurement sensors.




# Easy connection & Easy setup

## Communication setup is not needed

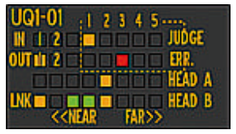
UQ1 series is recognized simply by installing on the MELSEC-Q series base unit with no communication setup required. There is also no communication setup needed between CD5/CD33 sensor and UQ1 series.




## Easy reading LED display

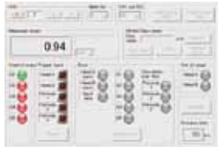
You can see following information on the LED display easily.

- Measurement result (Q1~Q5)
- Error status (sensor head connection etc.)
- I/O status
- Bar graph (simple status of distance or distribution status)




## Easy access software

Dedicated software “UQ1 Navigator” is now available. Easily access the intuitive software, change the setup parameters and check the measurement status without needing knowledge of PLC and ladder programming.



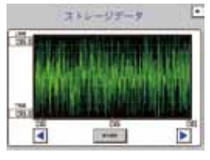

Measurement result

Calculation result

## Data/Ladder sample program for GOT are ready

Data/Ladder program (sample) for HMI touch panel GOT are ready.You can setup just by loading them. You can also utilize data storage function of UQ1.

Measurement result on the GOT




Storage data on the GOT







# SPECIFICATIONS

| Model | | UQ1-01 | UQ1-02 |
|---|---|---|---|
| I/O points to occupy | | 32 points (I/O: Intelligent 32 points) | |
| Sampling period | | 100µs Min | 500µs Min. |
| Communication method | | Infrared | |
| Terminalblock | Usable wire | Core: 0.3 ~ 0.75mm2 (Outer diameter: Max. 2.8mm) | |
| | Usable soldeless terminal | R1.25-3 without sleeve | |
| Communication I/F (between UQ1 and CD5) | No. of head | 2 Heads Max. | |
| | Protocol | RS-422 | |
| | Baud rate | 921.6kbps | 256kbps |
| | Cable | DOL-1212-G05M (5m sensor head cable) | |
| | Cable extension | Up to 50m using optional extension cable (unbundled) | |
| Control input / output | No. of I/O | 2 Input / 2 Output | |
| | Mode | NPN open collector | |
| | Output voltage | 12 - 24VDC (±10%) | |
| | Output current | 80mA (DC12-24V) | |
| | Residual voltage | 1V Max. | |
| | Leak current | 0.2mA Max. | |
| | Protection | Over current protection circuitry | |
| Trigger input | Logic | ON by connecting to GND (0V) | |
| | Voltage | ON voltage: 1.0V Max. / OFF voltage: 2.0V Min. | |
| | Input impedance | Approximately 10kΩ | |
| Function | | Setup sensor head, Control output, Calculation,Hold function, Filter function, Bank setup,Storage function | |
| High speed logging point | | 262,144 points Max. | |
| EEPROM over writing limit | | Max. 1000,000 times for same memory area | |
| DC5V current consumption | | 0.5A Max. | |
| Noise tolerance | | 500Vp-p (simulator), Noise width: 1µs Fast transient noise 1kV (IEC 61000-4-4) | |
| Insulation resistance | | Min. 10MΩ (insulation resistance meter) | |
| Protection category | | IP2X | |
| Operating Temp./Humid. | | -10°C to +55°C / 35 ~ 85%RH (non condensation) | |
| Storage Temp./Humid. | | -20°C to +70°C / 35 ~ 85%RH (non condensation) | |
| Vibration resistance | | 10 ~ 55Hz,1.5mm,X-Y-Z each for 2 hours | |
| Dimensions | | 98(H) * 27.4(W) * 90(D) [mm] | |
| Weight | | Approximately 150g | |