





**Sensors for  
Factory Automation**

Short Form



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## Application examples



Electronics



Automotive



Woodworking industry



Packaging industry



Glass/Wafer production



People counting



Electronic part discharging

## Everything from a single source

With over 100 years of innovation and manufacturing expertise, Panasonic Industry Europe remains committed to its vision of creating “A Better Life, A Better World.” Panasonic can look back on decades of experience in the electronics industry and, thanks to its dedicated customer orientation, is a competent and reliable partner for customers throughout Europe when it comes to technical expertise in combination with solution orientation. As a provider of tailor-made solutions, we focus on offering our customers products and services in the Mobility, Living Space and Business sectors that make a difference thanks to our proprietary innovations.

### Smart automation technology

The factory of the future will achieve new levels of productivity, effectiveness and profitability through comprehensive networking. Equipment and components from Panasonic Industry Europe offer leading-edge **Industry 4.0** features, as connectivity, energy efficiency, reliability and sturdiness play a pivotal role in modern production environments.

The Panasonic Industry Europe portfolio not only offers key electronic components, devices, modules and software but also complete solutions for production lines in a wide variety of industries. Panasonic Industry's comprehensive know-how along the entire value chain, combined with a corporate culture geared to customer needs, enables it to offer customer-specific solutions that extend beyond the products.

Our experience as a manufacturer and a sales partner for components and products allows us to share our experience with our customers. Customer wishes are specifically integrated into the development of new products, so that we can surpass our role as a supplier and become a competent, long-term partner for our customers.

### A new performance class of innovative sensor technology

Over the past ten years, Panasonic has developed a wide range of high-quality sensors that fit into our portfolio of a provider of complete solutions for factory automation. Besides through-beam and retroreflective types, reflective sensors and optical fiber photoelectric sensors, we also offer laser and eddy current and contact analog sensors that provide precise measurement results even in the most complicated of applications.

Our delivery program also includes safety sensors, photoelectric sensors for special applications, inductive proximity switches and miniature pressure sensors for relative or differential pressure measurement, and ionizers for Electro Static Discharge (ESD) applications. Of course, we adapt our sensors to your individual requirements in order to ensure optimal functionality and efficiency.



## Service

In addition to an expert hotline, the extensive service from Panasonic Industry Europe also includes workshops and on-site service to ensure that our sensors are used reliably and effectively.

Apart from the broad product portfolio of sensors, Panasonic Industry Europe also offers programmable logic controllers, touch terminals, drive technology, energy management systems, ionizers, automation components and many other products and complete solutions.

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

IO-Link  
Sensors

# IO-Link

DP-100L · HG-C1000L · FX-550L

Standardized connection to the  
field level

## Features

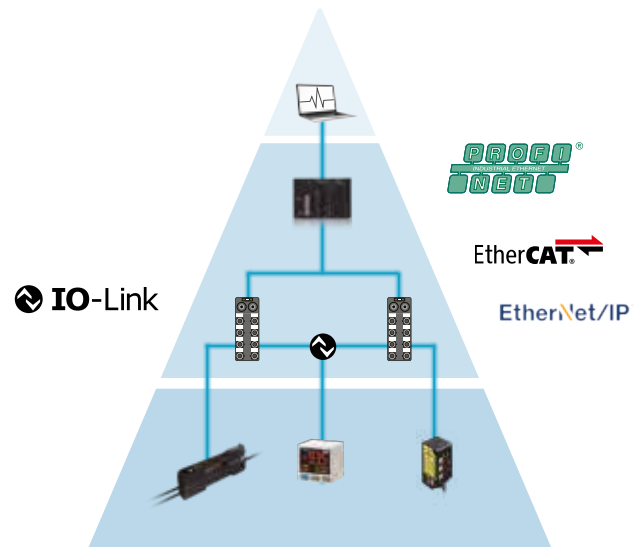
### ■ Connection to the field level

The standardized **IO-Link** technology makes connection to the field level easier than ever before.

Sensors can communicate with the defined masters via EtherCAT, Profinet or EtherNet/IP.

### ■ Self-diagnosis function

All IO-Link sensors from Panasonic have an integrated self-diagnosis function. The function monitors the function parameters specific to the sensor type and automatically outputs a warning signal if deviations from the specified behavior occur. Users save time because for maintenance it is sufficient to monitor only one signal instead of a number of sensor parameters.



## Technical specifications

### ■ HG-C1000L

| Cable type                             | HG-C1030L3-P   | HG-C1050L3-P               | HG-C1100L3-P   | HG-C1200L3-P   | HG-C1400L3-P                           |
|--|--|----------------------------|----------------|----------------|--|
| M12 connector type                     | HG-C1030L3-P-J   | HG-C1050L3-P-J             | HG-C1100L3-P-J | HG-C1200L3-P-J | HG-C1400L3-P-J                         |
| Measuring range                        | 30±5mm   | 50±15mm                    | 100±35mm       | 200±80mm       | 400±200mm                              |
| Repeatability                          | 10µm   | 30µm                       | 70µm           | 200µm          | 300µm (200-400mm)<br>800µm (400-600mm) |
| Linearity                              | ±0.1% F.S.   |                            |                | ±0.2% F.S.     | ±0.3% F.S.                             |
| Beam diameter                          | Approx. 50µm   | Approx. 70µm               | Approx. 120µm  | Approx. 300µm  | Approx. 500µm                          |
| Beam source                            | Red semiconductor laser (655nm), Class 2 (JIS/IEC/GB)/Class II (FDA)             |                            |                |                |  |
| Supply voltage                         | 12 to 24V DC ±10%  |                            |                |                |  |
| Switching and communication line (C/Q) | Communication specification  | IO-Link specification V1.1 |                |                |  |
|  | Baud rate  | COM3 (230.4kbit/s)         |                |                |  |
|  | Process data   | 4 bytes                    |                |                |  |
|  | Transmission cycle time  | 1ms                        |                |                |  |
| Control output (DO)                    | PNP open-collector transistor, max. 50mA   |                            |                |                |  |
| Response time                          | Switchable between high speed (1.5ms), standard (5ms), and high precision (10ms) |                            |                |                |  |
| Degree of protection                   | IP67   |                            |                |                |  |
| Cable                                  | Cable type: 4-wire PVC cable, 2m<br>M12 connector type: 4-wire PVC cable, 0.3m   |                            |                |                |  |
| Material                               | Enclosure: die-cast aluminum, front cover: acrylic                               |                            |                |                |  |
| Dimensions (HxWxD)                     | 44x20x25mm   |                            |                |                |  |

## DP-100L

| Type                                   | Pigtailed type  |   | M12 connector type                   |  |               |
|--|---|---|--------------------------------------|--|---------------|
|  | Low pressure type   | High pressure type  | Low pressure type                    | High pressure type                       |               |
| Model number                           | DP-101ZL3-M-P   | DP-102ZL3-M-P   | DP-101ZL3-M-P-C                      | DP-102ZL3-M-P-C                          |               |
| Rated pressure range (note 1)          | -1 bar to 1 bar<br>(-100.0 to +100.0kPa)  | -1 bar to +10 bar<br>(-0.100 to +1.0MPa)  | -1 to 1 bar<br>(-100.0 to +100.0kPa) | -1 bar to +10 bar<br>(-0.100 to +1.0MPa) |               |
| Applicable fluid                       | Non-corrosive gas   |   |                                      |  |               |
| Supply voltage                         | 12 to 24V DC $\pm$ 10%  |   |                                      |  |               |
| Switching and communication line (C/Q) | Communication specification   | IO-Link specification V1.1  |                                      |  |               |
|  | Baud rate   | COM3 (230.4kbit/s)  |                                      |  |               |
|  | Process data  | 4 bytes   |                                      |  |               |
|  | Transmission cycle time   | 1ms   |                                      |  |               |
| Control output (DO)                    | PNP open-collector transistor, max. 50mA  |   |                                      |  |               |
| Output operation                       | Output operation  | Normally open contact (NO) / normally closed contact (NC) selectable                          |                                      |  |               |
|  | Output modes  | 3 modes: EASY, hysteresis mode, window comparator mode  |                                      |  |               |
|  | Hysteresis  | Minimum 1 digit (variable)  |                                      |  |               |
|  | Repeatability (within $\pm$ 2 digits)   | $\pm$ 0.1% FS   | $\pm$ 0.2% FS                        | $\pm$ 0.1% FS                            | $\pm$ 0.2% FS |
|  | Response time   | 2.5ms, 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1000ms, 5000ms selectable by key operation |                                      |  |               |
| LED indicator                          | LED (orange)  |   |                                      |  |               |
| Pressure port                          | M5 female thread  |   |                                      |  |               |
| Material                               | Housing: PBT, LC display: Acrylic, Pressure port: SUS 303, thread: brass, buttons: silicon rubber |   |                                      |  |               |
| Connection method                      | Connector (note 2)  |   | M12 connector                        |  |               |
| Dimensions (HxWxD)                     | 30x30x42.5mm  |   |                                      |  |               |
| Accessories                            | CN-14A-C2 pigtail type 2m: 1 pc.  |   | M12 connector cable 0.3m: 1 pc.      |  |               |

- Notes:**
- 1.) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20°C. Reference pressure = 1atm
  - 2.) The cable CN-14A-C2 is included

## FX-550L

| Type                                   | Pigtailed type   | M12 connector type  |
|--|--|---|
| Model number                           | FX-551L3-P-C2  | FX-551L3-P-J  |
| Supply voltage                         | 12 to 24V DC $\pm$ 10%   |   |
| Switching and communication line (C/Q) | Communication specification  | IO-Link specification V1.1  |
|  | Baud rate  | COM3 (230.4kbit/s)  |
|  | Process data   | 4 bytes   |
|  | Transmission cycle time  | 1ms   |
| Control output (DO)                    | PNP open-collector transistor, max. 50mA   |   |
| Emitting element (modulated)           | Red LED (Peak emission wavelength: 660nm)  |   |
| Response time                          | Adjustable. STD: min. 250 $\mu$ s, LONG: min. 2ms, U-LG: min. 4ms, HYPR: min. 24ms   |   |
| Sensitivity setting                    | 2-point teaching, limit teaching, full auto-teaching, manual adjustment  |   |
| Incident light sensitivity setting     | Incorporated, 4 steps  |   |
| Incident light intensity display range | Adjustable. STD: 0 to 4000, LONG: 0 to 8000, U-LG / HYPR: 0 to 9999  |   |
| Degree of protection                   | IP40   |   |
| Ambient temperature                    | -10 to +55°C   |   |
|  | For 4 to 7 sensors in series connection: -10 to +50°C; for 8 to 16 sensors in series connection: -10 to +45°C (no condensation or freezing). Storage: -20 to +70°C |   |
| Connection method                      | 0.2mm <sup>2</sup> 4-core cab tire cable, 2m   | 0.2mm <sup>2</sup> 4-core cab tire cable with M12 connector, 0.3m |
| Material                               | Housing and protective cover: Polycarbonate; buttons: Polyacetal   |   |
| Dimensions (HxWxD)                     | 34x10x75mm   |   |

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Sensors

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SensorsMeasurement  
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- Accessories



# GX-300

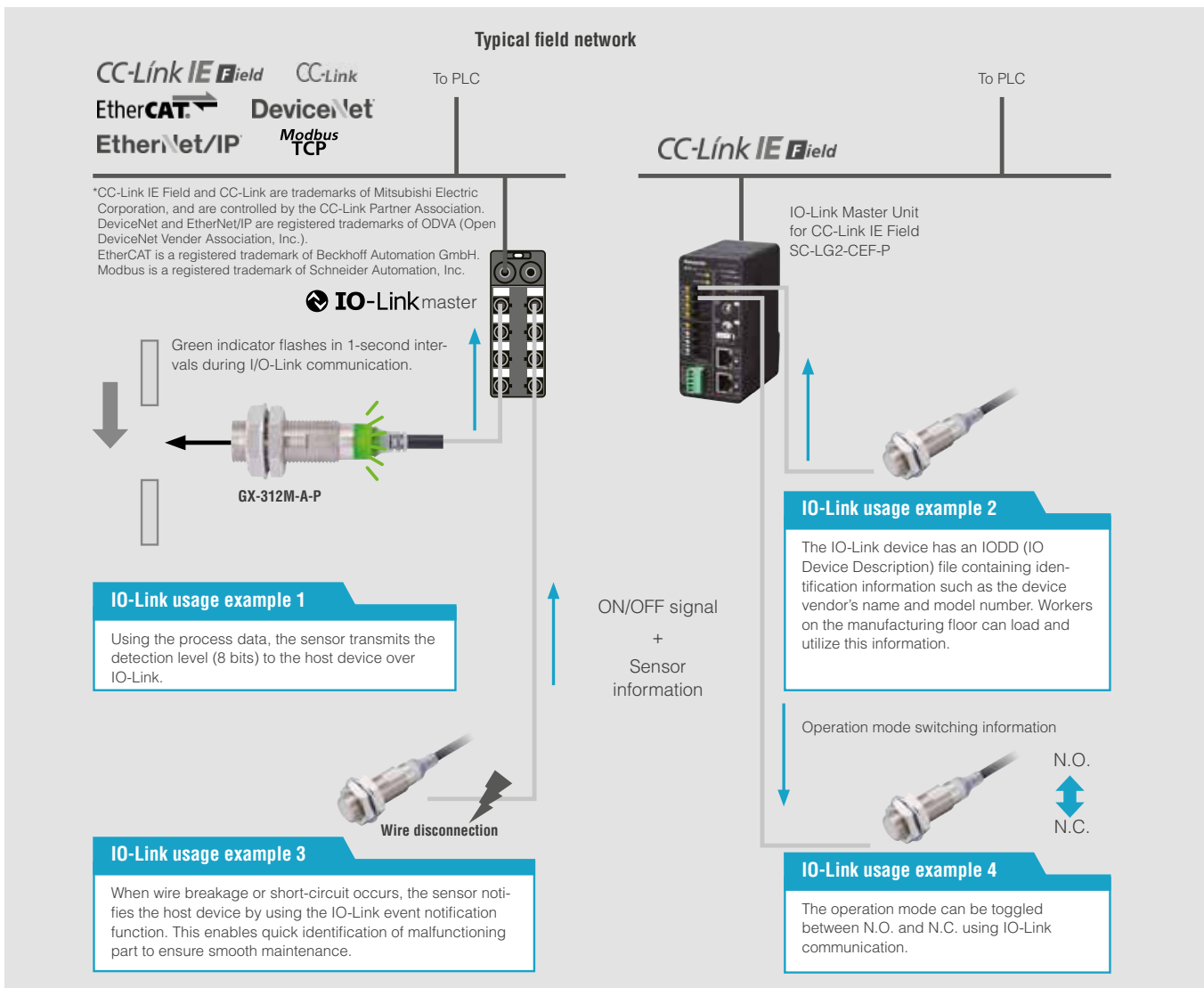
Cylindrical inductive sensor with IO-Link type

## Features

### IOT ready

With the implemented IO-Link technology network integration is easy. The IO-Link models can be used as normal digital PNP output sensors or providing information about the sensor level

or the current sensor condition via IO-Link interface. This is perfect for predictive maintenance and applications with higher expectations.





## DC 3-wire type ( Shielded type)

| Type                                   |                             | Shielded type  |               |               |               |
|--|-----------------------------|--|---------------|---------------|---------------|
|  |                             | Threaded type  |               |               |               |
| Model No. (note 2)                     | Normally Open               | GX-308M-A-P-□  | GX-312M-A-P-□ | GX-318M-A-P-□ | GX-330M-A-P-□ |
| Rated sensing distance                 |                             | 1.5mm  | 2.0mm         | 5mm           | 10mm          |
| Stable sensing distance (note 3)       |                             | 0 to 1.2mm   | 0 to 1.6 mm   | 0 to 4 mm     | 0 to 8mm      |
| Standard sensing object (note 7)       |                             | 8x8mm  | 12x12mm       | 18x18mm       | 30x30mm       |
| Hysteresis                             |                             | Max. 10% of measurement distance   |               |               |               |
| Supply voltage (note 4)                |                             | 10-30V DC ±10% (note1)   |               |               |               |
| Current consumption                    |                             | max. 16mA  |               |               |               |
| Control output                         |                             | PNP open-collector transistor, 200mA (note 2)  |               |               |               |
| Switching and communication line (C/Q) | Communication specification | IO-Link specification V1.1   |               |               |               |
|  | Baud rate                   | COM3 (230.4kbit/s)   |               |               |               |
|  | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |               |               |               |
|  | Transmission cycle time     | 0.4ms  |               |               |               |
| Response Frequency (note 5)            |                             | 2kHz   | 1.5kHz        | 0.6kHz        | 0.4kHz        |
| Protection                             |                             | IP67 (IEC)   |               |               |               |
| Ambient temperature                    |                             | -40 to +85°C   |               |               |               |
| Dimension (HxWxD)                      |                             | M8x37.8mm  | M12x47.1mm    | M18x55.3mm    | M30x60.3mm    |
| Material                               |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |               |               |               |
| Connection method (note 6)             |                             | Cable, 2m or 5m; M12 connector type; pigtail type  |               |               |               |

## DC 3-wire type (Shielded type, long sensing range)

| Type                                   |                             | Shielded type  |                |                |                |
|--|-----------------------------|--|----------------|----------------|----------------|
|  |                             | Long sensing range   |                |                |                |
|  |                             | Threaded type  |                |                |                |
| Model No. (note 2)                     | Normally Open               | GX-308MK-A-P-□   | GX-312MK-A-P-□ | GX-318MK-A-P-□ | GX-330MK-A-P-□ |
| Rated sensing distance                 |                             | 2.0mm  | 4.0mm          | 8mm            | 15mm           |
| Stable sensing distance (note 3)       |                             | 0 to 1.6mm   | 0 to 3.2mm     | 0 to 6.4mm     | 0 to 12mm      |
| Standard sensing object (note 7)       |                             | 8x8mm  | 12x12mm        | 18x18mm        | 30x30mm        |
| Hysteresis                             |                             | Max. 15% of measurement distance   |                |                |                |
| Supply voltage (note 4)                |                             | 10-30V DC ±10% (note1)   |                |                |                |
| Current consumption                    |                             | max. 16mA  |                |                |                |
| Control output                         |                             | PNP open-collector transistor, 200mA (note 2)  |                |                |                |
| Switching and communication line (C/Q) | Communication specification | IO-Link specification V1.1   |                |                |                |
|  | Baud rate                   | COM3 (230.4kbit/s)   |                |                |                |
|  | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |                |                |                |
|  | Transmission cycle time     | 0.4ms  |                |                |                |
| Response Frequency (note 5)            |                             | 1.5kHz   | 1.kHz          | 0.5kHz         | 0.25kHz        |
| Protection                             |                             | IP67 (IEC)   |                |                |                |
| Ambient temperature                    |                             | -40 to +85°C   |                |                |                |
| Dimension (HxWxD)                      |                             | M8x37.8mm  | M12x47.1mm     | M18x55.3mm     | M30x60.3mm     |
| Material                               |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |                |                |                |
| Connection method (note 6)             |                             | Cable, 2m or 5m; M12 connector type; pigtail type  |                |                |                |

### Notes:

- 1.) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- 2.) Suffix -P = PNP type
- 3.) The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- 4.) When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- 5.) The response frequency is an average value.
- 6.) Suffix -C5 = 5m cable / Suffix -J = Pigtail 0.3m with M12 connector / Suffix -Z = M12 connector type
- 7.) Standard sensing object = sheet steel, thickness: 1mm

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### DC 3-wire type (Non-shielded type)

| Type                                   |               | Non-shielded type   |                |                |                |
|--|---------------|---|----------------|----------------|----------------|
|  |               | Threaded type   |                |                |                |
| Model No. (note 2)                     | Normally Open | GX-308ML-A-P-□  | GX-312ML-A-P-□ | GX-318ML-A-P-□ | GX-330ML-A-P-□ |
| Rated sensing distance                 |               | 2.0mm   | 5.0mm          | 10mm           | 18mm           |
| Stable sensing distance (note 3)       |               | 0 to 1.6 mm   | 0 to 4 mm      | 0 to 8 mm      | 0 to 14.4 mm   |
| Standard sensing object (note 7)       |               | 8x8mm   | 12x12mm        | 18x18mm        | 30x30mm        |
| Hysteresis                             |               | Max. 10% of measurement distance  |                |                |                |
| Supply voltage (note 4)                |               | 10-30V DC ±10% (note1)  |                |                |                |
| Current consumption                    |               | max. 16mA   |                |                |                |
| Control output                         |               | PNP open-collector transistor, 200mA (note 2)   |                |                |                |
| Switching and communication line (C/Q) |               | Communication specification   |                |                |                |
|  |               | IO-Link specification V1.1  |                |                |                |
|  |               | Baud rate   |                |                |                |
|  |               | COM3 (230.4kbit/s)  |                |                |                |
|  |               | Process data  |                |                |                |
|  |               | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)  |                |                |                |
|  |               | Transmission cycle time   |                |                |                |
|  |               | 0.4ms   |                |                |                |
| Response Frequency (note 5)            |               | 1kHz  | 0.8kHz         | 0.4kHz         | 0.1kHz         |
| Protection                             |               | IP67 (IEC)  |                |                |                |
| Ambient temperature                    |               | -40 to +85°C  |                |                |                |
| Dimension (HxWxD)                      |               | M8x37.8mm   | M12x47.1mm     | M18x55.3mm     | M30x60.3mm     |
| Material                               |               | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308ML(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |                |                |                |
| Connection method (note 6)             |               | Cable, 2m or 5m; M12 connector type; pigtail type   |                |                |                |

#### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable  
Suffix -J = Pigtail 0.3m with M12 connector  
Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm

### DC 3-wire type (Non-shielded type, long sensing range)

| Type                                   |               | Non-shielded type  |                 |                 |                 |
|--|---------------|--|-----------------|-----------------|-----------------|
|  |               | Long sensing range   |                 |                 |                 |
|  |               | Threaded type  |                 |                 |                 |
| Model No. (note 2)                     | Normally Open | GX-308MLK-A-P-□  | GX-312MLK-A-P-□ | GX-318MLK-A-P-□ | GX-330MLK-A-P-□ |
| Rated sensing distance                 |               | 4mm  | 8mm             | 16mm            | 30mm            |
| Stable sensing distance (note 3)       |               | 0 to 3.2 mm  | 0 to 6.4 mm     | 0 to 12.8 mm    | 0 to 24 mm      |
| Standard sensing object (note 7)       |               | 12x12mm  | 24x24mm         | 48x48mm         | 90x90mm         |
| Hysteresis                             |               | Max. 15% of measurement distance   |                 |                 |                 |
| Supply voltage (note 4)                |               | 10-30V DC ±10% (note1)   |                 |                 |                 |
| Current consumption                    |               | max. 16mA  |                 |                 |                 |
| Control output                         |               | PNP open-collector transistor, 200mA (note 2)  |                 |                 |                 |
| Switching and communication line (C/Q) |               | Communication specification  |                 |                 |                 |
|  |               | IO-Link specification V1.1   |                 |                 |                 |
|  |               | Baud rate  |                 |                 |                 |
|  |               | COM3 (230.4kbit/s)   |                 |                 |                 |
|  |               | Process data   |                 |                 |                 |
|  |               | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |                 |                 |                 |
|  |               | Transmission cycle time  |                 |                 |                 |
|  |               | 0.4ms  |                 |                 |                 |
| Response Frequency (note 5)            |               | 1.5kHz   | 1.kHz           | 0.5kHz          | 0.25kHz         |
| Protection                             |               | IP67 (IEC)   |                 |                 |                 |
| Ambient temperature                    |               | -40 to +85°C   |                 |                 |                 |
| Dimension (HxWxD)                      |               | M8x37.8mm  | M12x47.1mm      | M18x55.3mm      | M30x82.3mm      |
| Material                               |               | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |                 |                 |                 |
| Connection method (note 6)             |               | Cable, 2m or 5m; M12 connector type; pigtail type  |                 |                 |                 |

#### Notes:

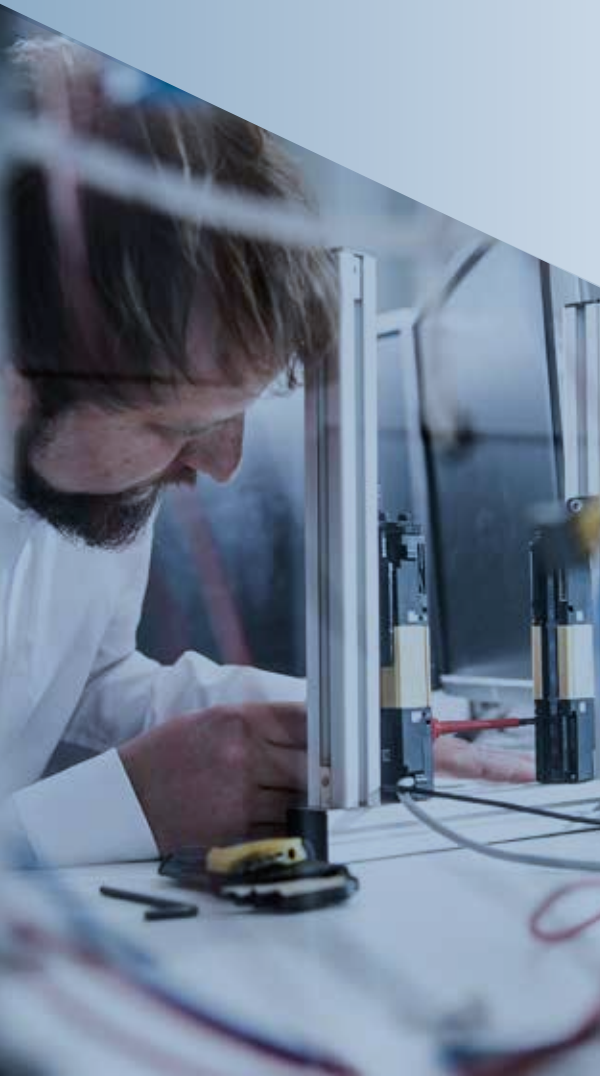
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable  
Suffix -J = Pigtail 0.3m with M12 connector  
Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm



## Services that make a difference

To ensure that our customers get the best out of our products and solutions we provide a complete package of services. Our experienced sales engineers, product specialists, product management and technical engineers consult on any new project and provide our customers with recommendations for the ideal products and solutions for each individual task. That is the reason why products and solutions of Panasonic Industry are considered highly reliable.

- › Product & project consulting
- › Feasibility studies
- › Local laboratory tests
- › Customizing
- › Installation support
- › Panasonic Academy
- › Technical Support
- › Warranty & claim handling
- › Discontinuation consulting





# CX-400

A full lineup of world standard photoelectric sensors

## Features

### ■ Great lineup of 170 models

The **CX-400** series has a high level of basic functionality and excellent cost performance. Moreover, a wide number of variations means that there is sure to be a sensor that fits your needs.

| Type  | Sensing range |
|---|---------------|
| CX-412 □ Thru-beam (long sensing range)               | 15m           |
| CX-411 □ Thru-beam                                    | 10m           |
| CX-493 □ Retroreflective (long sensing range)         | 5m            |
| CX-491 □ Retroreflective (with polarizing filters)    | 3m            |
| CX-482 □ Retroreflective (transparent object sensing) | 0.1 – 2m      |
| CX-481 □ Retroreflective (transparent object sensing) | 50 – 500mm    |
| CX-422 □ Diffuse reflective (800mm type)              | 800mm         |
| CX-421 □ Diffuse reflective (300mm type)              | 300mm         |
| CX-424 □ Diffuse reflective (100mm type)              | 100mm         |
| CX-423 □ Diffuse reflective (narrow-view)             | 70 – 200mm    |
| CX-442 □ Adjustable range reflective                  | 20 – 300mm    |
| CX-444 □ Adjustable range reflective                  | 15 – 100mm    |
| CX-443 □ Adjustable range reflective                  | 2 – 50mm      |
| CX-441 □ Adjustable range reflective (small spot)     | 2 – 50mm      |

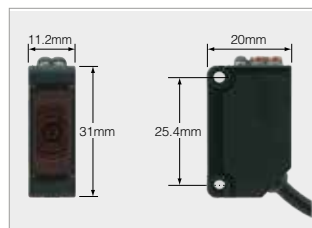
|  |   |
|--|---|
| <b>Output</b>                              | NPN, PNP  |
| <b>Connecting method (note 1)</b>          | Cable type, M8 plug-in connector type, M12 pigtailed type |
| <b>Cable length of cable type (note 2)</b> | 0.5m, 2m, 5m  |

#### Notes:

- 1.) Only the cable type and M8 plug-in connector type are available for the adjustable range reflective type.
- 2.) Only the 2m cable length type (standard) is available for the adjustable range reflective type.

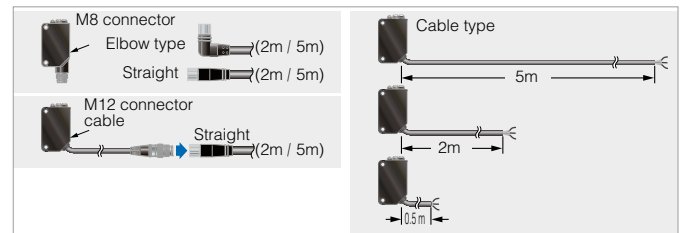
### ■ Compact size

The sensors are compact in size at 11.2x31x20mm (WxHxD). The mounting pitch is also at the world standard size of 25.4mm.



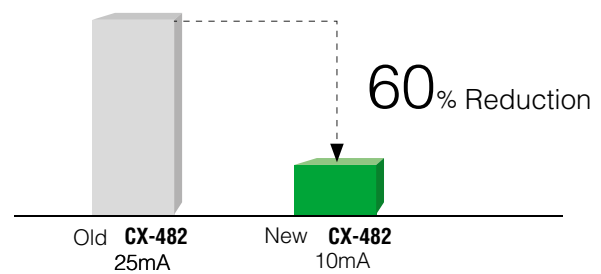
### ■ Less processing

M8 plug-in connector type and M12 pigtailed type are available. This contributes to less time spent setting up. In addition, cable types are available with the following cable lengths: 0.5m, 2m, and 5m.



### ■ Less power consumed

By relentlessly developing our technologies, we have been able to considerably reduce our sensors' power consumption.



### ■ Less resources used

Based on environmental considerations, simplified packaging is used in order to reduce waste.

In addition, the bag is made of polyethylene, which produces no toxic gases even when burned.

**CX-41□/42□/49□**

**Strong against oil and coolant liquids**

The lens material for the thru-beam type, retroreflective type (excluding the CX-48□) and the diffuse reflective type is made of a strong acrylic that resists the harmful effects of coolants. These sensors can be used with confidence even around metal processing machinery that disperses oil mists. The protection mechanism also conforms to IP67 (IEC).

**CX-44□/48□**

**Strong against ethanol**

A strong, ethanol-resistant polycarbonate is used for the front and display covers. Safe even for installing near food processing machinery that disperses ethanol-based detergents. The protection mechanism also conforms to IP67 (IEC).

**Strong against interference**

The interference prevention function allows two sensors to be mounted close together.

**Typical applications**

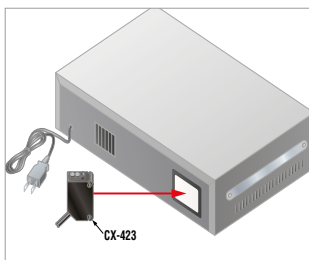
**Detecting cars on conveyor lines**



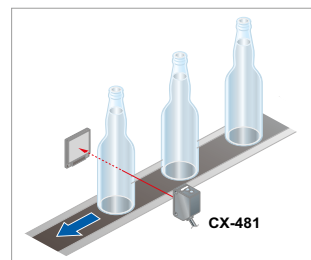
**Detecting transparent bottles**



**Detecting labels**



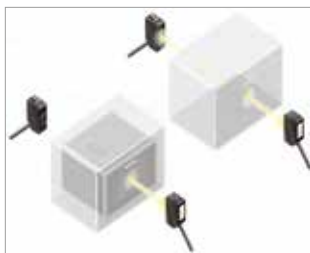
**Detecting transparent glass bottles**



**Thru-beam type CX-412□**

**Strong infrared beam**

It realizes a 15m long-distance sensing range. Remarkable penetrating power enables applications such as package content detection.



**Retroreflective type CX-493□**

**Strongest sensing range in its class**

A long 5m sensing range is possible with the red LED type that is easy to align with the beam axis. Can be used for wide automatic door shutters.



**Diffuse reflective type CX-423□**

**Beam axis alignment made easy**

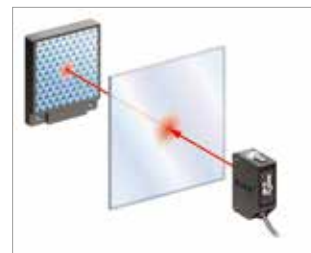
These sensors realize a high luminance red LED spot that provides bright visibility enabling the sensing position to be checked at a glance. Because it has the small spot, approx. 2mm, even the minutest object can be accurately detected.



**CX-481□/482□**

**Introducing the transparent object sensing type sensor**

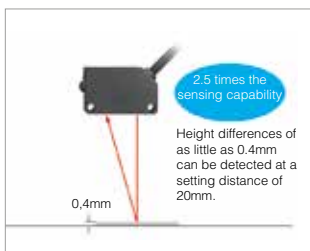
Our unique optical system and transparent object sensing circuitry provide stable sensing of even thinner transparent objects than the conventional models.



**CX-441/443□**

**Can sense differences as small as 0.4mm, with hysteresis of max. 2%**

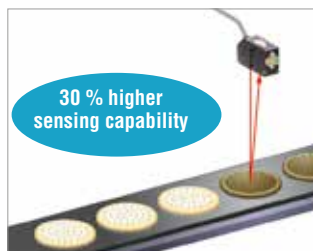
An advanced optical system provides sensing performance that is approx. 2.5 times more precise than conventional models. Even ultra small differences of 0.4mm can be detected accurately.



**CX-44□**

**Not affected by color**

Both black and white objects can be sensed at almost the same distances. No adjuster control is needed, even when products of different colors are moving along the production line.

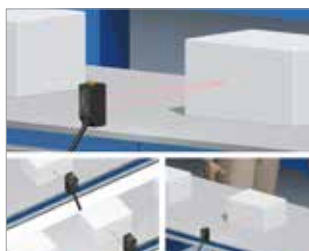


**CX-442□**

**BGS/FGS functions make even the most challenging settings possible!**

**Background suppression BGS**

When object and background are separated.



**CX-483□**

**Foreground suppression FGS**

When object and background are close together.

When the object is glossy or uneven.



- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

**CX-440**

## Technical specifications

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

CX-400

| Type  |            | Thru-beam  |              |              | Retroreflective  |  |                                |                     |                    |
|---|------------|--|--------------|--------------|--|--|--------------------------------|---------------------|--------------------|
|   |            | Long sensing range   |              |              | With polarizing filter   | Long sensing range                                     | For transparent object sensing |                     |                    |
| Model no.   | NPN output | CX-411(-Z)<br>(note 1)   | CX-412(-Z)   | CX-413(-Z)   | CX-491(-Z)   | CX-493(-Z)   | CX-481(-Z)                     | CX-483(-Z)          | CX-482(-Z)         |
|   | PNP output | CX-411-P(-Z)   | CX-412-P(-Z) | CX-413-P(-Z) | CX-491-P(-Z)   | CX-493-P(-Z)   | CX-481-P(-Z)                   | CX-483-P(-Z)        | CX-482-P(-Z)       |
| <b>Sensing range</b>                              |            | 10m  | 15m          | 30m          | 3m (note 2)  | 5m (note 2)  | 50 to 500mm (note 2)           | 50 to 1.0m (note 2) | 0.1 to 2m (note 2) |
| <b>Object to be sensed</b>                        |            | Min. Ø 12mm (opaque)   |              |              | Min. Ø 50mm<br>(opaque, transparent)<br>(note 2)               | Min. Ø 50mm (opaque, transparent or specular) (note 2) |                                |                     |                    |
| <b>Hysteresis</b>                                 |            | -  |              |              |  |  |                                |                     |                    |
| <b>Supply voltage</b>                             |            | 12 to 24VDC ±10%   |              |              |  |  |                                |                     |                    |
| <b>Output</b>                                     |            | PNP / NPN open-collector transistor, max. 100mA  |              |              |  |  |                                |                     |                    |
| <b>Output operation</b>                           |            | Switchable either Light-ON or Dark-ON  |              |              |  |  |                                |                     |                    |
| <b>Response time</b>                              |            | Max. 1ms   |              | Max. 2ms     | Max. 1ms   |  |                                |                     |                    |
| <b>Emitting element</b>                           |            | Red LED  | Infrared LED |              | Red LED  |  |                                | Infrared LED        |                    |
| <b>Automatic interference prevention function</b> |            | Two units of sensors can be mounted close together with interference prevention filters. (Sensing range: 5m)         |              | -            | Incorporated (two sensor units can be mounted close together.) |  |                                |                     |                    |
| <b>Protection</b>                                 |            | IP67 (IEC)   |              |              |  |  |                                |                     |                    |
| <b>Ambient temperature</b>                        |            | -25 to +55°C   |              |              |  |  |                                |                     |                    |
| <b>Material</b>                                   |            | Enclosure: PBT, Lens: Polycarbonate (CX-48□: Polycarbonate), Protection cover: Polycarbonate (CX-48□: Polycarbonate) |              |              |  |  |                                |                     |                    |
| <b>Connection method</b>                          |            | 2m cable, Suffix - Z: M8 connector (note 3)  |              |              |  |  |                                |                     |                    |
| <b>Dimensions (HxWxD)</b>                         |            | 31x11.2x20mm (-Z connector type: 35.5x11.2x20mm)   |              |              |  |  |                                |                     |                    |
| <b>Accessories</b>                                |            | -  |              |              | Reflector: <b>RF-230</b> 1 pc.                                 |  |                                |                     |                    |

### Notes:

- 1.) Suffix -Z = M8 connector type
- 2.) The sensing range is specified for the attached reflector **RF-230**
- 3.) Cable is not included in delivery. Please select under accessories (page 129)

| Type                                       |            | Diffuse reflective   |              |              |              | Adjustable range reflective (note 2)  |  |  |
|--|------------|--|--------------|--------------|--------------|---------------------------------------|--|--|
|  |            |  |              |              | Narrow view  | Small spot                            |  |  |
| Model no.                                  | NPN output | CX-424(-Z)<br>(note 1)   | CX-421(-Z)   | CX-422(-Z)   | CX-423(-Z)   | CX-441(-Z)                            | CX-444(-Z)                               | CX-442(-Z)                               |
|  | PNP output | CX-424-P(-Z)   | CX-421-P(-Z) | CX-422-P(-Z) | CX-423-P(-Z) | CX-441-P(-Z)                          | CX-444-P(-Z)                             | CX-442-P(-Z)                             |
| Sensing range                              |            | 100mm  | 300mm        | 800mm        | 70 to 300mm  | 2 to 50mm (adjustable range: 20-50mm) | 15 to 100mm (adjustable range: 20-100mm) | 20 to 300mm (adjustable range: 40-300mm) |
| Object to be sensed                        |            | Opaque, transparent  |              |              |              | -                                     |  |  |
| Hysteresis                                 |            | Max. 15% of sensing range  |              |              |              | Max. 2% of sensing range              |  | Max. 5% of sensing range                 |
| Supply voltage                             |            | 12 to 24VDC ±10%   |              |              |              |                                       |  |  |
| Output                                     |            | PNP / NPN open-collector transistor, max. 100mA  |              |              |              |                                       |  |  |
| Output operation                           |            | Switchable either Light-ON or Dark-ON  |              |              |              |                                       |  |  |
| Response time                              |            | Max. 1ms   |              |              |              |                                       |  |  |
| Emitting element                           |            | Infrared LED   |              |              | Red LED      | Red LED                               |  |  |
| Automatic interference prevention function |            | Incorporated (two sensor units can be mounted close together.)   |              |              |              |                                       |  |  |
| Protection                                 |            | IP67 (IEC)   |              |              |              |                                       |  |  |
| Ambient temperature                        |            | -25 to +55°C   |              |              |              |                                       |  |  |
| Material                                   |            | Enclosure: PBT, Lens: Polycarbonate (CX-48□: Polycarbonate), Protection cover: Polycarbonate (CX-48□: Polycarbonate) |              |              |              |                                       |  |  |
| Connection method                          |            | 2m cable, Suffix - Z: M8 connector (note 3)  |              |              |              |                                       |  |  |
| Dimensions (HxWxD)                         |            | 31x11.2x20mm (-Z connector type: 35.5x11.2x20mm)   |              |              |              |                                       |  |  |

**Notes:**

- Suffix -Z = M8 connector type
- FGS = Foreground suppression  
BGS = Background suppression  
Selectable by wiring the inputs correspondingly
- Cable is not included in delivery. Please select under accessories (page 129)

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

CX-440

- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers/ Electrostatic Sensors
- Accessories



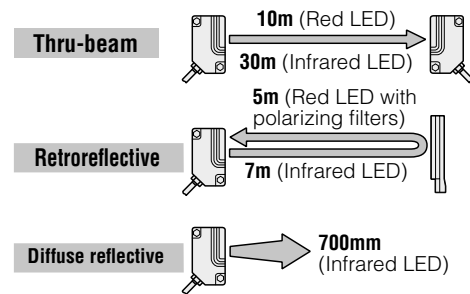
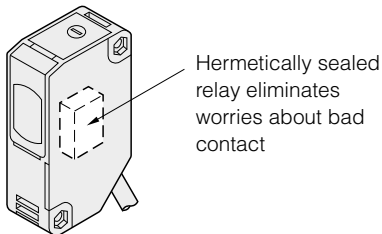
# NX5

Sensor usable world-wide

## Features

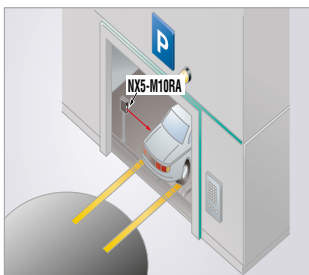
- Multi-voltage**  
 24 to 240VAC and 12 to 240VDC, suitable for supply voltages all over the world.
- High reliability**  
 The hermetically sealed output relay significantly increases its reliability.

- Interference prevention**  
 Two sensors operate normally even when mounted close together (excluding the 30m thru-beam type sensor).
- Long sensing range**  
 Suitable for conveyor lines and parking lot applications.

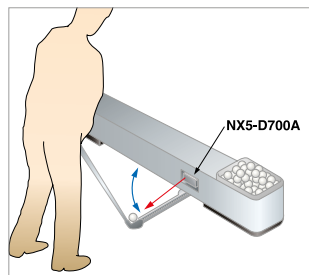


## Typical applications

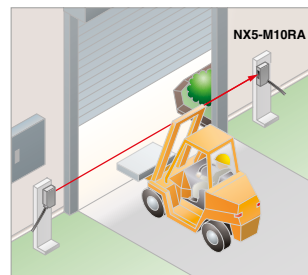
**Multistoried parking**  
 Detects if the car is protruding from the elevator door.



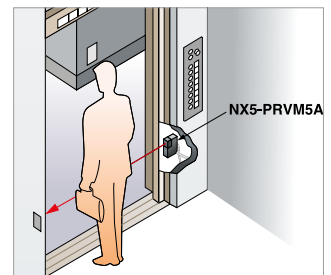
**Golf driving range**  
 The sensor detects the presence of a golf ball. The sensor is multi-voltage type so no DC power supply is needed.



**Arresting shutter closing**  
 The long sensing range sensor with a visible red beam can be used to control the shutter operation at the gate of a factory.



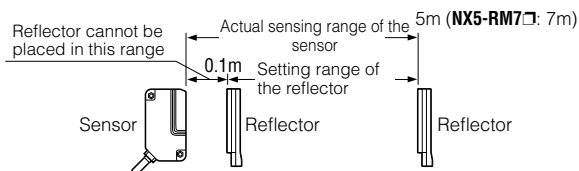
**Arresting door closing**  
 The sensor detects a person or an object and prevents the door from closing as long as its beam is interrupted.





## Technical specifications

| Type  | Thru-beam   |           |   |          | Retroreflective   |            |   |          | Diffuse reflective                              |           |
|---|---|-----------|---|----------|---|------------|---|----------|---|-----------|
|   |   |           | Long sensing range                        |          | With polarizing filters   |            | Long sensing range                              |          |   |           |
| Model no.                                     | NX5-M10RA   | NX5-M10RB | NX5-M30A                                  | NX5-M30B | NX5-PRVM5A  | NX5-PRVM5B | NX5-RM7A  | NX5-RM7B | NX5-D700A                                       | NX5-D700B |
| Sensing range                                 | 10m   |           | 30m                                       |          | 0.1 to 5m (note 1)  |            | 0.1 to 7m (note 1)                              |          | 700mm (note 2)                                  |           |
| Object to be sensed                           | Min. Ø 20mm (opaque transparent) (note 3)   |           |   |          | Min. Ø 50mm (opaque, semi-transparent or transparent) (note 1, 3) |            | Min. Ø 50mm (opaque or translucent) (note 1, 3) |          | Opaque, semitransparent or transparent (note 3) |           |
| Hysteresis                                    | —   |           |   |          |   |            |   |          | Max. 15% of sensing range                       |           |
| Repeatability (perpendicular to sensing axis) | Max. 0.1mm  |           | Max. 0.2mm                                |          |   |            | Max. 0.3mm                                      |          |   |           |
| Supply voltage                                | 24 to 240VAC ± 10%, or 12 to 240V DC ± 10%  |           |   |          |   |            |   |          |   |           |
| Power consumption                             | Emitter: max. 1VA<br>Receiver: max. 2VA   |           | Emitter: max. 1.5VA<br>Receiver: max. 2VA |          | Max. 2VA  |            |   |          |   |           |
| Output  | Relay contact 1c<br>Switching capacity: 250V AC 1A (resistive load) 30VDC 2A (resistive load)<br>Electrical life: Min. 500000 switching operations (switching frequency 3600 operations/hour)<br>Mechanical life: Min. 100 million switching operations (switching frequency 36000 operations/hour) |           |   |          |   |            |   |          |   |           |
| Output operation                              | Light-ON  | Dark-ON   | Light-ON                                  | Dark-ON  | Light-ON  | Dark-ON    | Light-ON  | Dark-ON  | Light-ON  | Dark-ON   |
| Response time                                 | Max. 10ms   |           |   |          |   |            |   |          |   |           |
| Power indicator                               | —   |           | Red LED (lights up when the power is ON)  |          |   | —          |   |          |   |           |
| Sensitivity adjuster                          | Continuously variable adjuster  |           | —   |          | Continuously variable adjuster                                    |            | —   |          | Continuously variable adjuster                  |           |
| Automatic interference prevention function    | Use optional interference prevention filters  |           | —   |          | Incorporated (two sensor units can be mounted close together.)    |            |   |          |   |           |
| Protection                                    | IP66 (IEC)  |           |   |          |   |            |   |          |   |           |
| Ambient temperature                           | -20 to +55°C  |           |   |          |   |            |   |          |   |           |
| Emitting element                              | Red LED   |           | Infrared LED                              |          | Red LED   |            | Infrared LED                                    |          |   |           |
| Material                                      | Enclosure: Polycarbonate; lens: polycarbonate; cover: polycarbonate; front cover (retroreflective type sensor only): Acrylic  |           |   |          |   |            |   |          |   |           |
| Connection method                             | 5-core (thru-beam type emitter: 2 cable) cable, 2m  |           |   |          |   |            |   |          |   |           |
| Dimensions (HxWxD)                            | 62x18x35mm  |           |   |          |   |            |   |          |   |           |
| Accessories                                   | Adjusting screwdriver: 1 pc.  |           | —   |          | Reflector <b>RF-230</b> : 1 pc.<br>Adjusting screwdriver: 1 pc.   |            | Reflector <b>RF-230</b> : 1 pc.                 |          | Adjusting screwdriver: 1 pc.                    |           |



### Notes:

- 1.) The sensing range and the object to be sensed of the retroreflective type sensor is specified for the **RF-230**. Further, the sensing range is the possible setting range for the reflector. The sensor can also detect an object 0.1m, or more, away.
- 2.) The sensing range is specified for white non-glossy paper (200x200mm).
- 3.) Check the functionality with a real object.

10-Link Sensors

Photoelectric Sensors

Fiber-optic Sensors

Standard Fibers

Fiber Sensors Communication Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure & Flow Sensors

Inductive Proximity Sensors

Measurement Sensors

Ionizers / Electrostatic Sensors

Accessories

NX5

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

CY-100



# CY-100

Simple mounting with M18 thread

## Features

### ■ Wide product range

The availability of a wide range of models within the series means the **CY-100** sensors can solve relatively complex tasks. Types with integrated polarization filters can even recognize reflective objects. The side view type makes applications possible in cramped spaces.

### ■ M18 Thread

All models have an M18 male thread for easy and quick mounting. Furthermore the models are also available for the M12 connector type. You can easily replace and add these standard models. The nuts are included in delivery.

### ■ Long sensing range

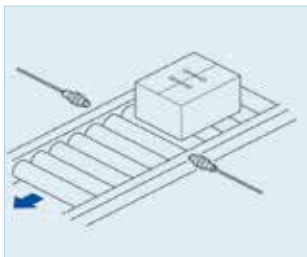
The thru-beam and retroreflective types of the CY-100 have a large sensing range of up to 15m.

### ■ Environmentally robust

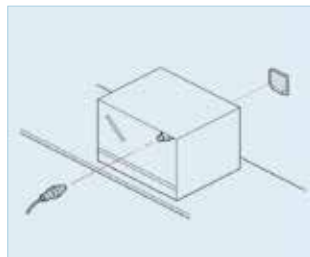
Thanks to the IP67 (IEC) casing, the sensor is suitable for installation in humid and dusty environments. Integrated status LEDs allow the operator to check the function of the sensor at a glance.

## Typical applications

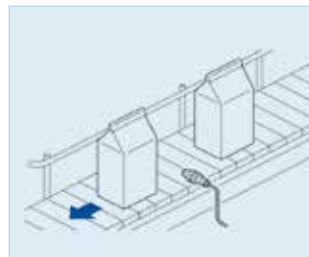
### Object detection



### Detecting specular objects



### Object counting



## Technical specifications

### Standard type

| Type                |            | Thru-beam                                       |                | Retroreflective type (note 3)              |                |  |                | Diffuse                               |                |                                       |                |
|---------------------|------------|---|----------------|--|----------------|--|----------------|---------------------------------------|----------------|---------------------------------------|----------------|
|                     |            | -   |                | -  |                | With polarizing filter                                 |                | -                                     |                | With sensitivity adjuster             |                |
|                     |            | Light-ON  | Dark-ON        | Light-ON                                   | Dark-ON        | Light-ON   | Dark-ON        | Light-ON                              | Dark-ON        | Light-ON                              | Dark-ON        |
| Model no.           | NPN output | CY-111A (-Z)<br>(note 1)                        | CY-111B (-Z)   | CY-192A (-Z)                               | CY-192B (-Z)   | CY-191A (-Z)   | CY-191B (-Z)   | CY-121A (-Z)                          | CY-121B (-Z)   | CY-122A (-Z)                          | CY-122B (-Z)   |
|                     | PNP output | CY-111A-P (-Z)                                  | CY-111B-P (-Z) | CY-192A-P (-Z)                             | CY-192B-P (-Z) | CY-191A-P (-Z)   | CY-191B-P (-Z) | CY-121A-P (-Z)                        | CY-121B-P (-Z) | CY-122A-P (-Z)                        | CY-122B-P (-Z) |
| Sensing range       |            | 15m   |                | 4m   |                | 2m   |                | 100mm (note 2)                        |                | 600mm (note 2)                        |                |
| Object to be sensed |            | Min. Ø 18mm (opaque)                            |                | Min. Ø 50mm (opaque, transparent) (note 1) |                | Min. Ø 50mm (opaque, transparent or specular) (note 1) |                | Opaque, transparent                   |                |                                       |                |
| Supply voltage      |            | 12 to 24VDC ±10%                                |                |  |                |  |                |                                       |                |                                       |                |
| Output              |            | PNP / NPN open-collector transistor, max. 100mA |                |  |                |  |                |                                       |                |                                       |                |
| Response time       |            | Max. 1ms  |                |  |                |  |                |                                       |                |                                       |                |
| Emitting element    |            | Infrared LED                                    |                |  |                | Red LED  |                | Infrared LED                          |                |                                       |                |
| Protection          |            | IP67 (IEC)                                      |                |  |                |  |                |                                       |                |                                       |                |
| Ambient temperature |            | -25 to +55°C                                    |                |  |                |  |                |                                       |                |                                       |                |
| Material            |            | Enclosure: PBT, Lens: PMMA                      |                |  |                |  |                |                                       |                |                                       |                |
| Connection method   |            | 2m cable, Suffix - Z: M12 connector (note 4)    |                |  |                |  |                |                                       |                |                                       |                |
| Dimensions (HxWxD)  |            | M18x46mm, -Z connector type: M18x60mm           |                |  |                | M18 x 48mm, -Z connector type: M18x62mm                |                | M18x46mm, -Z connector type: M18x60mm |                | M18x62mm, -Z connector type: M18x76mm |                |
| Accessories         |            | Nuts 4 pcs.                                     |                | Nuts 2 pcs.                                |                |  |                | Nuts 2 pcs.<br>Screwdriver 1pc.       |                |                                       |                |

### Side sensing type

| Type                |            | Thru-beam                                       |                | Retroreflective type (note 3)              |                |  |                | Diffuse                               |                |                                       |                |  |
|---------------------|------------|---|----------------|--|----------------|--|----------------|---------------------------------------|----------------|---------------------------------------|----------------|--|
|                     |            | -   |                | -  |                | With polarizing filter                                 |                | -                                     |                | With sensitivity adjuster             |                |  |
|                     |            | Light-ON  | Dark-ON        | Light-ON                                   | Dark-ON        | Light-ON   | Dark-ON        | Light-ON                              | Dark-ON        | Light-ON                              | Dark-ON        |  |
| Model no.           | NPN output | CY-111VA(-Z)<br>(note 1)                        | CY-111VB(-Z)   | CY-192VA(-Z)                               | CY-192VB(-Z)   | CY-191VA(-Z)   | CY-191VB(-Z)   | CY-121VA(-Z)                          | CY-121VB(-Z)   | CY-122VA(-Z)                          | CY-122VB(-Z)   |  |
|                     | PNP output | CY-111VA-P(-Z)                                  | CY-111VB-P(-Z) | CY-192VA-P(-Z)                             | CY-192VB-P(-Z) | CY-191VA-P(-Z)   | CY-191VB-P(-Z) | CY-121VA-P(-Z)                        | CY-121VB-P(-Z) | CY-122VA-P(-Z)                        | CY-122VB-P(-Z) |  |
| Sensing range       |            | 15m   |                | 4m   |                | 2m   |                | 100mm (note 2)                        |                | 600mm (note 2)                        |                |  |
| Object to be sensed |            | Min. Ø 18mm (opaque)                            |                | Min. Ø 50mm (opaque, transparent) (note 1) |                | Min. Ø 50mm (opaque, transparent or specular) (note 1) |                | Opaque, transparent                   |                |                                       |                |  |
| Supply voltage      |            | 12 to 24V DC ±10%                               |                |  |                |  |                |                                       |                |                                       |                |  |
| Output              |            | PNP / NPN open-collector transistor, max. 100mA |                |  |                |  |                |                                       |                |                                       |                |  |
| Response time       |            | 1ms   |                |  |                |  |                |                                       |                |                                       |                |  |
| Emitting element    |            | Infrared LED                                    |                |  |                | Red LED  |                | Infrared LED                          |                |                                       |                |  |
| Protection          |            | IP67 (IEC)                                      |                |  |                |  |                |                                       |                |                                       |                |  |
| Ambient temperature |            | -25 to +55°C                                    |                |  |                |  |                |                                       |                |                                       |                |  |
| Material            |            | Enclosure: PBT, Lens: PMMA                      |                |  |                |  |                |                                       |                |                                       |                |  |
| Connection method   |            | 2m cable, Suffix - Z: M12 connector (note 4)    |                |  |                |  |                |                                       |                |                                       |                |  |
| Dimensions (ØxD)    |            | M18x62mm, -Z connector type: M18x76mm           |                |  |                |  |                | M18x46mm, -Z connector type: M18x60mm | -              | M18x78mm, -Z connector type: M18x92mm |                |  |
| Accessories         |            | Nuts 4 pcs.                                     |                | Nuts 2 pcs.                                |                |  |                | Nuts 2 pcs.<br>Screwdriver 1 pc.      |                |                                       |                |  |

#### Notes:

Suffix -Z = M12 connector type

- 1.) The sensing range and object to be sensed of the retroreflective type are specified for the reflector **RF-420** (accessories page 130)
- 2.) The sensing range is specified for white, matt paper
- 3.) The reflector is not included in delivery; please order separately (accessories page 130)
- 4.) Cable not included in delivery; please order separately (accessories page 129)

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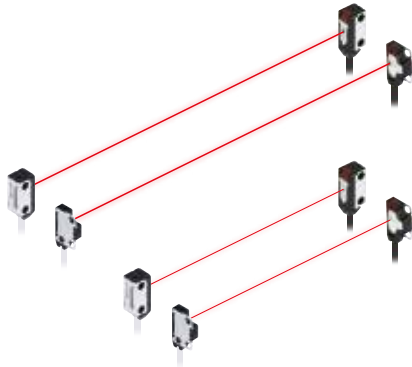
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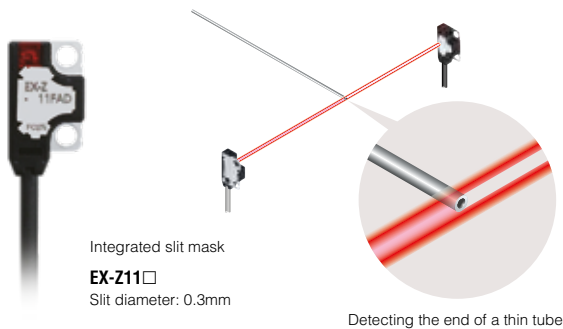
EX-Z



## Features

### ■ Smallest laser sensor with a built-in amplifier

The extreme thinness of 3mm of the **EX-Z** series has been achieved by utilizing a new semiconductor packaging technology that does not use wire bonding. The small unit size allows the installation of sensors in a narrow space where only a conventional fiber sensor head could be installed before. As opposed to a fiber sensor, the EX-Z has a built-in amplifier, which also saves on installation space.



### ■ Easy to install

The clearly visible red light beam makes installation and beam alignment very simple. The 4-element LED provides a stable strong light over a long period of time.

### ■ Great performance in an industrial environment

With IP67 degree of protection, the EX-Z can be installed in environments where water is used or splashed<sup>1</sup>. For this type of application, there are rustproof mounting brackets available in stainless steel and plastic.

<sup>1</sup> If water splashes on the sensor during sensing operation, the sensor may detect the water as an object

# EX-Z

Miniature thru-beam sensor with  
built-in amplifier

Front sensing

Side sensing

Approx.  
**50%** smaller  
than EX-10



EX-Z10□F□  
H14×W8×D3 mm

Approx.  
**35%** smaller  
than EX-10

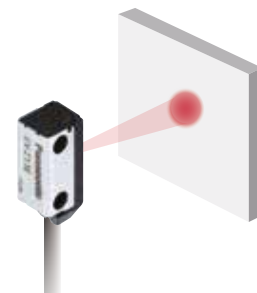


EX-Z10□  
H15.9×W5.5×D6.5 mm

### ■ Sensing extremely small objects

Thanks to the integrated slit mask, the sensor can detect objects with a diameter of as little as 0.3mm. Even at a distance of 500mm, the sensor is capable of reliably detecting objects as small as 1mm.

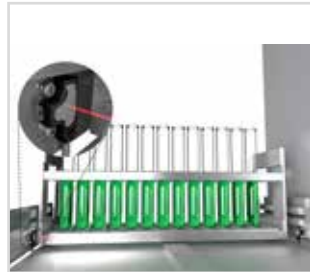
Clearly  
visible spot



Detection of parts in parts feeder



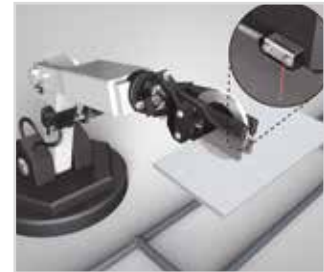
Detection of presence / absence of test tubes



Detection of LED contacts



Mounted on robot arm



## Technical specifications

### Standard type

| Type                 |          | Thru-beam                                      |               |               |                |              |              |
|----------------------|----------|--|---------------|---------------|----------------|--------------|--------------|
|                      |          | Front sensing                                  |               |               | Side sensing   |              |              |
| Model number         | Light-ON | EX-Z11FA (-P) (note)                           | EX-Z12FA (-P) | EX-Z13FA (-P) | EX-Z11A (-P)   | EX-Z12A (-P) | EX-Z13A (-P) |
|                      | Dark-ON  | EX-Z11FB (-P)                                  | EX-Z12FB (-P) | EX-Z13FB (-P) | EX-Z11B (-P)   | EX-Z12B (-P) | EX-Z13B (-P) |
| Sensing range        |          | 50mm   | 200mm         | 500mm         | 50mm           | 200mm        | 500mm        |
| Object to be sensed  |          | Min. Ø 0.3mm                                   | Min. Ø 0.5mm  | Min. Ø 1.0mm  | Min. Ø 0.3mm   | Min. Ø 0.5mm | Min. Ø 1.0mm |
| Supply voltage       |          | 12 to 24V DC ±10%                              |               |               |                |              |              |
| Output               |          | NPN / PNP open-collector transistor, max. 20mA |               |               |                |              |              |
| Response time        |          | Max. 0.5ms                                     |               |               |                |              |              |
| Degree of protection |          | IP67 (IEC)                                     |               |               |                |              |              |
| Ambient temperature  |          | -10 to +55°C                                   |               |               |                |              |              |
| Connection method    |          | 2m cable                                       |               |               |                |              |              |
| Dimensions (HxWxD)   |          | 14x8x3mm                                       |               |               | 15.5x5.5x6.5mm |              |              |
| Accessories          |          | Mounting screws, 1 set                         |               |               |                |              |              |

Note:  
 Suffix P= PNP output  
 No suffix = NPN type

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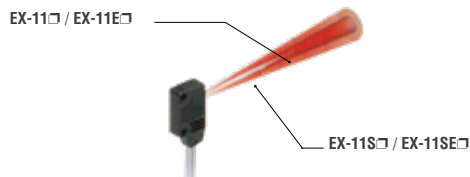
# EX-10

The slimmest: 3.5mm thick

## Features

### ■ Optimized precision optics

The enhanced EX-10 series offers a more precise light beam compared with the other standard models. Now you can realize an even more space saving installation, because no additional tools like slit masks are needed to prevent interferences. It is no problem to detect smallest objects with a diameter of 0.5mm.



### ■ Sensing range 1m: EX-19□

### ■ High-speed response time: 0.5ms

The sensor EX-10 with a response time of only 0.5ms is especially suitable for detecting small and high-speed traveling objects.

### ■ Flexible setup

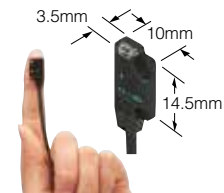
The EX-10 sensor is available as front sensing or side sensing type, allowing for flexible mounting in the narrowest of spaces.

### ■ 2-color indicator

A convenient bright, 2-color indicator has been incorporated in the miniature body. You can check the available power supply and current output operation at a glance.



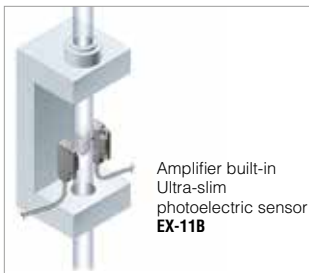
### ■ Freely mountable fingertip size



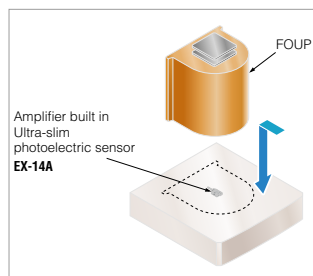
Freely mountable; dimensions 10x14.5x3.5mm (WxHxD) (Thru-beam type, front sensing). Moreover, easy alignment is possible with the visible red LED beam source.

## Typical applications

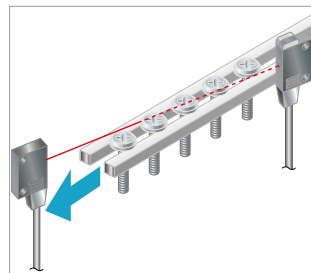
### Detecting the float for a flow meter



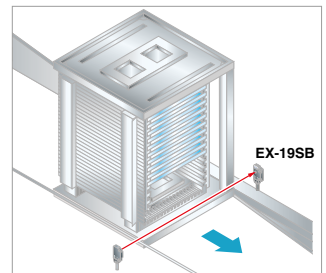
### Seating confirmation fiber



### Detecting small parts such as screws



### Sensing PCB rack screws



## Technical specifications

| Type                |               | Thru-beam                                    |              |                     |              |              |              | Convergent reflective                                |             |
|---------------------|---------------|--|--------------|---------------------|--------------|--------------|--------------|--|-------------|
| Model no.           | Front sensing | EX-11A(-PN)<br>(note)                        | EX-11B(-PN)  | EX-13A(-PN)         | EX-13B(-PN)  | EX-19A(-PN)  | EX-19B(-PN)  | EX-14A(-PN)  | EX-14B(-PN) |
|                     | Side sensing  | EX-11EA(-PN)                                 | EX-11EB(-PN) | EX-13EA(-PN)        | EX-13EB(-PN) | EX-19EA(-PN) | EX-19EB(-PN) | –  | –           |
| Sensing range       |               | 150mm  |              | 500mm               |              | 1m           |              | 2 to 25mm (conv. point: 10mm)                        |             |
| Object to be sensed |               | Min. Ø 1mm (opaque)                          |              | Min. Ø 2mm (opaque) |              |              |              | Min. Ø 0.1mm copper wire<br>(Setting distance: 10mm) |             |
| Supply voltage      |               | 12 to 24V DC ± 10 %                          |              |                     |              |              |              |  |             |
| Output              |               | PNP/NPN open-collector transistor, max. 50mA |              |                     |              |              |              |  |             |
| Output operation    |               | Light-ON                                     | Dark-ON      | Light-ON            | Dark-ON      | Light-ON     | Dark-ON      | Light-ON   | Dark-ON     |
| Response time       |               | Max. 0.5ms                                   |              |                     |              |              |              |  |             |
| Protection          |               | IP67 (IEC)                                   |              |                     |              |              |              |  |             |
| Ambient temperature |               | -25 to +55°C                                 |              |                     |              |              |              |  |             |
| Connection method   |               | 2m cable                                     |              |                     |              |              |              |  |             |
| Dimensions (HxWxD)  |               | 14.5x10x3.5mm                                |              |                     |              |              |              | 13x14.5x3.5mm  |             |
| Accessories         |               | Mounting screws, 1 set                       |              |                     |              |              |              |  |             |

**Note:**  
 Suffix -PN = PNP type  
 No suffix = NPN type

### ■ Narrow-view type

| Type                |          | Thru-beam                                    |                          |                          |                          |                          |
|---------------------|----------|--|--------------------------|--------------------------|--------------------------|--------------------------|
|                     |          | Front sensing                                | Side sensing             | Front sensing            | Side sensing             | Front sensing            |
| Model no.           | Light-ON | EX-11SA(-PN)<br>(note)                       | EX-11SEA(-PN)            | EX-13SA(-PN)             | EX-13SEA(-PN)            | EX-19SA(-PN)             |
|                     | Dark-ON  | EX-11SB(-PN)                                 | EX-11SEB(-PN)            | EX-13SB(-PN)             | EX-13SEB(-PN)            | EX-19SB(-PN)             |
| Sensing range       |          | 150mm  |                          | 500mm                    |                          | 1m                       |
| Object to be sensed |          | Min. Ø 0.5mm<br>(opaque)                     | Min. Ø 1.0mm<br>(opaque) | Min. Ø 1.0mm<br>(opaque) | Min. Ø 2.0mm<br>(opaque) | Min. Ø 2.0mm<br>(opaque) |
| Supply voltage      |          | 12 to 24V DC ± 10%                           |                          |                          |                          |                          |
| Output              |          | PNP/NPN open-collector transistor, max. 50mA |                          |                          |                          |                          |
| Response time       |          | Max. 0.5ms                                   |                          |                          |                          |                          |
| Protection          |          | IP67 (IEC)                                   |                          |                          |                          |                          |
| Ambient temperature |          | -25 to +55°C                                 |                          |                          |                          |                          |
| Connection method   |          | 2m cable                                     |                          |                          |                          |                          |
| Dimensions (HxWxD)  |          | 14.5x10x3.5mm                                |                          |                          |                          |                          |
| Accessories         |          | Mounting screws, 1 set                       |                          |                          |                          |                          |

**Note:**  
 Suffix -PN = PNP type  
 No suffix = NPN type

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EX-20



# EX-20

Miniature-sized and still mountable  
with M3 screws

## Features

### ■ Long sensing range

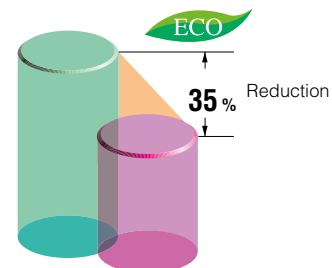
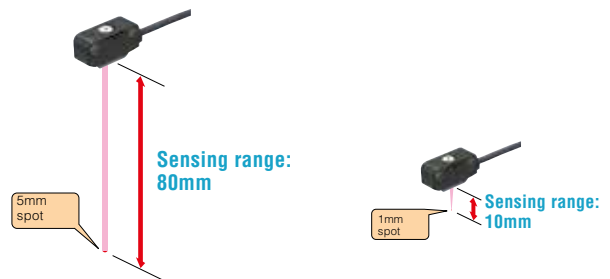
The **EX-20** series achieves long distance sensing [thru-beam type: 2m, retroreflective type: 200mm (when using the attached reflector), diffuse reflective type: 160mm], despite its miniature size. Hence, it is usable even on a wide conveyor.

### ■ Clear beam spot using red LED dot light source

The emission area of a dot light source is smaller than that of a conventional LED flat light source. It is possible to design a high power, narrow beam. Since a red LED dot light source is used, the red beam spot is clearly visible even at a long distance so that the alignment and confirmation of the sensing position is easy.

### ■ Less power consumed!

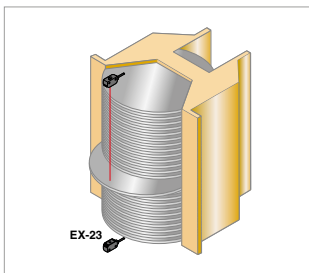
By relentlessly developing our technologies, we have been able to considerably reduce our sensors' power consumption.



## Typical applications

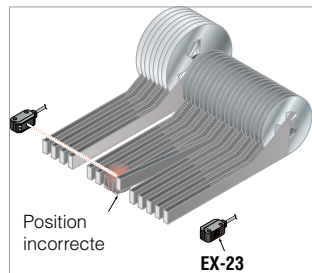
### Checking protrusion of wafer

The ultra compact photoelectric sensor EX-23 has a sufficiently long sensing range of 2m. Further, its visible red LED beam makes beam alignment very easy.



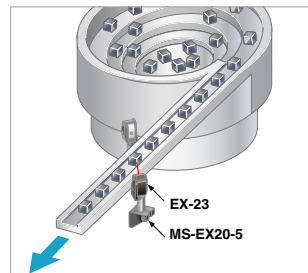
### Detecting tape feeder cassette out of position

Ultra compact in size with an ample sensing range of 2m, ideal for monitoring tape feeder cassettes that are out of position.



### Detecting fill-up of parts in feeder

The sensor setting can be finely adjusted since a universal sensor mounting bracket is available, with which the height and the angle of the sensor can be freely adjusted.





## Technical specifications

| Type                |          | Thru-beam                                      |   | Retroreflective                                       | Diffuse reflective type                      |  |                                  |  |
|---------------------|----------|--|---|---|--|--|----------------------------------|--|
|                     |          |  |   |   | Standard type                                | Diffuse beam   | Small spot beam                  | Long distance spot beam                      |
|                     |          | Front sensing                                  | Side sensing                                  | Side sensing  | Side sensing                                 | Front sensing  | Side sensing                     | Side sensing                                 |
| Model no.           | Light-ON | EX-21A(-PN) (note)                             | EX-23(-PN) Light-ON/<br>Dark-ON<br>switchable | EX-29A(-PN)   | EX-22A(-PN)                                  | EX-24A(-PN)  | EX-26A(-PN)                      | EX-28A(-PN)                                  |
|                     | Dark-ON  | EX-21B(-PN)                                    |   | EX-29B(-PN)   | EX-22B(-PN)                                  | EX-24B(-PN)  | EX-26B(-PN)                      | EX-28B(-PN)                                  |
| Sensing range       |          | 1m   | 2m  | 30 to 200mm   | 5 to 160mm                                   | 2 to 25mm<br>(Conv. point: 10mm)                     | 6 to 14mm<br>(Conv. point: 10mm) | 45 to 115mm                                  |
| Object to be sensed |          | Min. Ø 2.6mm<br>(opaque)                       | Min. Ø 3mm<br>(opaque)                        | Min. Ø 15mm opaque<br>or translucent object           | Opaque, translucent<br>or transparent object | Min. Ø 0.1mm copper wire<br>(Setting distance: 10mm) |                                  | Opaque, translucent<br>or transparent object |
| Supply voltage      |          | 12 to 24VDC ± 10%                              |   |   |  |  |                                  |  |
| Output              |          | PNP / NPN open-collector transistor, max. 50mA |   |   |  |  |                                  |  |
| Response time       |          | Max. 0.5ms                                     |   |   |  |  |                                  |  |
| Protection          |          | IP67 (IEC)                                     |   |   |  |  |                                  |  |
| Ambient temperature |          | -25 to +55°C                                   |   |   |  |  |                                  |  |
| Connection method   |          | Cable 2m                                       |   |   |  |  |                                  |  |
| Dimensions (HxWxD)  |          | 18x16x4.5mm                                    | 8.2x22x10.5mm                                 | 8.2x25x12.3mm   |  | 16x18x4.5mm  | 8.2x25x12.3mm                    | 10x14.5x3.5mm                                |
| Accessories         |          | –  | Screwdriver, 1 pc.                            | Reflector <b>RF-200</b> , 1 pc.<br>Screwdriver, 1 pc. | Screwdriver, 1 pc.                           | –  | Screwdriver, 1 pc.               |  |

**Note:**  
Suffix -PN = PNP type  
No suffix = NPN type

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EX-20

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Accessories

EX-30



# EX-30

An alternative to fiber sensors

## Features

### ■ An alternative to fiber sensors

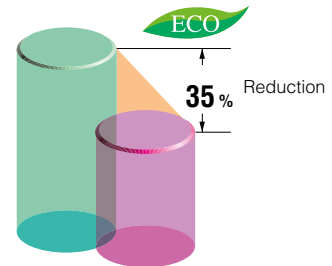
The **EX-30** series can be screw-mounted (M4 for thru-beam type, M6 for reflective type). This means that they can be inserted into production lines in exactly the same way as conventional fiber sensors.

### ■ 800mm thru-beam type available

The sensing range is 1.5 times greater than previous models! It also has a sensitivity adjuster to enable compatibility with a wide range of applications.

### ■ Less power consumed!

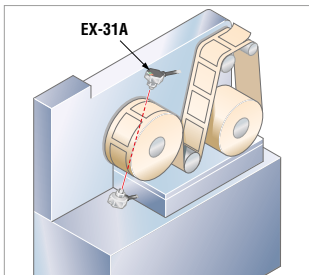
By relentlessly developing our technologies, we have been able to considerably reduce our sensors' power consumption.



## Typical applications

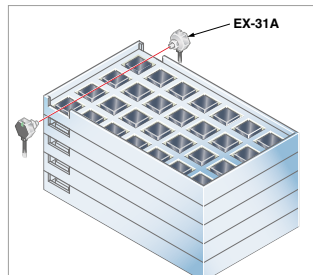
### Detecting quantity of labels in label magazine

Detects the remaining amount of labels by the thickness of the roll.



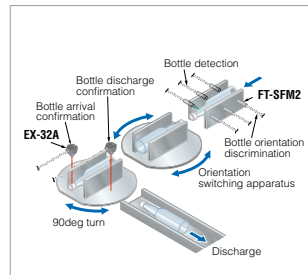
### Detecting ICs

Detects whether ICs are accurately placed in IC trays.



### Resin bottle detection

The EX-32A threaded photoelectric sensor confirms the arrival of bottles.



## Technical specifications

| Type                       |            | Thru-beam                                      |           |                           | Diffuse reflective                        |           |  |
|----------------------------|------------|--|-----------|---------------------------|---|-----------|--|
| Model no.                  | NPN output | EX-31A   | EX-31B    | EX-33                     | EX-32A                                    | EX-32B    |  |
|                            | PNP output | EX-31A-PN                                      | EX-31B-PN | EX-33-PN                  | EX-32A-PN                                 | EX-32B-PN |  |
| <b>Sensing range</b>       |            | 500mm  |           |                           | 800mm                                     | 50mm      |  |
| <b>Object to be sensed</b> |            | Min. 2mm (or opaque)                           |           |                           | Opaque, translucent or transparent object |           |  |
| <b>Supply voltage</b>      |            | 12 to 24V DC $\pm$ 10%                         |           |                           |   |           |  |
| <b>Output</b>              |            | PNP / NPN open-collector transistor, max. 50mA |           |                           |   |           |  |
| <b>Output operation</b>    |            | Light-ON                                       | Dark-ON   | Variable switching method | Light-ON                                  | Dark-ON   |  |
| <b>Response time</b>       |            | Max. 0.5ms                                     |           |                           |   |           |  |
| <b>Protection</b>          |            | IP67 (IEC)                                     |           |                           |   |           |  |
| <b>Ambient temperature</b> |            | -25 to +55°C                                   |           |                           |   |           |  |
| <b>Connection method</b>   |            | Cable 2m                                       |           |                           |   |           |  |
| <b>Dimensions (HxWxD)</b>  |            | 14x15.6x18mm                                   |           |                           |   |           |  |
| <b>Accessories</b>         |            | Nuts, 2 pcs.; washers, 2 pcs.                  |           |                           | Nut, 1 pc.; washer, 1 pc.                 |           |  |

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EX-30

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PM-25/45/65



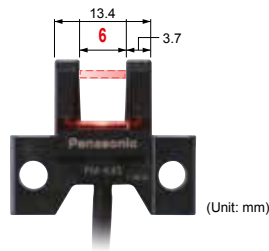
# PM-25/45/65

Enables equipment miniaturization  
and quick construction

## Features

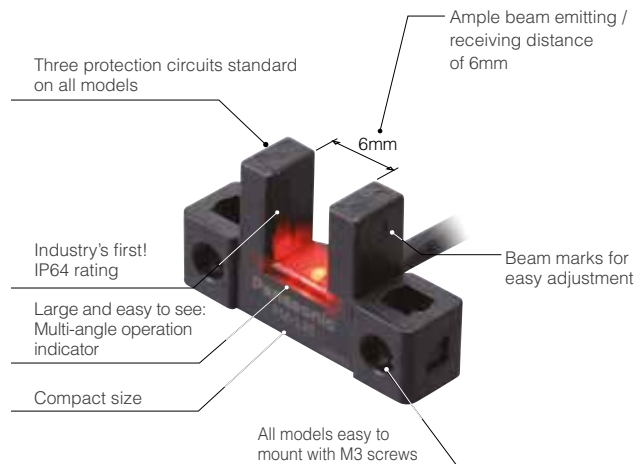
### ■ Increased beam emitting / receiving distance of 6mm

The beam emitting and receiving sections are 0.5mm thinner compared to our conventional models although the external dimensions have not changed. As a result, the distance between the beam-emitting and the beam-receiving point increased by 1mm. The wider distance means less possibility of collision with the object to be sensed.



### ■ Beam marks for easy adjustment

There are marks on the front and back of the sensor to indicate the upper and the lower limit of the beam axis. This makes it easy to adjust the position of the object to be sensed.

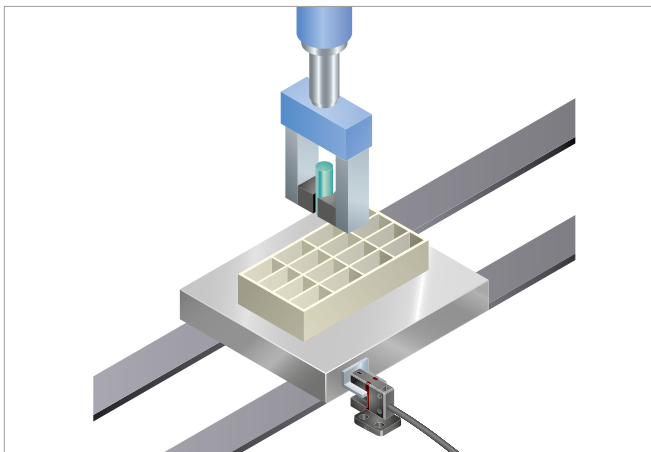


### ■ Large and easy-to-see operation indicator

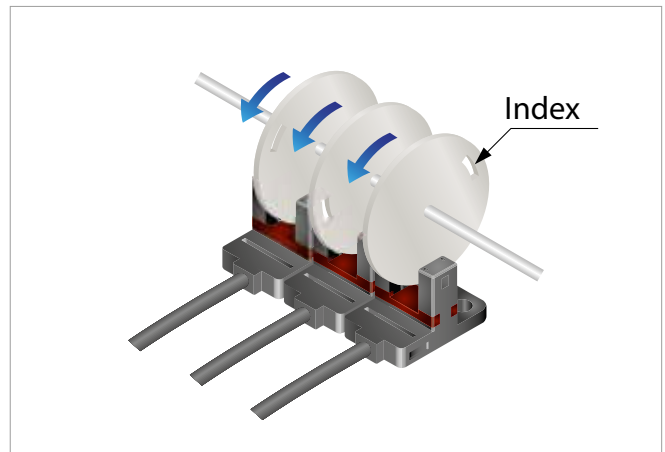
The large operation indicator (orange) lights up when an object enters the beam axis. The indicator is easy to see from any angle – even from above and from the sides.

## Typical applications

### Positioning of a pallet



### Sensing the starting point on a rotating body



# Order guide

| Type   | Dimensions (mm) | Model no. |
|--------|-----------------|-----------|
| K type |                 | PM-K25    |
|        |                 | PM-K25-P  |
| L type |                 | PM-L25    |
|        |                 | PM-L25-P  |
| F type |                 | PM-F25    |
|        |                 | PM-F25-P  |
| R type |                 | PM-R25    |
|        |                 | PM-R25-P  |
| U type |                 | PM-U25    |
|        |                 | PM-U25-P  |

| Type   | Dimensions (mm) | Model no. |
|--------|-----------------|-----------|
| K type |                 | PM-K45    |
|        |                 | PM-K45-P  |
| T type |                 | PM-T45    |
|        |                 | PM-T45-P  |
| L type |                 | PM-L45    |
|        |                 | PM-L45-P  |
| Y type |                 | PM-Y45    |
|        |                 | PM-Y45-P  |
| F type |                 | PM-F45    |
|        |                 | PM-F45-P  |
| R type |                 | PM-R45    |
|        |                 | PM-R45-P  |

| Type   | Dimensions (mm) | Model no. |
|--------|-----------------|-----------|
| K type |                 | PM-K65    |
|        |                 | PM-K65-P  |
| T type |                 | PM-T65    |
|        |                 | PM-T65-P  |
|        |                 | PM-T65-W  |
| L type |                 | PM-L65    |
|        |                 | PM-L65-P  |
| Y type |                 | PM-Y65    |
|        |                 | PM-Y65-P  |
| F type |                 | PM-F65    |
|        |                 | PM-F65-P  |
|        |                 | PM-F65W   |
|        |                 | PM-F65W-P |
| R type |                 | PM-R65    |
|        |                 | PM-R65-P  |
|        |                 | PM-R65W   |
|        |                 | PM-R65W-P |

IO-Link Sensors

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Accessories

PM-25/45/65

## Technical specifications

| Type                  |            | Ultra small type   | Small type         |                    |
|-----------------------|------------|--|--------------------|--------------------|
|                       |            | With cable   |                    | Built-in connector |
| Model no.<br>(note 1) | NPN output | PM-□25(-R) (note 2)  | PM□45              | PM-□65             |
|                       | PNP output | PM-□25P  | PM□45P             | PM-□65P            |
| Fork width            |            | 6mm (fix)  |                    |                    |
| Object to be sensed   |            | 0.8 x 1.2mm (opaque)   |                    |                    |
| Repeatability         |            | 0.01mm   |                    |                    |
| Supply voltage        |            | 5 to 24V DC ±10%   |                    |                    |
| Output                |            | PNP / NPN open-collector transistor, max. 50mA   |                    |                    |
| Output operation      |            | Incorporated with 2 outputs: Light-ON / Dark-ON  |                    |                    |
| Response time         |            | Under light incident condition: max. 20μs<br>Under light interrupted condition: max. 80μs<br>(Response frequency: min. 3kHz) |                    |                    |
| Ambient temperature   |            | -25 to +55°C   |                    |                    |
| Protection            |            | IP64 (IEC)   | IP40 (IEC)         |                    |
| Emitting element      |            | Infrared LED   |                    |                    |
| Connection method     |            | Cable, 1m  | Connector (note 3) |                    |

### Notes:

- 1.) K = K type  
L = L type  
F = F type  
R = R type  
U = U type  
T = T type  
Y = Y type
- 2.) Suffic -R = bending-resistant cable
- 3.) Cable not included in delivery, please order separately (accessories, page 129)

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Accessories

PM-25/45/65



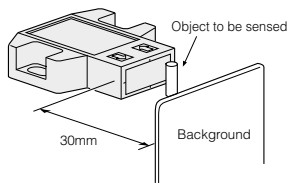
# PM2

Convergent reflection sensing  
ensures stable detection

## Features

### ■ Stable detection by convergent reflective mode

The stable detection characteristics of the **PM2** series are obtained since it is a convergent reflective type and senses a limited area. Thus regardless of the background, stable detection is possible.



### ■ Not affected by background

Even a specular background does not affect the sensing performance if the sensor is located 30mm away from it (when directly opposite).

### ■ Dark object detectable

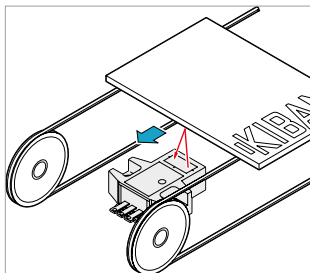
Since the sensor is very sensitive, it can detect even a dark object of low reflectivity.

### ■ Object to be sensed

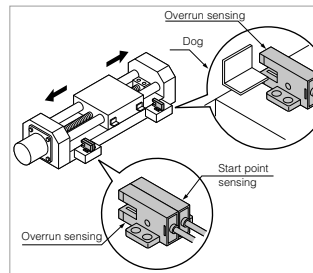
A 0.05mm copper wire can be detected at a distance of 5mm.

## Typical applications

### Minute object detectable

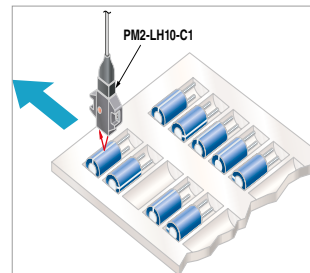


### Starting point and overrun is sensed using the dog on the base



### Detecting capacitors in tray

The convergent reflective type sensor reliably detects capacitors in a tray without being affected by their color, characters, marks or glossiness.



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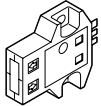
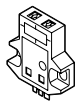
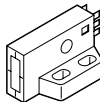
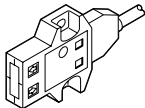
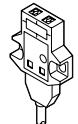
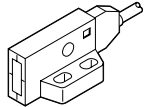
Measurement  
Sensors

Ionizers/  
Electrostatic  
Sensors

Accessories

PM2

## Technical specifications

| Type           | Image   | Model no.    |
|----------------|---|--------------|
| Connector type | Top sensing<br>            | PM2-LH10     |
|                |   | PM2-LH10B    |
|                | Front sensing<br>          | PM2-LF10     |
|                |   | PM2-LF10B    |
|                | L type (Top sensing)<br>   | PM2-LL10     |
|                |   | PM2-LL10B    |
| Cable type     | Top sensing<br>            | PM2-LH10-C1  |
|                |   | PM2-LH10B-C1 |
|                | Front sensing<br>         | PM2-LF10-C1  |
|                |   | PM2-LF10B-C1 |
|                | L type (Top sensing)<br> | PM2-LL10-C1  |
|                |   | PM2-LL10B-C1 |

| Type  | Connector type  |               |                         | Cable type  |               |                         |              |
|---|---|---------------|-------------------------|-------------|---------------|-------------------------|--------------|
|   | Top sensing   | Front sensing | L type<br>(Top sensing) | Top sensing | Front sensing | L type<br>(Top sensing) |              |
| Model no.   | Light-ON  | PM2-LH10      | PM2-LF10                | PM2-LL10    | PM2-LH10-C1   | PM2-LF10-C1             | PM2-LL10-C1  |
|   | Dark-ON   | PM2-LH10B     | PM2-LF10B               | PM2-LL10B   | PM2-LH10B-C1  | PM2-LF10B-C1            | PM2-LL10B-C1 |
| Sensing range                                       | 2.5 to 8mm (conv. point: 5mm) with white non-glossy paper (15x15mm) |               |                         |             |               |                         |              |
| Object to be sensed                                 | Min. Ø 0.05mm copper wire (setting distance: 5mm)                   |               |                         |             |               |                         |              |
| Repeatability<br>(perpendicular to<br>sensing axis) | 0.08mm  |               |                         |             |               |                         |              |
| Supply voltage                                      | 5 to 24VDC ± 10%  |               |                         |             |               |                         |              |
| Output  | NPN open-collector transistor, max. 50mA                            |               |                         |             |               |                         |              |
| Response time                                       | Max. 0.8ms  |               |                         |             |               |                         |              |
| Emitting element                                    | Infrared LED  |               |                         |             |               |                         |              |
| Connection method                                   | Connector for soldering (note)                                      |               |                         | Cable, 1m   |               |                         |              |

**Note:** Cable is not included in delivery. Please select under accessories (page 129)





# EQ-500

Long range sensing capability  
up to 2.5m

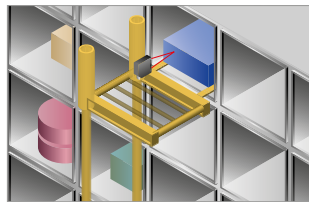
## Features

### ■ Impervious to variations in color or angle

Due to its advanced optical system, the sensor is not affected by variations in the object's angle or gloss as compared to conventional sensors. Moreover, sensing can be performed at a somewhat constant distance even if the sensing object is black or white.

### ■ Not affected by background objects

Due to the 2-segment photodiode adjustable range system, the sensor does not detect objects outside the preset sensing field. It will not malfunction even if someone walks behind the sensing object, or machines or conveyors are in the background.

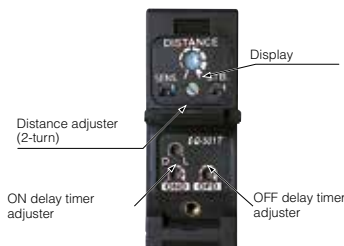


### ■ An easy-to-set adjuster with indicator

Equipped with a 2-turn adjuster with indicator making it easy to set for short or long distances. EQ-500 series can function with 24 to 240V AC and 12 to 240V DC. Therefore, almost any power supply anywhere in the world will work.

### ■ Equipped with BGS/FGS function

We have added a DC-voltage type with NPN and PNP transistor outputs, all in one sensor. Its BGS/FGS function controls any background effects for more stable sensing.



### ■ Convenient timer function models

Types with an ON-delay/OFF-delay timer available. (EQ-5□T)

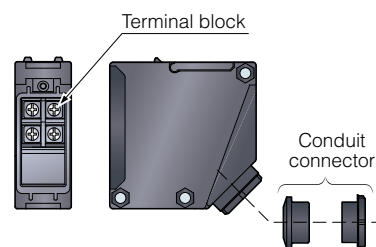
- › Operation: ON-delay OFF-delay
- › Timer period: 0.1 to 5s (individual setting possible)

### ■ Little affected by contamination on lens

Even if the lens surface gets somewhat dirty from dust particles, there is very little change in the operation field, rendering stable and consistent detection even for particles appearing close to the front surface of the unit.

### ■ Convenient terminal block type

Cabling is enabled by way of a terminal block.



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- Fiber Sensors Communication Units
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- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

## Technical specifications

| Type                | Multi-voltage type  |   |             |   | DC-voltage  |   |             |   |
|---------------------|---|---|-------------|---|---|---|-------------|---|
|                     |   | With timer  |             | With timer  |   | With timer  |             | With timer  |
| Model no.           | EQ-501  | EQ-501T   | EQ-502      | EQ-502T   | EQ-511  | EQ-511T   | EQ-512      | EQ-512T   |
| Sensing range       | 0.2 to 2.5m   |   | 0.2 to 1.0m |   | 0.2 to 2.5m   |   | 0.2 to 1.0m |   |
| Supply voltage      | 24 to 240V AC $\pm$ 10%, or 12 to 240V DC $\pm$ 10%           |   |             |   | 12 to 24V DC $\pm$ 10%  |   |             |   |
| Output              | Relay contact 1a 3A/250V AC                                   |   |             |   | PNP / NPN open-collector transistor, max. 100mA               |   |             |   |
| Output operation    | Light-ON or Dark-ON   |   |             |   |   |   |             |   |
| Response time       | Max. 20ms (for EQ-50□T dependent on the setting timer period) |   |             |   | Max. 20ms (for EQ-51□T dependent on the setting timer period) |   |             |   |
| Timer periods       | –   | Incorporated with variable ON-delay / OFF-delay timer (0.1 to 5s) | –           | Incorporated with variable ON-delay / OFF-delay timer (0.1 to 5s) | –   | Incorporated with variable ON-delay / OFF-delay timer (0.1 to 5s) | –           | Incorporated with variable ON-delay / OFF-delay timer (0.1 to 5s) |
| Protection          | IP67 (IEC)  |   |             |   |   |   |             |   |
| Ambient temperature | –20 to +55°C  |   |             |   |   |   |             |   |
| Emitting element    | Infrared LED  |   |             |   |   |   |             |   |
| Connection method   | Convenient terminal block                                     |   |             |   |   |   |             |   |
| Dimensions (HxWxD)  | 68x26x68mm  |   |             |   |   |   |             |   |
| Accessories         | Screwdriver, 1 pc.  |   |             |   |   |   |             |   |

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Electrostatic  
Sensors

Accessories

EQ-500



# EQ-30

Unaffected by color or material,  
2m distance adjustable  
fixed-focus sensing

## Features

- Not affected by object color or background
- Long sensing range 2m
- Compact size

The **EQ-30** saves space since a miniaturized housing of 68x20x40mm (HxWxD) has been designed.

- **Plug-in connector type**

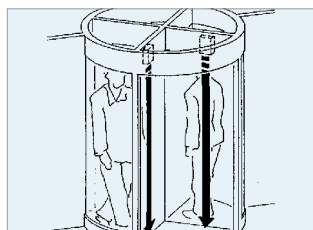
The plug-in connector type (M12) of the EQ-30 series can be easily disconnected for replacement.

## Technical specifications

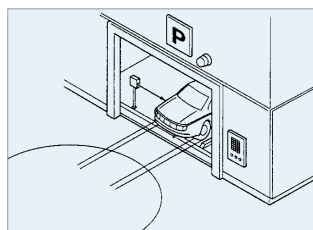
| Type                                   |            | Diffuse   |
|--|------------|---|
| Model no.                              | NPN output | EQ-34 (J) (note)                                |
|  | PNP output | EQ-34PN (J)                                     |
| Rated sensing distance                 |            | 2.0m  |
| Sensing range                          |            | 0.1-2m  |
| Detectable target                      |            | Transparent and opaque material                 |
| Hysteresis                             |            | Max. 10% of measurement                         |
| Response time                          |            | Max. 2ms  |
| Supply voltage                         |            | 10 to 30VDC $\pm$ 10%                           |
| Output                                 |            | PNP / NPN open-collector transistor, max. 100mA |
| Emitting element                       |            | Infrared LED                                    |
| Rated current consumption without load |            | NPN type: 50mA<br>PNP type: 55mA                |
| Material                               |            | Plastic   |
| Protection                             |            | IP67 (IEC)                                      |
| Ambient temperature                    |            | -20 to +55°C                                    |
| Connection method                      |            | Cable 2m or M12 connector                       |
| Dimensions (HxWxD)                     |            | 68x20x40mm                                      |
| Accessories                            |            | Screwdriver, 1 pc.                              |

Note: Suffix J = M12 connector type

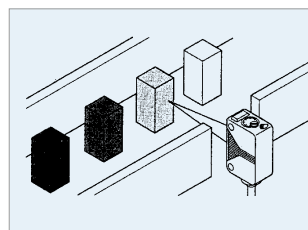
## Typical applications



Long distance sensing



Object detection



Color-independent detection

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Sensors

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Accessories

EQ-30

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- Ionizers/ Electrostatic Sensors
- Accessories



# NA1-11

Cross-beam scanning system to detect slim objects

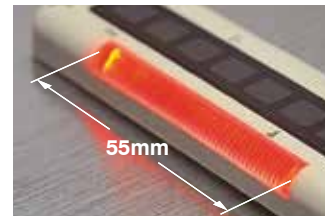
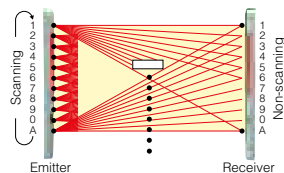
## Features

- **Letters, postcards can be detected**  
 Thin objects can be detected by using the cross-beam scanning system.
- **Beam pitch: 10mm**  
 Object to be sensed size of  $\varnothing 13.5\text{mm}$  is realized by using a beam pitch of 10mm.

- **Long sensing range**  
 Though very slim, a wide sensing area of 1m length and 100mm width is realized. It is most suitable for object detection on a wide assembly line or for detecting the dropping of or incursion by small objects whose travel path is uncertain.

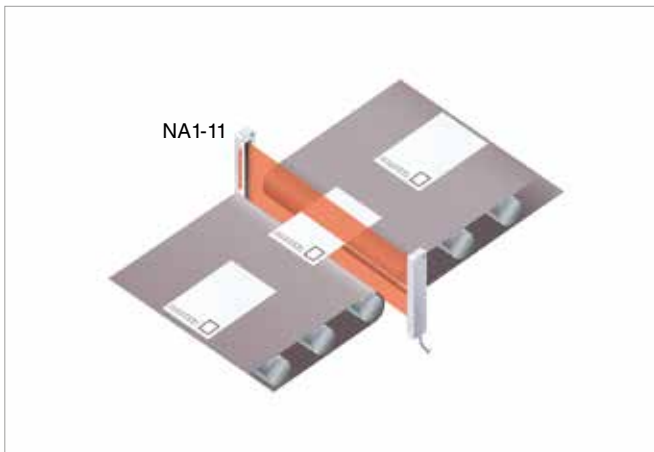
- **Clearly visible large indicator**  
 A clearly visible large indicator having a 55mm width is incorporated on both the emitter and the receiver.

Cross-beam scanning system

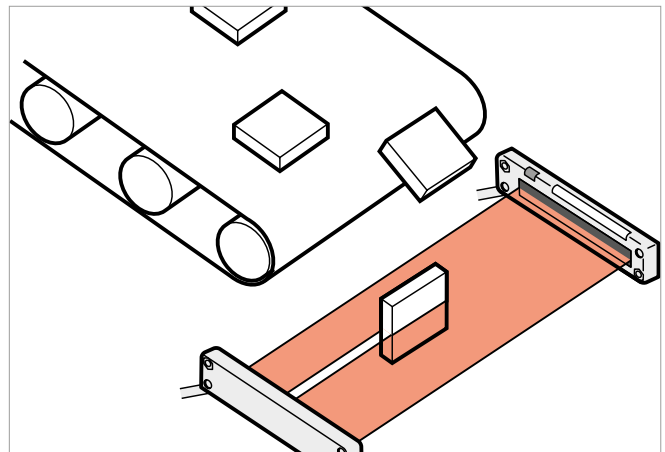


## Typical applications

**Detecting postcards**  
 NA1-11 can detect thin postcards due to its crossbeam scanning system.



**Detection of haphazardly falling objects**



## Technical specifications

| Type                     | NPN   | PNP                                       |
|--------------------------|---|---|
| Model no.                | NA1-11  | NA1-11-PN                                 |
| Sensing height           | 100mm   |   |
| Sensing range            | 0 to 1m (note)  |   |
| Beam pitch               | 10mm  |   |
| Numbers of beam channels | 11 each on the emitter and the receiver, respectively |   |
| Object to be sensed      | Min. $\varnothing$ 13.5mm (opaque)                    |   |
| Supply voltage           | 12 to 24VDC $\pm$ 10%                                 |   |
| Output                   | NPN open-collector transistor, max. 100mA             | PNP open-collector transistor, max. 100mA |
| Ambient temperature      | -10 to +55°C  |   |
| Connection method        | Cable, 2m   |   |
| Dimensions (HxWxD)       | 140x30x10mm   |   |

**Note:** Operating range for the receiver: 0.17 to 1m

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Sensors

Accessories

NA1-11

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# NA1-PK5/ NA1-PK3

Pick-to-light sensor –  
Ultra-slim body

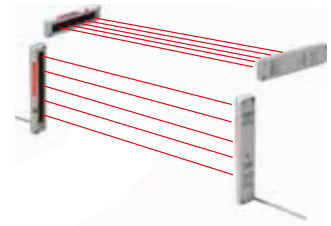
## Features

**■ 10 mm thick: half the thickness of conventional models**  
Space saving now possible; ultra-thin design does not obstruct picking operations.

**■ Two unit installations are possible**  
Sensor units can now be set to different light emission frequencies in order to prevent mutual interference.  
Two units can now be operated in a side-by-side configuration without interference for problem-free detection over wide areas.



Cable can be freely arranged in any position

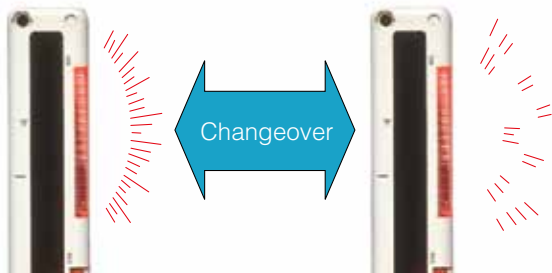


**■ Lighting pattern selectable**  
The job indicator operation can be selected as either continuous lighting or blinking.

**■ Selectable detection operation**  
Sensor units can be set to detect the interruption of 1 beam channel or 2 or more beam channels.

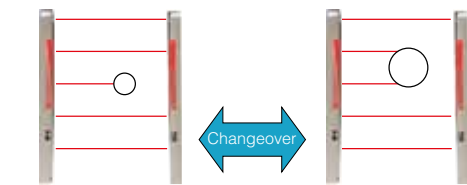
Continuous lighting

Blinking



Single beam interruption

Double beam interruption



All opaque bodies with  $\varnothing 35\text{mm}$  or greater will be detected.

The accidental passage of small objects through the beam axis will not trigger detection, yet the operator's hands will always be accurately detected. This function is also useful when small objects regularly interrupt the beam axis.

NA1-PK5/  
NA1-PK3

## Typical applications

### Cell production line



### Assembly line



## Technical specifications

| Type                    | NPN                                     |                                  | PNP                                     |                                  |
|-------------------------|---|----------------------------------|---|----------------------------------|
|                         | NA1-PK5                                 | NA1-PK3                          | NA1-PK5-PN                              | NA1-PK3-PN                       |
| Model no.               | NA1-PK5                                 | NA1-PK3                          | NA1-PK5-PN                              | NA1-PK3-PN                       |
| Sensing height          | 100mm                                   | 49.2mm                           | 100mm                                   | 49.2mm                           |
| Sensing range           | 0.1 to 1.2m                             | 0.03 to 0.3m                     | 0.1 to 1.2m                             | 0.03 to 0.3m                     |
| Beam pitch              | 25mm                                    | 24.6mm                           | 25mm                                    | 24.6mm                           |
| Number of beam channels | 5 beam channels                         | 3 beam channels                  | 5 beam channels                         | 3 beam channels                  |
| Object to be sensed     | Min. $\varnothing$ 35mm (opaque)        | Min. $\varnothing$ 29mm (opaque) | Min. $\varnothing$ 35mm (opaque)        | Min. $\varnothing$ 29mm (opaque) |
| Supply voltage          | 12 to 24VDC $\pm$ 10%                   |                                  |   |                                  |
| Output                  | NPN open-collector transistor max.100mA |                                  | PNP open-collector transistor max.100mA |                                  |
| Connection method       | Cable, 2m                               |                                  |   |                                  |
| Dimensions (HxWxD)      | 140x30x10mm                             | 70x24x8mm                        | 140x30x10mm                             | 70x24x8mm                        |

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Accessories

NA1-PK5/  
NA1-PK3

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Accessories

FX-100



# FX-100

Excellent price/performance ratio

## Features

### ■ Easy to read

The digital dual display allows you to check both the threshold value and incident light intensity at the same time. It also makes the procedures for setting the various values much easier.

### ■ Multipurpose M8 connector type

The connectors used are commercially available M8 connectors, so that processing costs and lead time required for carrying out processing can be greatly reduced.

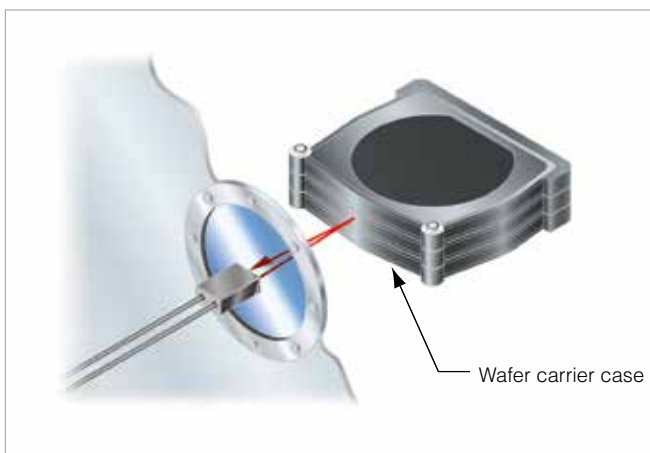
### ■ Designed in a 3-layer structure to accommodate basic through advanced settings

Setting details are divided into three levels for clearer operation, so that settings for normal operation are made in 'RUN mode', basic settings are made in 'SET mode', and advanced functions are set in 'PRO mode'. This makes setting operations much easier to understand and carry out.

## Typical applications

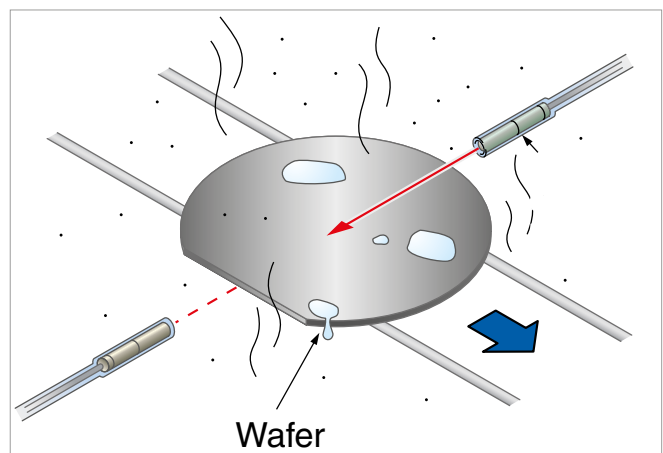
### Wafer detection

Detects wafer carrier cases through vacuum chamber's view port.



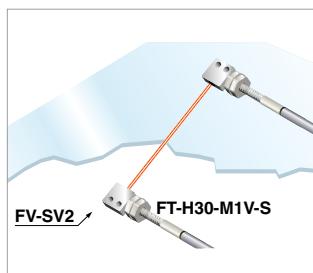
### Wafer detection

Sensing possible in corrosive environment. Lenses at the ends of the fiber heads expand the sensing range.





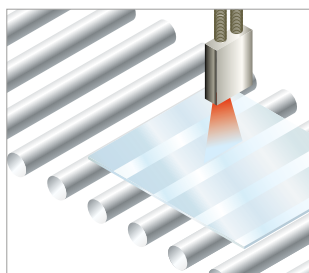
### Detection of breaks / cracks of glass



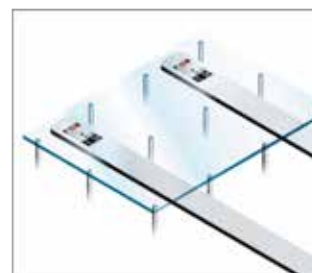
### Detection over long ranges



### Detection of glass substrate in vacuum chamber



### Detection of glass substrate



## Technical specifications

| Type                     |            | Standard type  |  | Long sensing range  |  |
|--------------------------|------------|--|--|---|--|
|                          |            | Connector type   | Cable type   | Connector type  | Cable type   |
| Model no.                | NPN output | FX-101 (-Z) (note 2)   | FX-101-CC2   | FX-102 (-Z) (note 2)  | FX-102-CC2   |
|                          | PNP output | FX-101P (-Z) (note 2)  | FX-101P-CC2  | FX-102P (-Z) (note 2)   | FX-102P-CC2  |
| Supply voltage           |            | 12 to 24VDC ±10%   |  |   |  |
| Power consumption        |            | Normal operation: max. 720mW (current consumption max. 30mA at 24V supply voltage)<br>Eco mode: max. 600mW (current consumption max. 25mA at 24V supply voltage)             |  |   |  |
| Response time            |            | Response time 0:<br>Response time 1:<br>Response time 2:<br>Response time 3:   | max. 250µs<br>max. 450µs<br>max. 500µs<br>max. 600µs | Response time 1:<br>Response time 2:<br>Response time 3:<br>Response time 4:                          | max. 2.5ms<br>max. 2.8ms<br>max. 3.2ms<br>max. 5.0ms |
| Output                   |            | PNP / NPN open-collector transistor, max. 100mA  |  |   |  |
| Output operation         |            | Selectable either Light-ON or Dark-ON  |  |   |  |
| Short-circuit protection |            | Incorporated   |  |   |  |
| Sensitivity setting      |            | 2-level teaching/Limit teaching/Full-auto teaching   |  |   |  |
| Digital display          |            | 4 digit green + 4 digit red LCD display  |  |   |  |
| Timer function           |            | ON-delay /OFF-delay, switchable either effective or ineffective.<br>[Timer period:1ms, 5ms, 10ms, 20ms, 40ms, 50ms, 100ms, 500ms, 1000ms]                                    |  |   |  |
| Interference prevention  |            | Incorporated<br>Selectable response time method (note 1)<br>(Functions at response time 1, 2 or 3)   |  | Incorporated<br>Selectable response time method (note 1)<br>(Functions at response time 1, 2, 3 or 4) |  |
| Ambient temperature      |            | -10 to +55°C (if 4 to 7 units are mounted close together: -10 to +50°C;<br>if 8 to 16 units are mounted close together: -10 to +45°C (no dew condensation or icing allowed)) |  |   |  |
| Emitting element         |            | Red LED  |  |   |  |
| Material                 |            | Enclosure: polycarbonate; key switch: polycarbonate; fiber lock lever: PBT   |  |   |  |
| Connection method        |            | Small connector<br>M8 connector (note 3)   | Cable, 2m  | Small connector<br>M8 connector (note 3)  | Cable, 2m  |
| Dimensions (HxWxD)       |            | 32x9x66.4mm  |  |   |  |
| Accessories              |            | —  | CN-14A-C2 (Connector attached<br>cable: 2m): 1 pc.   | —   | CN-14A-C2 (Connector attached<br>cable: 2m): 1 pc.   |

#### Notes:

- When using the interference prevention function, set the emission frequencies for the amplifiers to be covered by the interference prevention function to different frequency values. However, the interference prevention function does not operate at emission frequency 0 (factory default setting) for the **FX-101(P)(-Z)/FX-101(P)(P)-CC2**
- Suffix -Z = M8 connector type
- The cable is not included in delivery. Please select under accessories (page 129)

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FX-100

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Accessories

FX-301



# FX-301

Enhanced functions  
- strong performance  
- easy to use

## Features

### ■ FX-301(P) (red LED type) version upgrade

We improved the standard model by enhancing its sensing stability and equipping it with handy functions such as the light-emitting amount selection function.

### ■ Super high-speed response of 35 $\mu$ s

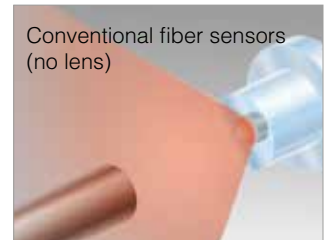
The **FX-301(P)-HS** model is the digital type fiber sensor realizing a super high-speed response of 35 $\mu$ s rendering it capable of sensing minute objects moving at high speeds.

### ■ Stable sensing over long and short periods

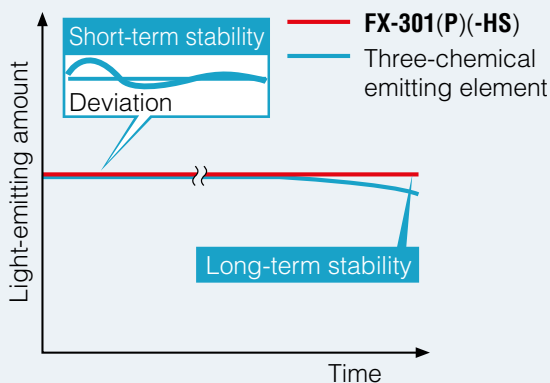
In addition to a four-chemical emitting element which suppresses changes in the light-emitting element over time so that a stable level of light emission can be maintained over long periods, a new APC (Auto Power Control) circuit has also been adopted. Because fluctuations over short periods of time have also been suppressed, stable sensing is possible very quickly once the power is turned back on after setup changes.

### ■ Sensing range has been greatly increased

All models use a double coupling lens that enables a much wider sensing range and maximization in the light emission efficiency. Sensing ranges with small diameter fibers and ultra small diameter fibers, which have become very popular due to the miniaturization of chip components, have been increased by 50% over previous values achieved with other amplifiers.



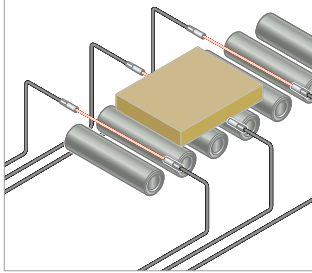
### Stable sensing comparison



## Typical applications

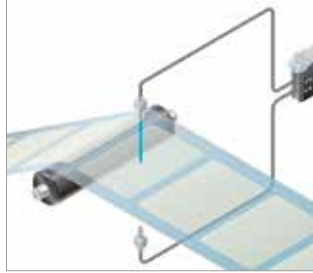
### Workpiece detection

This standard type of FX-301(P)(-HS) using red light has a four-chemical emitting element for stable sensing over long periods.



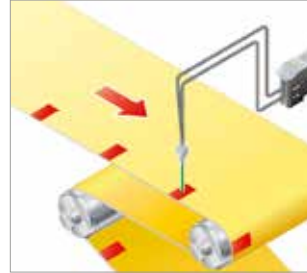
### Sensing translucent stickers

The blue LED type greatly reduces the damping rate, making it ideal for delicate sensing for yellow/red transitions.



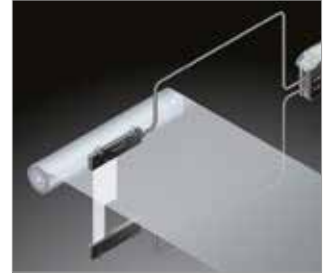
### Register mark detection

The green LED type greatly reduces the damping rate, making it ideal for delicate sensing.



### Sensing film meandering

Infrared LED type is ideal for sensing environments with light restrictions, such as places where light-sensitive film is being handled.



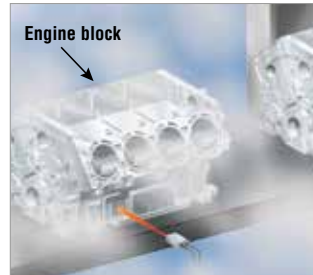
### Object sensing during the painting process

Due to a sensing range of 19.5m (FX-301 long range mode) and a 10m fiber length, it can be lead through rough environments freely.



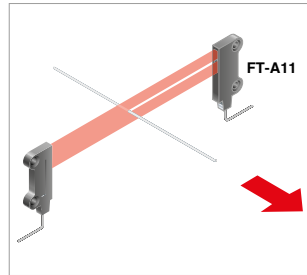
### Engine block passage confirmation

FD-WKZ1 has realized a sensing range of 480mm (FX-301 long range mode). In addition, due to its powerful beam, it can even work in adverse environments such as in areas prone to dust.



### Wire breakage detection

Wide beams are ideal for moving wire detection.



## Technical specifications

| Type                                       |            | Standard type  | High speed   |
|--|------------|--|--|
| Model no.                                  | NPN output | FX-301(-B/-G/-H) (note 1)  | FX-301-HS  |
|  | PNP output | FX-301(-B/-G/-H)P  | FX-301P-HS   |
| Supply voltage                             |            | 12 to 24VDC ±10%   |  |
| Response time                              |            | Max. 65µs<br>H-SP (Red LED type only); max. 150µs (FAST);<br>max. 250µs [STD/S-D (Red LED type only)];<br>max. 2ms (LONG) selectable with jog switch | Max. 35µs (H-SP);<br>max. 150µs (FAST);<br>max. 250µs (STD/S-D);<br>max. 2ms (LONG) selectable with jog switch |
| Output                                     |            | PNP / NPN open-collector transistor, max. 100mA  |  |
| Output operation                           |            | Selectable either Light-ON or Dark-ON, with jog switch   |  |
| Sensitivity setting                        |            | 2-level teaching/Limit teaching/<br>Full-auto/ teaching  |  |
| Digital display                            |            | 4-digit red LED display  |  |
| Automatic interference prevention function |            | Incorporated (Up to 4 sets of fiber heads can be mounted close together.) (However, H-SP mode is 2 sets.)  |  |
| Ambient temperature                        |            | -10 to +55°C   |  |
| Emitting element                           |            | FX-301(P): Red LED,<br>FX-301B(P): Blue LED,<br>FX-301G(P): Green LED,<br>FX-301H(P): Infrared LED   | Red LED  |
| Connection method                          |            | Connector (note 2)   |  |
| Dimensions (HxWxD)                         |            | 30.5x10x64.5mm   |  |
| Accessories                                |            | FX-MB1 Amplifier protection seal   |  |

#### Notes:

- Without suffix = Red LED  
Suffix-B = Blue LED  
Suffix-G = Green LED  
Suffix-H = Infrared LED
- The cable for amplifier connection is not supplied as an accessory. Please select under accessories (page 129)

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FX-301

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Accessories

FX-311



# FX-311

Remarkably easy to use

## Features

### ■ 12-turn potentiometer with visible indicator

12-turn potentiometer has been incorporated for fine adjustments. It enables very fine differences to be detected. Since the potentiometer is illuminated, you can even make adjustments easily in dark areas.

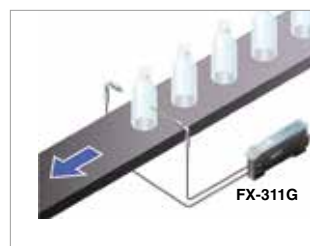
### ■ Three light source types (red, green, blue) are made available for expanding applications

Rapid blinking 'assist function' eases adjustment for optimum sensitivity.

## Typical applications

### Detecting transparent PET bottles

The green LED type is ideal for stably sensing objects such as transparent bottles which yield only small amounts of light fluctuation.



### Register mark detection

The blue LED type can accurately sense yellow marks on white backgrounds that are difficult to sense using the red LED type.



## Technical specifications

| Model no.                                  | NPN output   | FX-311  |
|--|--|---------|
|  | PNP output   | FX-311P |
| Supply voltage                             | 12 to 24VDC $\pm$ 10%  |         |
| Power consumption                          | Max. 840mW (Current consumption max. 35mA at 24V supply voltage)   |         |
| Response time                              | Max. 250 $\mu$ s (STD / S-D), max. 2ms (LONG) selectable with selection switch   |         |
| Output                                     | PNP / NPN open-collector transistor, max. 100mA  |         |
| Output operation                           | Selectable either Light-ON or Dark-ON, with selection switch   |         |
| Short-circuit protection                   | Incorporated   |         |
| Operation of indicators                    | Orange LED (lights up when the output is ON)   |         |
| Timer function                             | Incorporated with OFF-delay timer, selectable either effective (approx. 10ms or 40ms) or ineffective   |         |
| Automatic interference prevention function | Incorporated (Up to 4 sets of fiber heads can be mounted closely.) (note 1)  |         |
| Ambient temperature                        | -10 to +55°C (if 4 to 7 units are mounted close together: -10 to +50°C;<br>if 8 to 16 units are mounted close together: -10 to +45°C (no dew condensation or icing allowed)) |         |
| Emitting element                           | Red LED  |         |
| Material                                   | Enclosure: Heat-resistant ABS, Case cover: polycarbonate   |         |
| Connection method                          | Connector (note 2)   |         |
| Dimensions (HxWxD)                         | 34.5x10x70.5mm   |         |

### Notes:

- 1.) When the power supply is switched on, the light emission timing is automatically set for interference prevention
- 2.) The cable for amplifier connection is not supplied as an accessory. Please select under accessories (page 129)



# FX-500 / 550

Fiber amplifier at the industry's leading edge

IO-Link Sensors

Photoelectric Sensors

Fiber-optic Sensors

Standard Fibers

Fiber Sensors Communication Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure & Flow Sensors

Inductive Proximity Sensors

Measurement Sensors

Ionizers / Electrostatic Sensors

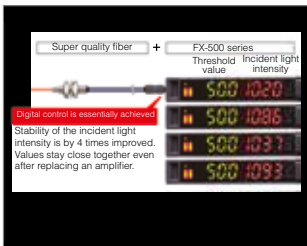
Accessories

FX-500/550

## Features

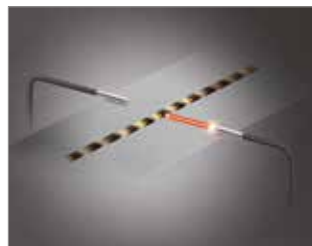
### Optimized stability

When used with the super quality fiber as a set, the incident light intensity variation among units is decreased to only 1/4 of that of conventional models.



### High performance

The FX-500 with its ultra high response time improves of 25µs productivity.



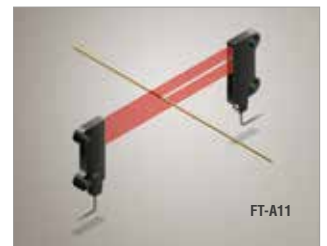
### HYPER mode incorporated

FX-500 in combination with the small diameter fiber can handle challenging detections over a super long sensing range.



### Improved accuracy!

FX-500 with its accurate detection catches fractional difference in light intensity, fulfilling high precision and low-hysteresis applications.

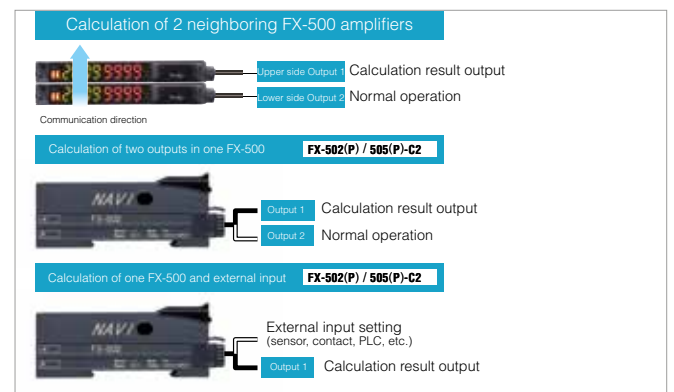


## No PLC necessary, saving material and programming costs



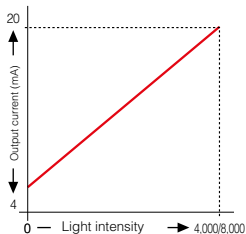
### Logical operation of sensors

Three logical calculations (AND/OR/XOR) are selectable using Output 1 of multiple FX-500 series amplifiers. You can logically connect two outputs of an FX-500 or one input of a normal sensor to the output of an FX-500 sensor.

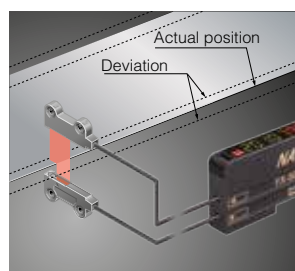


## Analog output cable type FX-505

The sensor outputs an analog signal of 4-20mA in proportion to digital value displayed for the current light intensity received.



### Edge tracking of film or sheet

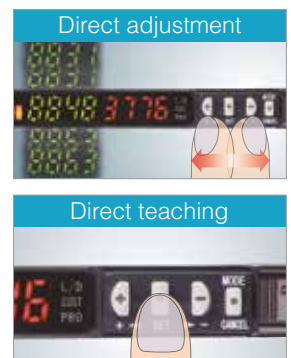


Drifting path can be tracked as the light intensity changes.

## Direct settings

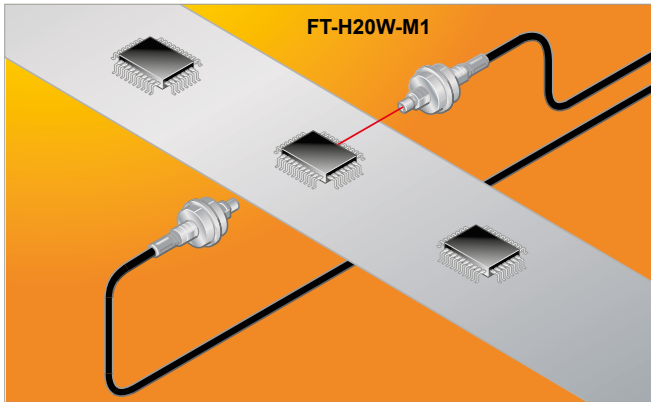
Direct adjustment: Threshold values can be changed directly in RUN mode.

Direct teaching: Teaching can be done in RUN mode. Just press the SET button once for object "present" and "not present".

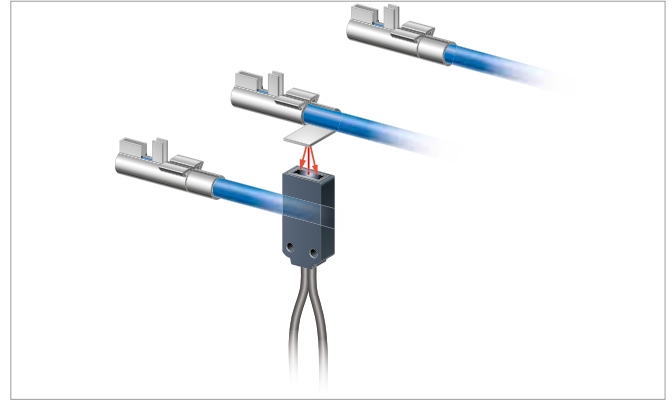


## Typical applications

### Counting of IC pins



### Check crimping



### Glass substrate sensing



## Technical specifications

| Type                                     | Connector   |         |         | Cable                        |            |   |
|--|---|---------|---------|------------------------------|------------|---|
| Model no.                                | NPN output  | FX-501  | FX-502  | FX-551                       | FX-551-C2  | FX-505-C2   |
|  | PNP output  | FX-501P | FX-502P | FX-551P                      | FX-551P-C2 | FX-505P-C2  |
| Digital fiber sensor amplifier           | Digital   |         |         |                              | Analog     |   |
| Timer function                           | Adjustable: 0.1ms to 999.9ms in 0.1ms steps, 1 to 9999ms in 1ms steps, 1 to 32s in 1s steps       |         |         |                              |            |   |
| Interference prevention                  | Auto interference prevention function for up to 12 units and selectable emission frequency method |         |         | Incorporated (up to 4 units) |            | Auto interference prevention function for up to 12 units and selectable emission frequency method |
| Response time                            | Max. 25µs/60µs/250µs/2ms/4ms/24ms   |         |         | Max. 60µs/250µs/2ms/4ms/24ms |            | Max. 25µs/60µs/250µs/2ms/4ms/24ms   |
| Analog voltage output                    | -   |         |         |                              |            | 4 to 20mA   |
| Supply voltage                           | 12 to 24V DC ±10%   |         |         |                              |            |   |
| Output                                   | PNP / NPN open-collector transistor, max. 100mA   |         |         |                              |            |   |
| Emitting element                         | Red LED   |         |         |                              |            |   |
| Material                                 | Enclosure: polycarbonate, switch: POM   |         |         |                              |            |   |
| Rated current consumption (without load) | Normal operation: max. 40mA at 24V supply voltage<br>Eco mode: max. 30mA at 24V supply voltage    |         |         |                              |            |   |
| Protection                               | IP40 (IEC)  |         |         |                              |            |   |
| Ambient temperature                      | -10 to +55°C  |         |         |                              |            |   |
| Connection method                        | Connector type (note)   |         |         |                              | Cable, 2m  |   |
| Dimensions (HxWxD)                       | 34x10x75mm  |         |         |                              |            |   |
| Accessories                              | FX-MB1 Amplifier protection seal  |         |         | -                            |            | FX-MB1 Amplifier protection seal  |

Note: The cable for amplifier FX-501□, FX-502□, FX-551□ is not supplied as an accessory. Please select under accessories (page 129).

# Fiber-optic Sensors

Now with communication interface!



## Fibers with integrated high-precision plug

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

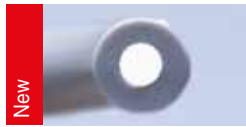
### Stable light intensity

Optical **fibers** with insertion plug-in achieve a very high quality standard. Through the integrated high-precision plug, the fiber core can be centered to within  $\pm 40\mu\text{m}$ . Variation in light intensity could thus be reduced to  $\pm 10\%$ .



### New fiber core

Now the core consists of only one fiber instead of several single fibers. This design improves sensing stability dramatically because there is no variation in light intensity among individual fibers.



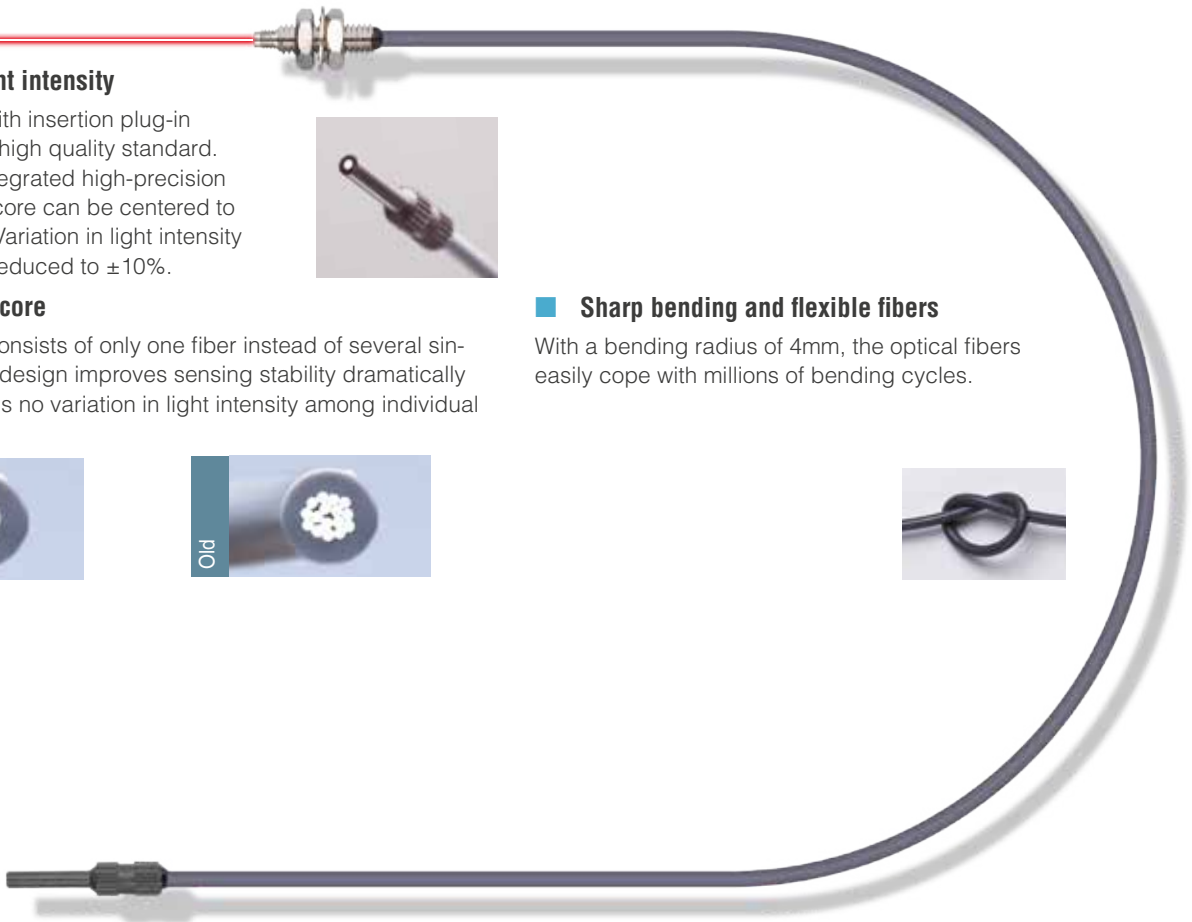
New



Old

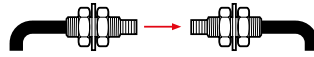
### Sharp bending and flexible fibers

With a bending radius of 4mm, the optical fibers easily cope with millions of bending cycles.

Fibers with  
integrated high-  
precision plug



**Thru-beam type (one pair set)**



| Type        | Shape of fiber head (mm) | Model no.              | Bending radius | Fiber cable length | Sensing range (mm)           |                            |               | Beam axis dia. (mm) | Protection | Ambient temperature |
|-------------|--------------------------|------------------------|----------------|--------------------|------------------------------|----------------------------|---------------|---------------------|------------|---------------------|
|             |                          |                        |                |                    | FX-500 series                | U-LG LONG FAST H-SP        | FX-101 FX-102 |                     |            |                     |
| Threaded    | M3<br>                   | <b>Tough</b><br>FT-30  | R2             | 2m                 | STD 400<br>HYPR 1350         | 810<br>650<br>210<br>75    | 135<br>400    | ∅0.5                | IP67 (IEC) | -55 to +80°C        |
|             | M4<br>                   | <b>Tough</b><br>FT-40  | R4             |                    | STD 1200<br>HYPR (note) 3600 | 2200<br>1700<br>530<br>190 | 320<br>870    | ∅1                  |            |                     |
| Cylindrical | ∅1.5<br>                 | <b>Tough</b><br>FT-S20 | R2             |                    | STD 400<br>HYPR 1350         | 810<br>650<br>210<br>75    | 135<br>400    | ∅0.5                |            |                     |
|             | ∅3<br>                   | <b>Tough</b><br>FT-S30 | R4             |                    | STD 1200<br>HYPR (note) 3600 | 2200<br>1700<br>30<br>190  | 320<br>870    | ∅1                  |            |                     |

Note: The length of the fiber cable affects the sensing range.

**Reflective type**



| Type        | Shape of fiber head (mm) | Model no.              | Bending radius | Fiber cable length | Sensing range (mm) (note) |                         |               | Protection | Ambient temperature |
|-------------|--------------------------|------------------------|----------------|--------------------|---------------------------|-------------------------|---------------|------------|---------------------|
|             |                          |                        |                |                    | FX-500 series             | U-LG LONG FAST H-SP     | FX-101 FX-102 |            |                     |
| Threaded    | M3<br>                   | <b>Tough</b><br>FD-30  | R2             | 2m                 | STD 160<br>HYPR 600       | 330<br>250<br>80        | 45<br>155     | IP67 (IEC) | -55 to +80°C        |
|             | M4<br>                   | <b>Tough</b><br>FD-40  |                |                    | STD 520<br>HYPR 1550      | 900<br>740<br>260<br>90 | 140<br>420    |            |                     |
|             | M6<br>                   | <b>Tough</b><br>FD-60  | R4             |                    | STD 160<br>HYPR 600       | 330<br>250<br>80<br>25  | 45<br>155     |            |                     |
| Cylindrical | ∅3<br>                   | <b>Tough</b><br>FD-S30 |                |                    |                           |                         |               |            |                     |

Note: The sensing range is specified for white, matt paper.

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

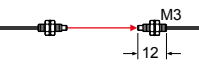
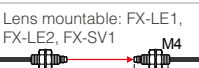



- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

Fibers with integrated high-precision plug

## Threaded fibers

### Thru-beam type (one pair set)



| Type     | Shape of fiber head (mm) | Model no.   | Bending radius | Fiber cable length | Sensing range (mm) (note 1)           |   |   | Beam axis dia. (mm)     | Protection | Ambient temperature |      |
|----------|--------------------------|---|----------------|--------------------|---------------------------------------|---|---|-------------------------|------------|---------------------|------|
|          |                          |   |                |                    | FX-500 series                         | U-LG LONG FAST H-SP                       | FX-101 FX-102                                     |                         |            |                     |      |
| Threaded | M3                       |  <b>Tough</b> FT-31  | R2             | 2m                 | STD 315<br>HYPR 210<br>1350           | 770<br>550<br>210<br>70                   | 130<br>340  | ø0.5                    | IP67 (IEC) | -55 to +80°C        |      |
|          | M4                       | Lens mountable: FX-LE1, FX-LE2, FX-SV1  <b>Tough</b> FT-43                 | R4             |                    | STD 1400<br>HYPR 770<br>(note 2) 3600 | 2800<br>2100<br>770<br>240                | 350<br>970  |                         |            |                     | ø1.5 |
|          | Elbow                    | Lens mountable: FX-LE1, FX-LE2,  <b>Tough</b> FT-R40                       | R4             |                    | STD 930<br>HYPR (note 2) 3600         | 1750<br>1500<br>500<br>160                | 270<br>740  |                         |            |                     |      |
|          | M4                       | Square head<br>Lens mountable: FX-LE1, FX-LE2, FX-SV1  <b>Tough</b> FT-R43 | R4             |                    | STD 720<br>HYPR 430<br>(note 2) 3000  | 1600<br>1100<br>430<br>130                | 210<br>640  |                         |            |                     | ø10  |
|          | M14                      | Long sensing range<br>With expansion lens  <b>Tough</b> FT-140             | R4             |                    | 10m                                   | STD (note 2) 19600<br>HYPR (note 2) 19600 | 19600 (note 2)<br>19600 (note 2)<br>16000<br>6300 | 14000<br>19600 (note 2) | ø10        | IP67 (IEC)          |      |

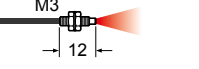
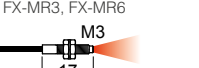
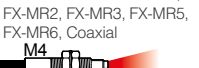
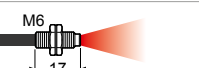

**Notes:**

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

### Reflective type



| Type     | Shape of fiber head (mm) | Model no.   | Bending radius | Fiber cable length | Sensing range (mm) (note 1, 2) |                         |                         | Protection | Ambient temperature |
|----------|--------------------------|---|----------------|--------------------|--------------------------------|-------------------------|-------------------------|------------|---------------------|
|          |                          |   |                |                    | FX-500 series                  | U-LG LONG FAST H-SP     | FX-101 FX-102           |            |                     |
| Threaded | M3                       |  <b>Tough</b> FD-31  | R2             | 2m                 | STD 125<br>HYPR 80<br>515      | 290<br>220<br>80<br>25  | 35<br>140               | IP67 (IEC) | -55 to +80°C        |
|          | M3                       | Coaxial • Lens mountable: FX-MR3, FX-MR6  <b>Tough</b> FD-32G                        | R2             |                    | STD 200<br>HYPR 650            | 380<br>270<br>95<br>27  | 70<br>190               |            |                     |
|          | Ultra-small diameter     | Lens mountable: FX-MR3, FX-MR6, Coaxial  <b>Tough</b> FD-EG30                        | R4             |                    | 500mm                          | STD 48<br>HYPR 170      | 130<br>110<br>30<br>9   | 20<br>70   | IP67 (IEC)          |
| Threaded | M4                       |  <b>Tough</b> FD-41  | R2             | 2m                 | STD 125<br>HYPR 515            | 290<br>220<br>80<br>25  | 35<br>140               | IP67 (IEC) |                     |
|          | M4                       | Lens mountable: FX-MR1, FX-MR2, FX-MR3, FX-MR5, FX-MR6, Coaxial  <b>Tough</b> FD-42G | R2             |                    | STD 200<br>HYPR 650            | 380<br>270<br>95<br>27  | 70<br>190               |            | IP40 (IEC)          |
| Threaded | M6                       |  <b>Tough</b> FD-61  | R4             | 2m                 | STD 450<br>HYPR 1400           | 840<br>670<br>200<br>70 | 120<br>410              | IP67 (IEC) |                     |
|          | M6                       | Coaxial  <b>Tough</b> FD-61G   | R4             |                    | STD 420<br>HYPR 1100           | 800<br>650<br>200<br>60 | 120<br>350              |            | IP40 (IEC)          |
|          | Elbow                    |  <b>Tough</b> FD-R60   | R4             |                    | 2m                             | STD 290<br>HYPR 1100    | 600<br>550<br>190<br>65 | 110<br>240 |                     |

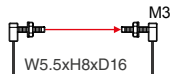

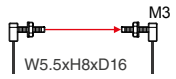

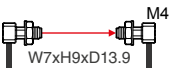






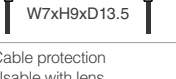
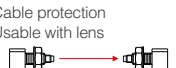

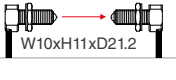
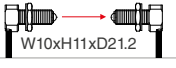
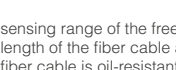
**Notes:**

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

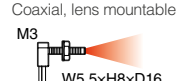

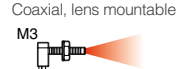
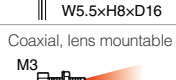
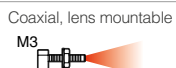
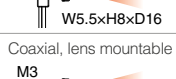
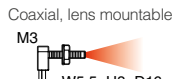
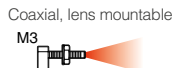
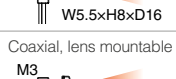
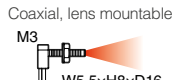
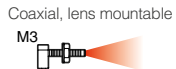


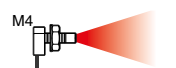

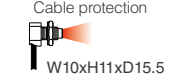
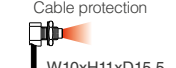
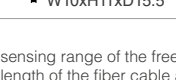
# Square head fibers

## Thru-beam type (one pair set)

| Type        | Shape of fiber head (mm)   | Model no.               | Bending radius   | Fiber cable length  | Sensing range (mm) (note 1)  |  |                                      | Beam axis $\phi$ (mm) | Protection | Ambient temperature    |
|-------------|--|-------------------------|--|---|--|--|--------------------------------------|-----------------------|------------|------------------------|
|             |  |                         |  |   | FX-500 series  | U-LG LONG FAST H-SP  | FX-101 FX-102                        |                       |            |                        |
| Square head | <br>W5.5xH8xD16   | <b>Tough</b><br>FT-R31  | R2   | <br>2m | STD<br> 270<br>HYPR<br> 1000 | 580<br>440<br>160<br>55  | 100<br>340                           | $\phi$ 0.5            | IP67 (IEC) | -55 to +80°C           |
|             |  | FT-R41W                 | R1   |   | STD<br> 800<br>HYPR<br> 3200 | 1800<br>1400<br>460<br>150   | 250<br>710                           | $\phi$ 1              | IP40 (IEC) | -40 to +60°C           |
|             | With lens<br><br>W7xH9xD14.4                              | <b>Tough</b><br>FT-R42W |  |   | R4   | STD<br> 2200<br>HYPR<br> 3600 (note 2) | 3600 (note 2)<br>3500<br>1300<br>460 | 510<br>2000           |            |                        |
|             | Lens mountable:<br>FX-LE1/FX-LE2/FX-SV1  | <b>Tough</b><br>FT-R43  | R4   |   |  | STD<br> 720<br>HYPR<br> 3000           | 1600<br>1100<br>430<br>130           | 210<br>640            | $\phi$ 1   | IP67 (IEC)             |
|             | Cable protection<br>Usable with lens<br><br>W7xH9.5xD15.5 | <b>Tough</b><br>FT-R44Y |  |   | R4   | STD<br> 720<br>HYPR<br> 3000          | 1600<br>1100<br>430<br>130           | 210<br>640            | $\phi$ 1   | IP67 (IEC)<br>(note 3) |
|             | Full protection<br><br>W10xH11xD21.2                    | <b>Tough</b><br>FT-R60Y | STD<br> 2100<br>HYPR<br> 3600 (note 2) |   |  | 3600 (note 2)<br>3600 (note 2)<br>1260<br>400  | 690<br>1890                          | $\phi$ 3.5            | IP68G      | -55 to +80°C           |

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced by 20% depending upon how the fiber is cut
  - 2.) The length of the fiber cable affects the sensing range
  - 3.) The fiber cable is oil-resistant

## Reflective type

| Type   | Shape of fiber head (mm)  | Model no.               | Bending radius   | Fiber cable length  | Sensing range (mm) (note 1, 2)  |   |                         | Beam axis $\phi$ (mm) | Degree of protection | Ambient temperature |
|--|---|-------------------------|--|---|---|---|-------------------------|-----------------------|----------------------|---------------------|
|  |   |                         |  |   | FX-500 series   | U-LG LONG FAST H-SP   | FX-101 FX-102           |                       |                      |                     |
| Square head  | <br>W5.5xH8xD16                            | <b>Tough</b><br>FD-R31G | R2   | <br>2m | STD<br> 170<br>HYPR<br> 530 | 310<br>260<br>85<br>27  | 45<br>150               | Emitter $\phi$ 0.5    | IP40                 | -55 to +80°C        |
|  |   | FD-R32EG                | R4   |   | STD<br> 45<br>HYPR<br> 170  | 110<br>92<br>30<br>9  | 20<br>68                | Emitter $\phi$ 0.25   |                      |                     |
|  | Coaxial, lens mountable<br><br>W5.5xH8xD16 | FT-R34EG                |  |   | STD<br> 138<br>HYPR<br> 130 | 90<br>70<br>23<br>7   | 17<br>60                | Emitter $\phi$ 0.175  |                      |                     |
|  | Coaxial, lens mountable<br><br>W5.5xH8xD16 | FD-R33EG                |  |   | STD<br> 119<br>HYPR<br> 84  | 44<br>33<br>11<br>3   | 7<br>22                 | Emitter $\phi$ 0.125  | -20 to +60°C         |                     |
|  | M4<br><br>W7xH9xD13.5                      | <b>Tough</b><br>FD-R41  | R2   |   | <br>2m   | STD<br> 210<br>HYPR<br> 710 | 430<br>320<br>100<br>34 | 60<br>170             | $\phi$ 0.75          | IP67                |
| Cable protection<br><br>W10xH11xD15.5 | <b>Tough</b><br>FD-R61Y   | R4                      | TD<br> 280<br>HYPR<br> 990 | 610<br>435<br>160<br>50   |   | 85<br>185   | -                       | IP67<br>(note 3)      |                      |                     |

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced by 20% depending upon how the fiber is cut
  - 2.) The length of the fiber cable affects the sensing range
  - 3.) The fiber cable is oil-resistant

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

- IO-Link Sensors
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- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories
- Square head fibers

### Cylindrical fibers

#### Thru-beam type (one pair set)



| Type     | Shape of fiber head (mm) | Model no.              | Bending radius         | Fiber cable length                   | Sensing range (mm) (note 1)    |                                      |                                | Beam axis dia. (mm) | Protection   | Ambient temperature |              |
|----------|--------------------------|------------------------|------------------------|--------------------------------------|--------------------------------|--------------------------------------|--------------------------------|---------------------|--------------|---------------------|--------------|
|          |                          |                        |                        |                                      | FX-500 series                  | U-LG LONG FAST H-SP                  | FX-101 FX-102                  |                     |              |                     |              |
| Cylinder |                          | <b>Tough</b><br>FT-S11 |                        | 500mm                                | STD<br>90<br>HYPR<br>350       | 210<br>160<br>60<br>19               | 40<br>90                       | ∅0.25               | IP67 (IEC)   | -55 to +80°C        |              |
|          |                          | <b>Tough</b><br>FT-S21 | R2                     | 2m                                   | STD<br>315<br>HYPR<br>1350     | 770<br>550<br>210<br>70              | 130<br>340                     | ∅0.5                |              |                     |              |
|          |                          | FT-S21W                | R1                     |                                      | STD<br>260<br>HYPR<br>990      | 590<br>440<br>150<br>53              | 80<br>240                      | ∅0.25               | -40 to +60°C |                     |              |
|          |                          | FT-S32                 | R10                    | STD<br>3100<br>HYPR<br>(note 2) 3600 | 3600 (note 2)<br>3600 (note 2) | 1100<br>3000                         | ∅2                             | IP40 (IEC)          | -40 to +70°C |                     |              |
|          |                          | FT-S31W                | R1                     | STD<br>800<br>HYPR<br>3300           | 1900<br>1400<br>490<br>160     | 260<br>720                           | ∅1                             | -40 to +60°C        |              |                     |              |
|          | Ultra-small diameter     |                        | <b>Tough</b><br>FT-E13 |                                      | 1m                             | STD<br>15<br>HYPR<br>52              | 30<br>24<br>8<br>2             | 6<br>19             | ∅0.125       | IP67 (IEC)          | -40 to +70°C |
|          |                          |                        | <b>Tough</b><br>FT-E23 | R2                                   |                                | STD<br>75<br>HYPR<br>270             | 160<br>125<br>42<br>13         | 22<br>80            | ∅0.25        |                     |              |
|          | Side sensing             |                        | <b>Tough</b><br>FT-V40 | R4                                   | 2m                             | STD<br>3500<br>HYPR<br>(note 2) 3600 | 3600 (note 2)<br>3600 (note 2) | 1000<br>3100        | ∅2.5         | IP50 (IEC)          | -40 to +60°C |

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range

#### Reflective type



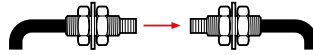
| Type        | Shape of fiber head (mm) | Model no.               | Bending radius           | Fiber cable length        | Sensing range (mm) (note 1, 2) |                         |                    | Protection   | Ambient temperature |
|-------------|--------------------------|-------------------------|--------------------------|---------------------------|--------------------------------|-------------------------|--------------------|--------------|---------------------|
|             |                          |                         |                          |                           | FX-500 series                  | U-LG LONG FAST H-SP     | FX-101 FX-102      |              |                     |
| Cylindrical |                          | <b>Tough</b><br>FD-S21  | R2                       | 1m                        | STD<br>80<br>HYPR<br>190       | 130<br>110<br>37<br>11  | 25<br>70           | IP40 (IEC)   | -55 to +80°C        |
|             |                          | <b>Tough</b><br>FD-S32  | R4                       | 2m                        | STD<br>420<br>HYPR<br>1200     | 790<br>660<br>220<br>75 | 120<br>345         | IP67 (IEC)   |                     |
|             |                          | FD-S32W                 | R1                       |                           | STD<br>270<br>HYPR<br>900      | 630<br>430<br>150<br>45 | 80<br>230          | ∅0.25        | -40 to +60°C        |
|             |                          | <b>Tough</b><br>FD-S31  | R2                       | STD<br>125<br>HYPR<br>515 | 290<br>220<br>80<br>25         | 35<br>140               | ∅0.25              | -55 to +80°C |                     |
|             |                          | FD-S33GW                | R1                       | STD<br>150<br>HYPR<br>670 | 340<br>280<br>90<br>25         | 45<br>140               | ∅0.25              | -40 to +60°C |                     |
|             |                          | <b>Tough</b><br>FD-S60Y | R4                       | STD<br>320<br>HYPR<br>600 | 590<br>420<br>200<br>75        | 140<br>300              | IP68G              | -40 to +70°C |                     |
|             | Ultra-small diameter     |                         | FD-E13                   | R4                        | 1m                             | STD<br>12<br>HYPR<br>50 | 29<br>25<br>7<br>2 | 5<br>15      | IP40 (IEC)          |
|             |                          | FD-E23                  | STD<br>55<br>HYPR<br>170 |                           |                                | 120<br>80<br>30<br>9    | 20<br>70           |              |                     |

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper

## Fibers with sleeve

### Thru-beam type (one pair set)



| Type     | Shape of fiber head (mm) | Model no.              | Bending radius         | Fiber cable length | Sensing range (mm) (note 1, 2) |                            |                          | Beam axis dia. (mm) | Protection | Ambient temperature |              |
|----------|--------------------------|------------------------|------------------------|--------------------|--------------------------------|----------------------------|--------------------------|---------------------|------------|---------------------|--------------|
|          |                          |                        |                        |                    | FX-500 series                  | U-LG LONG FAST H-SP        | FX-101 FX-102            |                     |            |                     |              |
| Threaded | M3<br>                   | <b>Tough</b><br>FT-31S | R2                     | 2m                 | STD<br>315<br>HYPR<br>1220     | 740<br>550<br>195<br>63    | 130<br>340               | ø0.5                | IP67 (IEC) | -55 to +80°C        |              |
|          | M4<br>                   | <b>Tough</b><br>FT-42S | R4<br>(note 3)         |                    | STD<br>1130<br>HYPR<br>3600    | 2050<br>1600<br>530<br>190 | 300<br>800               |                     |            |                     |              |
|          | Ultra-small<br>          | <b>Tough</b><br>FT-E23 | R2                     | 1m                 | STD<br>75<br>HYPR<br>270       | 160<br>125<br>42<br>13     | 22<br>80                 | ø0.25               |            | -40 to +70°C        |              |
|          | Side sensing<br>ø2       |                        | <b>Tough</b><br>FT-V23 | R4                 | 2m                             | STD<br>450<br>HYPR<br>1800 | 1000<br>880<br>280<br>90 | 160<br>400          | ø0.75      | IP30 (IEC)          | -55 to +80°C |
|          |                          |                        | <b>Tough</b><br>FT-V25 | R2                 |                                | STD<br>240<br>HYPR<br>900  | 550<br>480<br>140<br>45  | 95<br>260           | ø0.5       |                     |              |
|          |                          | <b>Tough</b><br>FT-V30 | R4                     |                    | STD<br>680<br>HYPR<br>2200     | 1200<br>1000<br>340<br>100 | 180<br>480               | ø1.0                |            |                     |              |

**Notes:**

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range
- 3.) The bending radius of the sleeve is min. 10mm

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

### Reflective type



| Type        | Shape of fiber head (mm)         | Model no.              | Bending radius         | Fiber cable length | Sensing range (mm) (note 1, 2) |                               |                        | Protection | Ambient temperature |              |
|-------------|----------------------------------|------------------------|------------------------|--------------------|--------------------------------|-------------------------------|------------------------|------------|---------------------|--------------|
|             |                                  |                        |                        |                    | FX-500 series                  | U-LG LONG FAST H-SP           | FX-101 FX-102          |            |                     |              |
| Threaded    | Ultra-small diameter<br>M3<br>   | FD-EG30S               | R4                     | 1m                 | STD<br>50<br>HYPR<br>170       | 110<br>80<br>30<br>9          | 20<br>70               | IP40 (IEC) | -40 to +70°C        |              |
|             | M4<br>                           | <b>Tough</b><br>FD-41S | R2<br>(note 3)         | 2m                 | STD<br>125<br>HYPR<br>515      | 290<br>220<br>80<br>25        | 35<br>140              | IP67 (IEC) | -55 to +80°C        |              |
|             | M6<br>                           | <b>Tough</b><br>FD-61S | R4<br>(note 3)         |                    | STD<br>420<br>HYPR<br>1200     | 790<br>660<br>220<br>75       | 130<br>360             |            |                     |              |
| Cylindrical | Ultra-small diameter<br>ø1.5<br> | FD-E13                 | R4                     | 1m                 | STD<br>12<br>HYPR<br>50        | 29<br>25<br>7<br>2            | 5<br>15                | IP40 (IEC) | -40 to +60°C        |              |
|             | Side sensing<br>ø3               |                        | <b>Tough</b><br>FD-V30 | R2                 | 2m                             | STD<br>65 2559<br>HYPR<br>240 | 130<br>120<br>35<br>14 | 25<br>75   | IP30 (IEC)          | -55 to +80°C |
|             |                                  |                        | <b>Tough</b><br>FD-V50 | R4                 |                                | STD<br>120<br>HYPR<br>370     | 220<br>210<br>75<br>25 | 40<br>100  |                     |              |

**Notes:**

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper
- 3.) The bending radius of the sleeve is min. 10mm

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

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Laser Sensors

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Pressure & Flow Sensors

Inductive Proximity Sensors

Measurement Sensors

Ionizers / Electrostatic Sensors

Accessories

Fibers with sleeve

## Flat fibers

## Thru-beam type (one pair set)



| Type | Shape of fiber head (mm)         | Model no.                        | Bending radius | Fiber cable length | Sensing range (mm) (note 1)    |   |                                | Beam axis dia. (mm)        | Protection  | Ambient temperature |      |            |
|------|----------------------------------|----------------------------------|----------------|--------------------|--------------------------------|---|--------------------------------|----------------------------|-------------|---------------------|------|------------|
|      |                                  |                                  |                |                    | FX-500 series                  | U-LG LONG FAST H-SP                           | FX-101 FX-102                  |                            |             |                     |      |            |
| Flat | Top sensing<br>W3 × H8 × D12     | <b>Tough</b><br>FT-Z30H          | R2             | 2m                 | STD 3500<br>HYPR (note 2) 3600 | 3600 (note 2)<br>2600<br>810                  | 1400<br>3200                   | 2×3                        | IP40 (IEC)  | -40 to +60°C        |      |            |
|      | Top sensing<br>W3 × H8 × D12     | FT-Z30HW                         | R1             |                    | STD 3500<br>HYPR (note 2) 3600 | 3600 (note 2)<br>2600<br>810                  | 1400<br>3200                   |                            |             |                     |      |            |
|      | Side sensing<br>W3 × H12 × D8    | <b>Tough</b><br>FT-Z30E          | R2             |                    | STD 3500<br>HYPR (note 2) 3600 | 3600 (note 2)<br>2400<br>740                  | 1200<br>3200                   |                            |             |                     |      |            |
|      | Side sensing<br>W3 × H12 × D8    | FT-Z30EW                         | R1             |                    | STD 3400<br>HYPR (note 2) 9600 | 3600 (note 2)<br>3600 (note 2)<br>2000<br>630 | 1400<br>2600                   |                            |             |                     |      |            |
|      | Front sensing<br>W8.5 × H12 × D3 | <b>Tough</b><br>FT-Z30           | R2             |                    | STD 2100<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>1200<br>410 | 710<br>2300                    |                            |             |                     | ø2   |            |
|      | Front sensing<br>W8.5 × H12 × D3 | FT-Z30W                          |                |                    | STD 1500<br>HYPR (note 2) 3600 | 3300<br>3200<br>1000<br>280                   | 540<br>1800                    |                            |             |                     |      |            |
|      | With boss                        | Front sensing<br>W10 × H7 × D2   | FT-Z20W        |                    | R1                             | 1m  | STD 530<br>HYPR (note 2) 1600  | 1100<br>900<br>330<br>100  | 230<br>670  |                     | ø1.5 | -          |
|      |                                  | Top sensing<br>W2 × H10 × D10    | FT-Z20HBW      |                    |                                |   | STD 260<br>HYPR 1100           | 670<br>570<br>180<br>55    | 100<br>320  |                     | ø0.5 | IP67 (IEC) |
|      |                                  | Front sensing<br>W14 × H7 × D3.5 | FT-Z40W        |                    |                                |   | STD 1400<br>HYPR (note 2) 3500 | 3300<br>2300<br>890<br>290 | 330<br>1000 |                     | ø1.5 | -          |
|      |                                  | Top sensing<br>W3.5 × H14 × D11  | FT-Z40HBW      |                    |                                |   | STD 800<br>HYPR (note 2) 3300  | 1900<br>1400<br>490<br>160 | 260<br>720  |                     | ø1   | IP67 (IEC) |

## Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range

## Reflective type



| Type | Shape of fiber head (mm)         | Model no. | Bending radius | Fiber cable length | Sensing range (mm) (note 1, 2) |  |                       | Protection | Ambient temperature |
|------|----------------------------------|-----------|----------------|--------------------|--------------------------------|--|-----------------------|------------|---------------------|
|      |                                  |           |                |                    | FX-500 series                  | U-LG LONG FAST H-SP                        | FX-101 Fx-102         |            |                     |
| Flat | Front sensing<br>W10 × H7 × D2   | FD-Z20W   | R1             | 1m                 | STD 2 to 65<br>HYPR 1 to 230   | 1 to 110<br>1 to 85<br>3 to 35<br>5 to 13  | 2 to 20<br>1 to 70    | -          | -40 to +60°C        |
|      | Top sensing<br>W2 × H10 × D10    | FD-Z20HBW |                |                    | STD 2 to 85<br>HYPR 1 to 340   | 1 to 210<br>1 to 180<br>2 to 55<br>3 to 15 | 2 to 30<br>1 to 90    | IP67 (IEC) |                     |
|      | Front sensing<br>W14 × H7 × D3.5 | FD-Z40W   |                | 2m                 | STD 110<br>HYPR 430            | 230<br>180<br>1.5 to 65<br>3 to 25         | 1 to 55<br>160        | -          |                     |
|      | Top sensing<br>W3.5 × H14 × D11  | FD-Z40HBW |                |                    | STD 260<br>HYPR 760            | 540<br>470<br>1 to 160<br>2 to 50          | 1 to 90<br>0.5 to 240 | IP67 (IEC) |                     |

## Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

## Wide beam fibers

### Thru-beam type (one pair set)



| Type      | Shape of fiber head (mm)                 | Model no.               | Bending radius | Fiber cable length   | Sensing range (mm) (note 1)             |   |                                | Beam axis dia. (mm) | Protection   | Ambient temperature |
|-----------|--|-------------------------|----------------|----------------------|---|---|--------------------------------|---------------------|--------------|---------------------|
|           |  |                         |                |                      | FX-500 series                           | U-LG LONG FAST H-SP                                     | FX-101 FX-102                  |                     |              |                     |
| Wide beam | Sensing width 32mm<br>W5 x H69 x D20     | <b>Tough</b><br>FT-A32  | R2             | 2m                   | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>3600 (note 2)<br>2100 | 3600 (note 2)<br>3600 (note 2) | 3.2 x 32            | IP40 (IEC)   | -40 to +60°C        |
|           | Sensing width 32mm<br>W5 x H69 x D20     | FT-A32W                 | R1             |                      | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>3000                  | 3600 (note 2)                  |                     |              | -40 to +55°C        |
|           | Sensing width 11mm<br>W4.2 x H31 x D13.5 | <b>Tough</b><br>FT-A11  | R2             |                      | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>3600 (note 2)<br>1100 | 1900 (note 2)<br>3600 (note 2) | 2.2 x 11            | IP40 (IEC)   | -40 to +70°C        |
|           | Sensing width 11mm<br>W4.2 x H31 x D13.5 | FT-A11W                 | R1             |                      | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>3600 (note 2)<br>1300 | 1700<br>3400                   |                     |              | -40 to +55°C        |
| Array     | Sensing width 5.5mm<br>W5 x H15 x D15    | <b>Tough</b><br>FT-AL05 | R2             | STD 860<br>HYPR 2300 | 1550<br>1500<br>50<br>170               | 250<br>660  | 0.25 x 5.5                     |                     | -55 to +80°C |                     |

#### Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range

### Reflective type



| Type      | Shape of fiber head (mm) | Model no.               | Bending radius | Fiber cable length | Sensing range (mm) (note 1, 2) |                         |               | Protection | Ambient temperature |
|-----------|--------------------------|-------------------------|----------------|--------------------|--------------------------------|-------------------------|---------------|------------|---------------------|
|           |                          |                         |                |                    | FX-500 series                  | U-LG LONG FAST H-SP     | FX-101 FX-102 |            |                     |
| Wide beam | W7 x H15 x D30           | <b>Tough</b><br>FD-A16  | R4             | 2m                 | STD 200<br>HYPR cannot use     | 200<br>200<br>140<br>75 | 120<br>240    | IP40 (IEC) | -40 to +60°C        |
| Array     | W5 x H20 x D20           | <b>Tough</b><br>FD-AL11 | R2             |                    | STD 320<br>HYPR 670            | 530<br>510<br>180<br>50 | 100<br>285    |            | -55 to +80°C        |

#### Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

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Laser Sensors

Safety Sensors

Pressure &  
Flow Sensors

Inductive  
Proximity  
Sensors

Measurement  
Sensors

Ionizers/  
Electrostatic  
Sensors

Accessories

Wide beam  
fibers

## Convergent reflective fibers for glass detection

### Reflective type



| Type                      | Shape of fiber head (mm)                     | Model no.               | Bending radius | Fiber cable length                  | Sensing range (mm) (note 1, 2)             |   |                      | Protection | Ambient temperature |
|---------------------------|--|-------------------------|----------------|-------------------------------------|--|---|----------------------|------------|---------------------|
|                           |  |                         |                |                                     | FX-500 series                              | U-LG LONG FAST H-SP                         | FX-101 FX-102        |            |                     |
| Glass substrate detection | Side sensing<br><br>W25 x H7.3 x D30         | FD-L32H                 | R4             | 4m                                  | STD<br>0 to 56<br>HYPR<br>0 to 110         | 0 to 87<br>0 to 74<br>1 to 38<br>Cannot use | 16 to 30<br>0 to 50  | IP40 (IEC) | -40 to +60°C        |
|                           | Long sensing range<br><br>W20 x H29 x D3.8   | <b>Tough</b><br>FD-L30A | R2             | 3m                                  | STD<br>0 to 43<br>HYPR<br>0 to 43          | 0 to 43<br>0 to 43<br>0 to 42<br>0 to 29    | 0 to 40<br>0 to 50   |            | 0 to +70°C          |
|                           | Long sensing range<br><br>W23.5 x H29 x D4.5 | <b>Tough</b><br>FD-L31A | R4             |                                     | STD<br>4 to 33<br>HYPR<br>3 to 35          | 4 to 33<br>4 to 33<br>4 to 32<br>5 to 25    | 5 to 30<br>4 to 33   |            | 0 to +70°C          |
|                           | Long sensing range<br><br>W17 x H29 x D3.8   | <b>Tough</b><br>FD-L22A | R2             | 2m                                  | STD<br>0 to 24<br>HYPR<br>0 to 31          | 0 to 28<br>0 to 27<br>0 to 24<br>0 to 18    | 0 to 19<br>0 to 25   |            | 0 to +70°C          |
|                           | Short sensing range<br><br>W18 x H29 x D3.8  | <b>Tough</b><br>FD-L23  |                | 3m                                  | STD<br>0 to 29<br>HYPR<br>0 to 30          | 0 to 30<br>0 to 30<br>0 to 28<br>1.5 to 24  | 0 to 28<br>0 to 30   |            | -20 to +70°C        |
|                           | Short sensing range<br><br>W12 x H19 x D3    | <b>Tough</b><br>FD-L11  | R4             | 2m                                  | STD<br>0 to 9.5<br>HYPR<br>0 to 11.5       | 0 to 10.5<br>0 to 10<br>0 to 9<br>0 to 8    | 0 to 8<br>0 to 9     |            | -40 to +60°C        |
|                           | Short sensing range<br><br>W12 x H19 x D3    | <b>Tough</b><br>FD-L10  |                |                                     | STD<br>0 to 5<br>HYPR<br>0 to 6            | 0 to 5.5<br>0 to 5.5<br>0 to 4.5<br>0 to 4  | 0 to 4.5<br>0 to 5.5 |            |                     |
|                           | Short sensing range<br><br>W24 x H21 x D4    | <b>Tough</b><br>FD-L21  |                |                                     | STD<br>1.5 to 16<br>HYPR<br>1 to 19        | 1 to 18<br>1 to 18<br>2 to 15<br>3 to 12    | 3 to 15<br>1.5 to 16 |            |                     |
|                           | Short sensing range<br><br>W24 x H21 x D4    | FD-L21W                 | R1             | STD<br>3 to 14<br>HYPR<br>1.5 to 15 | 2 to 15<br>2 to 15<br>4 to 14<br>6.5 to 10 | 7 to 12<br>3 to 14                          | -40 to +70°C         |            |                     |
|                           | Short sensing range<br><br>W6 x H18 x D14    | <b>Tough</b><br>FD-L20H | R2             | STD<br>23<br>HYPR<br>45             | 35<br>32<br>2 to 15<br>5 to 9              | 5 to 15<br>1 to 30                          |                      |            |                     |
| Ultra-small               | <br>W7.2 x H7.5 x D2                         | FD-L12W                 | R1             | 1m                                  | STD<br>8<br>HYPR<br>14                     | 12.5<br>12<br>0.5 to 7<br>0.5 to 4          | 1 to 4.5<br>0.5 to 7 | IP30 (IEC) | -40 to +60°C        |

Notes:

- The sensing range specified for transparent glass 100x100x0.7mm (FD-L32H: edge, FD-L21 and FD-L21W: 12mm), (FD-L20H: white non-glossy paper, FD-L10: silicon wafers 100x100x2mm)
- The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut

### Retroreflective type



| Type                        | Shape of fiber head (mm)                     | Model no.                | Bending radius | Fiber cable length | Sensing range (mm) (note 1, 2)           |  |                          | Protection | Ambient temperature |
|-----------------------------|--|--------------------------|----------------|--------------------|--|--|--------------------------|------------|---------------------|
|                             |  |                          |                |                    | FX-500 series                            | U-LG LONG FAST H-SP                                    | FX-101 FX-102            |            |                     |
| With polarizing filter      | W5.2 x H9.5 x D16<br><br>W30 x H30 x D0.5    | FR-Z50HW                 | R1             | 2m                 | STD<br>100 to 990<br>HYPR<br>100 to 1900 | 100 to 1400<br>100 to 1200<br>100 to 780<br>100 to 490 | 100 to 550<br>100 to 830 | IP40 (IEC) | -25 to +55°C        |
| Side sensing                | W7.5 x H2.2 x D11.2<br><br>W4 x H2 x D21.5   | <b>Tough</b><br>FR-KZ22E | R2             |                    | STD<br>15 to 310<br>HYPR<br>15 to 570    | 15 to 460<br>15 to 410<br>15 to 220<br>15 to 100       | 15 to 200<br>15 to 360   |            |                     |
| Narrow view<br>Top sensing  | W5.2 x H9.5 x D21<br><br>W10.6 x H28 x D10.1 | <b>Tough</b><br>FR-KZ50H |                |                    | STD<br>20 to 300<br>HYPR<br>20 to 1000   | 20 to 800<br>20 to 400<br>20 to 200<br>20 to 200       | 20 to 200<br>20 to 350   |            |                     |
| Narrow view<br>Side sensing | W9.5 x H25 x D5.2<br><br>W28 x H10.6 x D10.1 | <b>Tough</b><br>FR-KZ50E |                |                    |  |  |                          |            |                     |

Notes:

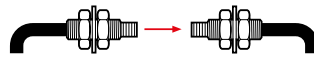
- The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- The sensing range is specified for the reflector

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)



# Heat-resistant fibers

## Thru-beam type (one pair set)



| Type                   | Temperature | Shape of fiber head (mm)           | Model no.              | Bending radius              | Fiber cable length | Sensing range (mm) (note 1)   |                            |               | Beam axis dia. (mm) | Ambient temperature |
|------------------------|-------------|------------------------------------|------------------------|-----------------------------|--------------------|-------------------------------|----------------------------|---------------|---------------------|---------------------|
|                        |             |                                    |                        |                             |                    | FX-500 series                 | U-LG LONG FAST H-SP        | FX-101 FX-102 |                     |                     |
| Heat-resistant fiber   | 350°C       | Lens mountable: FX-LE1/LE2/SV1<br> | FT-H35-M2              | R25                         | 2m                 | STD 430<br>HYPR 1200          | 880<br>670<br>250<br>80    | 170<br>490    | ø1.2                | -60 to +350°C       |
|                        | 200°C       | Lens mountable: FX-LE1/LE2/SV1<br> | FT-H20W-M1             | R10                         | 1m                 | STD 470<br>HYPR (note 2) 1600 | 1,000<br>840<br>300<br>90  | 100<br>300    | ø0.8                | -60 to +200°C       |
|                        | 130°C       | Lens mountable: FX-LE2<br>         | FT-H13-FM2             | R25                         | 2m                 | STD 700<br>HYPR 3300          | 1900<br>1300<br>410<br>140 | 250<br>700    | ø1.5                | -60 to +130°C       |
| Heat-resistant (joint) | 200°C       | Lens mountable: FX-LE1/LE2/SV1<br> | FT-H20-J20-S (note 5)  | Heat resistant R18 (note 4) | 200mm (note 3)     | STD 470<br>HYPR 1600          | 1000<br>790<br>300<br>90   | 135<br>420    | ø1.2                | -60 to +200°C       |
|                        |             | Lens mountable: FX-LE1/LE2/SV1<br> | FT-H20-J30-S (note 5)  |                             | 300mm (note 3)     |                               |                            |               |                     |                     |
|                        |             | Lens mountable: FX-LE1/LE2/SV1<br> | FT-H20-J50-S (note 5)  |                             | 500mm (note 3)     |                               |                            |               |                     |                     |
|                        |             | Side sensing<br>                   | FT-H20-VJ50-S (note 5) |                             | 800mm (note 3)     |                               |                            |               |                     |                     |
|                        |             | Side sensing<br>                   | FT-H20-VJ80-S (note 5) |                             |                    |                               |                            |               |                     |                     |

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
  - 2.) The length of the fiber cable affects the sensing range
  - 3.) The fiber length of the heat-resistant side cannot be cut
  - 4.) Bending radius R=25mm or more
  - 5.) Heat-resistant side and ordinary temperature fiber are sold together as a set

## Reflective type



| Type                 | Temperature                                     | Shape of fiber head (mm) | Model no.  | Bending radius | Fiber cable length | Sensing range (mm) (note 1, 2) |                               |  | Ambient temperature |  |
|----------------------|---|--------------------------|------------|----------------|--------------------|--------------------------------|-------------------------------|--|---------------------|--|
|                      |   |                          |            |                |                    | FX-500 series                  | U-LG LONG FAST H-SP           | FX-101 FX-102                                |                     |  |
| Heat-resistant fiber | Threaded  | Coaxial M6<br>           | FD-H35-M2  | R25            | 2m                 | STD 260<br>HYPR 720            | 540<br>460<br>150<br>45       | 75<br>280                                    | -60 to +350°C       |  |
|                      |   | Coaxial M6<br>           | FD-H20-M1  |                | 1m                 | STD 330<br>HYPR 840            | 550<br>500<br>200<br>55       | 120<br>300                                   | -60 to +200°C       |  |
|                      |   | Coaxial M6<br>           | FD-H13-FM2 |                | 2m                 | STD 350<br>HYPR 880            | 640<br>600<br>200<br>65       | 100<br>280                                   | -60 to +130°C       |  |
|                      | Glass substrate detection convergent reflective | 300°C                    |            |                | FD-H30-L32         | 2m                             | STD 17<br>HYPR 40             | 30<br>25<br>12<br>1.5 to 6                   | 2 to 9<br>0 to 17   | -60 to +300°C                                |
|                      |   | 250°C                    |            |                | FD-H25-L45         | 3m                             | STD 5 to 42<br>HYPR 4 to 43.5 | 4 to 43<br>4.5 to 43<br>5 to 40<br>6.5 to 34 | 7 to 35<br>7 to 38  | (-20 to +250°C Standard fibers -20 to +70°C) |
|                      |   | 180°C                    |            |                | FD-H18-L31         | 2m                             | STD 16<br>HYPR 60             | 32<br>24<br>13<br>2 to 6.5                   | 0 to 10<br>0 to 25  | -60 to +180°C                                |

- Notes:
- 1.) The sensing range is specified for white, matt paper (50x50mm, glass substrate: FD-H30-L32, FD-H18-L31, clear glass 100x100x0.7mm: FD-H25-L43 and FD-H25-L45)
  - 2.) The length of the fiber cable affects the sensing range

IO-Link Sensors

Photoelectric Sensors

Fiber-optic Sensors

Standard Fibers

Fiber Sensors Communication Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure & Flow Sensors

Inductive Proximity Sensors

Measurement Sensors

Ionizers / Electrostatic Sensors

Accessories

Heat-resistant fibers

### Chemical-resistant fibers

#### Thru-beam type (one pair set)



| Type                                 | Shape of fiber head (mm)                                       | Model no.                                  | Bending radius | Fiber cable length | Sensing range (mm) (note 1)             |   |                | Beam axis dia. (mm) | Protection    | Ambient temperature |
|--------------------------------------|--|--|----------------|--------------------|---|---|----------------|---------------------|---------------|---------------------|
|                                      |  |  |                |                    | FX-500 series                           | U-LG LONG FAST H-SP                           | FX-101 FX-102  |                     |               |                     |
| Oil-resistant Square head M4         | Cable-protection type<br>Compatible with lens<br>W7xH9.5xD15.5 | FT-R44Y                                    | R4             | 2m                 | STD 720<br>HYPR 3000                    | 1600<br>1100<br>430<br>130                    | 210<br>640     | ø1                  | IP67 (note 4) | -55 bis +80°C       |
|                                      | Side sensing<br>W10xH11xD21,2                                  | FT-R60Y                                    |                |                    | STD 2100<br>HYPR (note 2) 3600          | 3600<br>3600<br>1.260<br>400                  | 690<br>1.890   | ø3,5                |               |                     |
| Chemical-resistant Flat              | SEMI W7 x H15 x D13<br>  | FT-Z802Y                                   | R25            |                    | STD 3100<br>HYPR (note 2) 3600          | 3600 (note 2)<br>3600 (note 2)<br>1900<br>470 | 520<br>3100    |                     | IP68G         | 0 to +60°C          |
|                                      | Heat-resistant 115°C<br>ø5.5 (25)                              | FT-HL80Y                                   | R30            | 2m (note 3)        | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>2300<br>740 | 990<br>2340    | ø3.7                |               | -40 to +115°C       |
|                                      | ø5.5 (25)  | FT-L80Y                                    |                |                    | STD (note 2) 3600<br>HYPR (note 2) 3600 | 3600 (note 2)<br>3600 (note 2)<br>2800<br>920 | 1.100<br>2.600 |                     |               |                     |
| Side sensing metal free<br>ø5.5 (25) | FT-V80Y  | STD 1300<br>HYPR 800<br>HYPR (note 2) 3600 |                |                    | 2800<br>2200<br>800<br>240              | 340<br>800                                    | ø2.8           |                     | -40 to +70°C  |                     |

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range
- 3.) The allowable cutting range is 500mm from the end inserted at the amplifier
- 4.) The fiber is oil-resistant

### Vacuum-resistant fibers

#### Thru-beam type (one pair set)



| Type                            | Shape of fiber head (mm)                     | Model no.           | Bending radius | Fiber cable length | Sensing range (mm)  |                         |               | Beam axis dia. (mm) | Ambient temperature |
|---------------------------------|--|---------------------|----------------|--------------------|---------------------|-------------------------|---------------|---------------------|---------------------|
|                                 |  |                     |                |                    | FX-500 series       | U-LG LONG FAST H-SP     | FX-101 FX-102 |                     |                     |
| Vacuum-resistant Thru-beam type | 300°C<br>Lens mountable: FV-LE1/SV2<br>M4 30 | FT-H30-M1V-S (note) | R18            | 1m                 | STD 27<br>HYPR 1000 | 590<br>470<br>160<br>55 | 110<br>280    | ø1.2                | -30 to +300°C       |

Note: Sold as a set comprising vacuum type fiber and photo-terminal (FV-BR1)

#### Reflective type

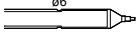

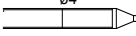

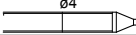
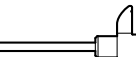




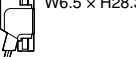
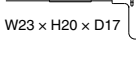


| Type                             | Shape of fiber head (mm)                           | Model no.              | Bending radius | Fiber cable length | Sensing range (mm) (note 2)    |   |                       | Ambient temperature |
|----------------------------------|--|------------------------|----------------|--------------------|--------------------------------|---|-----------------------|---------------------|
|                                  |  |                        |                |                    | FX-500 series                  | U-LG LONG FAST H-SP                             | FX-101 FX-102         |                     |
| Vacuum-resistant Reflective type | 300°C<br>W9.5 x H5.2 x D15                         | FD-H30-KZ1V-S (note 1) | R18            | 1m                 | STD 20 to 200<br>HYPR 5 to 500 | 10 to 340<br>15 to 270<br>20 to 120<br>20 to 45 | 25 to 80<br>10 to 220 | -30 to +300°C       |
|                                  | 300°C, Glass substrate detection<br>W19 x H5 x D27 | FD-H30-L32V-S (note 1) |                | 3m                 | STD 8<br>HYPR 18               | 12<br>10<br>5,5<br>1.5 to 3                     | 2.5 to 6.5<br>0 to 11 |                     |

Notes:

- 1.) Sold as a set comprising vacuum type fiber and photo-terminal (FV-BR1)
- 2.) The sensing range is specified for transparent glass 100x100x0.7mm

## Fibers for liquid leak/liquid detection

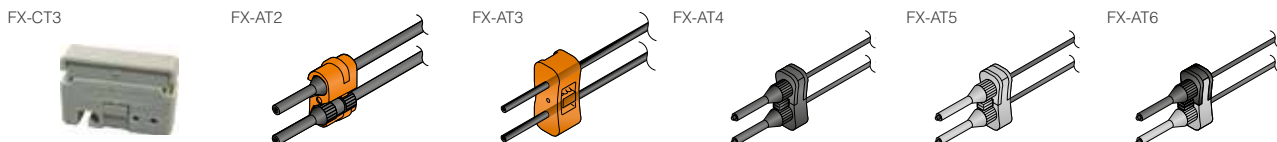
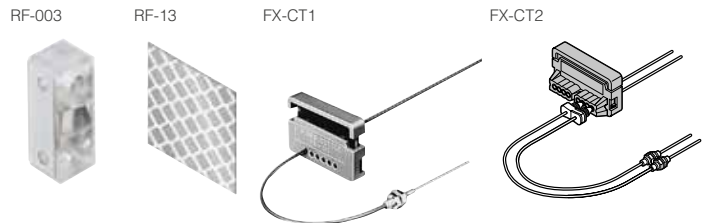
| Type  | Shape of fiber head (mm)   | Model no.  | Bending radius   | Fiber cable length  | Description  | Protection | Ambient temperature |
|---|--|--|--|---|--|------------|---------------------|
| Contact type  | Liquid level sensing<br>Heat resistant 125°C Fluorine resin coating<br> | FD-F8Y   | Protective tube R40<br>Standard fibers R15   |  2m (note) | ø6mm<br>Protective tube: Fluorine resin, Length 1m (not cuttable)<br>Liquid surface not contacted: beam received<br>Liquid surface contacted: no beam received   | IP68 (IEC) | -40 to +125°C       |
|   | Liquid level sensing<br>Heat resistant 105°C Fluorine resin coating<br> | FD-HF40Y   | Protective tube R20<br>Standard fibers   |  2m        | ø4mm<br>Protective tube: Fluorine resin, Length 500mm (not cuttable)<br>Liquid surface not contacted: beam received<br>Liquid surface contacted: no beam received  | IP67 (IEC) | -40 to +105°C       |
|   | Liquid level sensing<br>Heat resistant 70°C Fluorine resin coating<br>  | FD-F41Y  | <b>R10</b>   |   |  |            | -40 to +70°C        |
| Liquid leak detection<br>                          | SEMI S2<br>W20xH30xD10   | <b>Tough</b><br>FD-F71                           | Protective tube R20<br>Standard fibers <b>R4</b>   |  5m        | Liquid leak detection<br>Leak absent: beam received<br>Leak present: no beam received  |            | -20 to +60°C        |
| Pipe-mountable type   | Liquid level sensing<br>Default<br>                                    | FD-F41   | <b>R10</b>   |  2m      | Applicable pipe diameter: Outer dia.: ø6mm to ø26mm<br>Material: transparent pipe, PFA (fluorine resin, polycarbonate, acrylic, glass)<br>Wall thickness: 1 to 3mm<br>Liquid absent: beam received<br>Liquid present: no beam received | -          | -40 to +100°C       |
|   | Liquid level sensing<br>For wall thickness 1mm<br>                    | FD-F4  |  |   | Applicable pipe diameter: Outer dia.: ø6mm to ø26mm<br>Material: transparent pipe, PFA (fluorine resin).<br>Wall thickness: 1mm. Liquid absent: beam received<br>Liquid present: no beam received                                      |            |                     |
|   | Liquid sensing<br>Mountable on pipe<br>W6.5 x H28.3 x D17<br>         | <b>Tough</b><br>FD-FA93                          | <b>R4</b>  |   | Applicable pipe diameter: Outer dia.: ø8mm or more<br>(When used with the tying bands: ø8mm to ø80mm)<br>Material: transparent pipe, PFA (fluorine resin).<br>Liquid absent: beam received<br>Liquid present: no beam received         |            |                     |
| Liquid sensing<br>SEMI S2<br>W23 x H20 x D17<br> | <b>Tough</b><br>FT-F93   | Protective tube R20<br>Standard fibers <b>R2</b> | Applicable pipe diameter: Outer dia.: ø3mm to ø10mm<br>Material: transparent pipe, PFA (fluorine resin).<br>Wall thickness: 0.3 to 1mm<br>Liquid absent: beam received<br>Liquid present: no beam received | -40 to +60°C  |  |            |                     |

Note: The allowable cutting range is 500mm from the end inserted at the amplifier

**Tough** High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

## Accessories

- RF-003 (Reflector for FR-KZ21/KZ21E)
- RF-13 (Reflective tape for reflective type)
- FX-CT1 (Fiber cutter)
- FX-CT2 (Fiber cutter)
- FX-CT3 (Fiber cutter)
- FX-AT2 (Attachment for fixed-length fiber, Orange)
- FX-AT3 (Attachment for ø2.2mm fiber, Clear orange)
- FX-AT4 (Attachment for ø1mm fiber, Black)
- FX-AT5 (Attachment for ø1.3mm fiber, Gray)
- FX-AT6 (Attachment for ø1mm / ø1.3mm fiber, Black/Gray)



10-Link Sensors

Photoelectric Sensors

Fiber-optic Sensors

Standard Fibers

Fiber Sensors Communication Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure & Flow Sensors

Inductive Proximity Sensors

Measurement Sensors


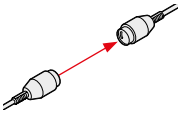



Ionizers / Electrostatic Sensors

Accessories

Fibers for liquid leak detection

## Lens


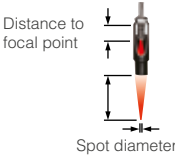
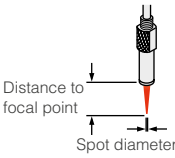
### Thru-beam type fiber

| Model no. | Picture   | Description  | Applicable fibers   |
|-----------|---|--|---|
| FX-LE1    |    | Expansion lens<br>increases the sensing range by 5 times or more,<br>ambient temperature: -60 to +350°C (note 1, 2)                  | <b>FT-43, FT-42, FT-42W, FT-45X, FT-R40, FT-R43,<br/>FT-H35-M2, FT-H20W-M1, FT-H20-M1, FT-H20-J50-S,<br/>FT-H20-J30-S, FT-H20-J20-S</b> |
| FX-LE2    |    | Expansion lens<br>increases the sensing range by 6 times or more,<br>ambient temperature: -60 to +350°C (note 1, 2)                  |   |
| FX-SV1    |    | Side-view lens, beam axis is bent by 90°,<br>ambient temperature:<br>-60 to +300°C (note 1, 2)                                       |   |
| FV-LE1    |    | Expansion lens for vacuum fiber<br>increases the sensing range by 4 times or more,<br>ambient temperature: -60 to +350°C (note 1, 2) | <b>FT-H30-M1V-S</b>   |
| FV-SV2    |  | Vacuum resistant side-view lens, beam axis is bent by 90°,<br>ambient temperature: -60 to +300°C (note 1, 2)                         |   |

#### Notes:

- 1.) Consider the ambient temperature of the fibers to be used in combination
- 2.) Please test the functionality after mounting the lenses

### Reflective type fiber

| Model no. | Picture   | Description  | Applicable fibers   |
|-----------|---|--|---|
| FX-MR1    |  | Pinpoint spot lens, distance to focal point 6±1mm,<br>spot diameter Ø 0.5mm,<br>ambient temperature -40 to +70°C (note 1, 2)   | <b>FD-42G, FD-42GW</b>                                    |
| FX-MR2    |  | Zoom lens, screw-in depth (7-14mm),<br>distance to focal point (18.5- 43mm),<br>spot diameter Ø 0.7-2mm,<br>ambient temperature: -40 to +60°C (note 1, 2)  |   |
| FX-MR3    |  | Extremely fine spot, distance to focal point: 7.5±0.5mm,<br>spot diameter: <b>FD-EG31</b> Ø 0.15mm/ <b>FD-EG30</b> Ø 0.3mm/<br><b>FD-42G, FD-42WG, FD-32G, FD-32GX</b> Ø 0.5,<br>ambient temperature: -40 to +70°C (note 1, 2) | <b>FD-EG31, FD-EG30, FD-42G, FD-42GW, FD-32G, FD-32GX</b> |

#### Notes:

- 1.) Consider the ambient temperature of the fibers to be used in combination
- 2.) Please test the functionality after mounting the lenses



# Communication units

Communications units for flexible solutions

## Functions

### Function handy for startup and maintenance

Using a PLC or PC, this communication unit not only facilitates inputs (teaching, bank switching) to a digital fiber sensor e.g. FX-301(P), but also received-light amount and output status verifications greatly enhance workability during startup and maintenance.

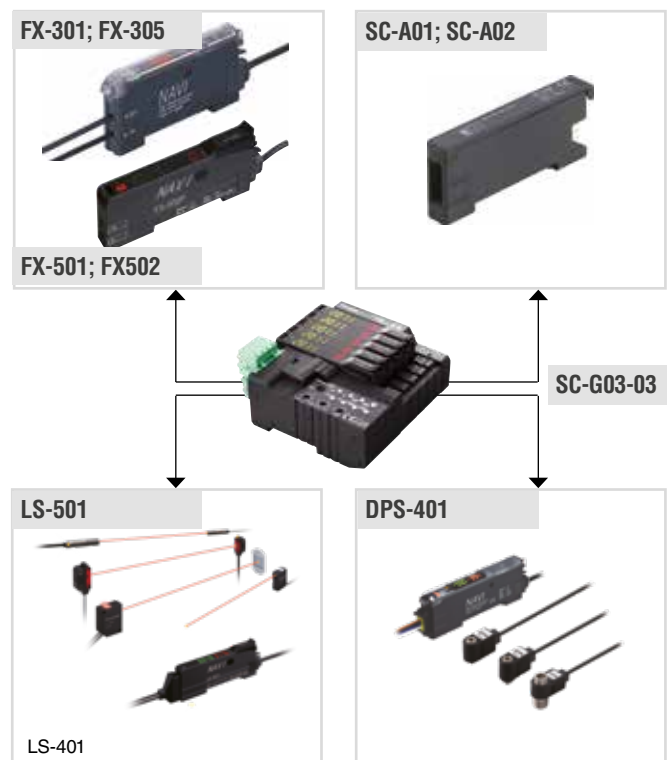
### Intuitive integration at the controller level

Rapid integration at the controller level enables reliable monitoring, remote maintenance or remote control via open networks. Several units can be configured with minimal wiring efforts. Data can be saved centrally, where it can be archived or used for evaluation purposes.



### Combining different units

The ability to combine different sensor types, e.g. laser sensors, pressure sensors or digital fiber-optic sensors, opens up many application areas, especially for special purpose machinery manufacture. The sensors themselves communicate with each other via an infrared interface.



- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories



# LX-100

Introducing the 3-LED mark sensor

## Functions

### ■ Equipped with 3 LEDs: red, green and blue

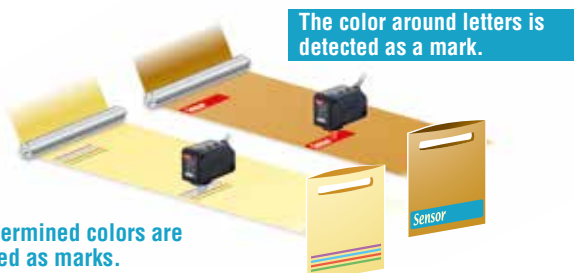
To detect any marking, this sensor is equipped with red, green and blue LED light emitting elements all in one. In addition, it uses a coaxial reflective optics system and realizes high precision sensing when used with a 1/4000 resolution 12-bit A/D converter.



### ■ 2 selectable sensing modes for any application

**Mark mode:** This sensing mode automatically selects a single color from the 3 R-G-B LEDs to realize an ultra quick 45μs response time. The automatic optimal LED selection function automatically selects the LED that is most suitable for the sensing. This function is perfect for ultra quick sensing.

**Color mode:** All 3 R-G-B LEDs light up and high precision mark color discrimination occurs using the R-G-B reflective light ratio. This function enables effective detection of films with patterns around the areas of the mark.



Predetermined colors are detected as marks.

### ■ Even beginners can quickly master MODE NAVI operation

The sensor's basic operations are represented by 6 indicator lamps (MODE NAVI). The user can check what mode the sensor is presently in with a quick glance rendering operation simple.

#### Sensing status digitally controllable

The sensing status, displayed numerically, can be verified at a glance. Also, the sensor settings for each type of packing film can be digitally indicated.

#### Direct codes enable settings verification at a glance

The settings for the LX-100 series sensors are displayed using a 4-digit direct code. Direct codes enable easy settings verification and maintenance by phone.

#### Super simple teaching

Teaching (setting the threshold value) is simple, even in "Mark Mode" or "Color Mode". In addition, because teaching via an operation panel or other external input device is also possible, models can be easily interchanged.

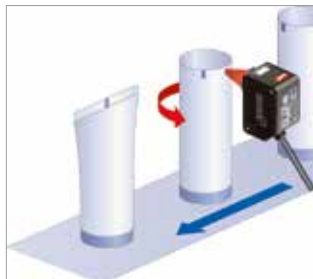
#### Compact design for significant space savings

Cable and plug-in connector types are available depending on the equipment used. These sensors can be easily integrated into already existing systems.

## Typical applications

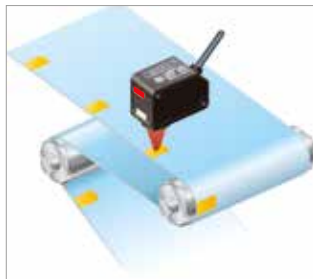
### Tube positioning

Detects printed marks to align tubes.



### Mark detection

Mark detection of packaging film.



## Technical specifications

| Type                | Cable   | M12 plug-in connector type                                  |
|---------------------|---|---|
| Model no.           | NPN output  | LX-101  |
|                     | PNP output  | LX-101-P  |
| Sensing range       | 10±3mm  |   |
| Power supply        | 12 to 24VDC ±10%  |   |
| Output              | 2 x NPN or 2 x PNP<br>open-collector transistor; max. 50mA  | 1 x NPN or 1 x PNP<br>open-collector transistor; max. 100mA |
| Output operation    | Mark mode: Light-ON/Dark-ON (auto-setting on teaching)<br>Color mode: Consistent-ON/Inconsistent-ON (setting on teaching) |   |
| Response time       | Mark mode: max. 45µs; color mode: max. 150µs  |   |
| Sensitivity setting | Mark mode: 2-level teaching/Limit teaching;<br>Color mode: 1-level teaching   |   |
| Protection          | IP67 (IEC)  |   |
| Ambient temperature | -10 to +55°C  |   |
| Emitting element    | Combined red/green/blue LED<br>(Peak emission wave length: 640nm/525nm/470nm)   |   |
| Connection method   | Cable 2m  | M12 connector (note 2)                                      |
| Dimensions (HxWxD)  | 35×24×57mm  | 35×24×71.5mm  |
| Accessories         | M4 screws with washers, 2 pcs.  |   |

#### Notes:

- 1.) Suffix -Z=M12 connector type
- 2.) Cable is not included in delivery. Please select under accessories (page 129)

IO-Link  
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SensorsFiber-optic  
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Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

EX-L200



# EX-L200

Miniature laser sensor with  
a built-in amplifier!

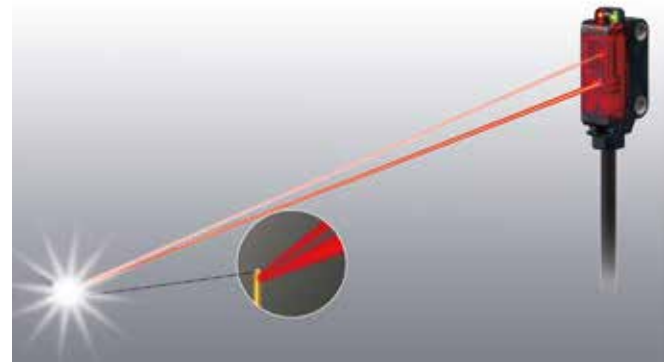
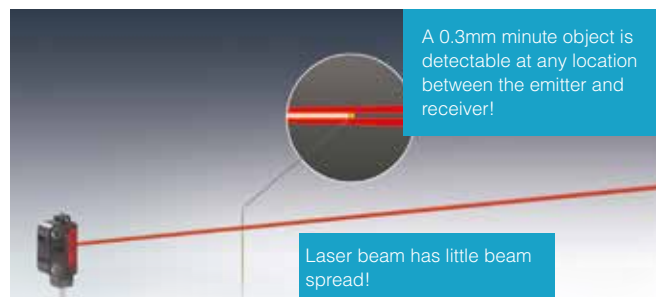
## Features

### ■ Minute object sensing type EX-L211 (thru-beam)

The beam of the **EX-L200** series is purposely widened to have a lower beam density and little beam spread so that when detecting minute objects, even a slight change in the light received intensity will not be missed.

### ■ Minute detection (reflective)

With a repeatability of 0.02mm the sensor is perfectly suited for positioning tasks.



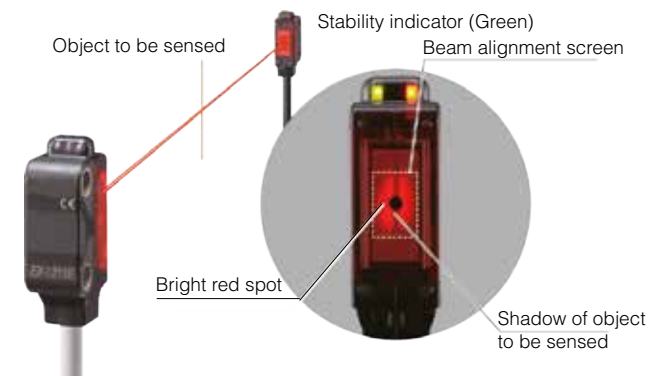
### ■ Environmental resistance

Thanks to the IP67 casing, the sensor is suitable for installation in humid and dusty environments.



### ■ Easy alignment

Beam alignment is carried out by looking at the red spot reflected on the beam alignment screen to match with the actual object. The optimum position can be understood at a glance by looking at the beam alignment screen and stability indicator (green).

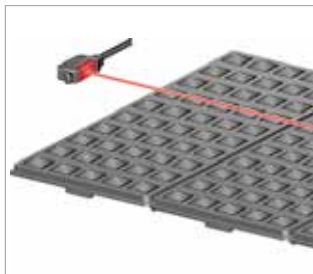


Easy adjustment by reflecting the shadow of the detection object.



## Typical applications

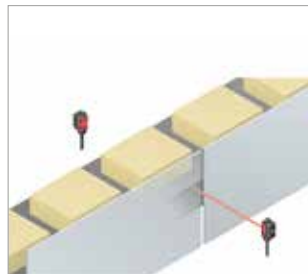
Detecting ICs that are out of position in multiple palettes



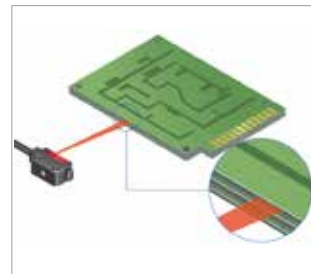
Detecting the tip of a very thin pipe



Detecting objects from an opening



Detecting very small objects



## Technical specifications

| Type                 |            | Thru-beam type                                      |                | Retro reflective type                                   | Diffuse reflective type |  |  |
|----------------------|------------|---|----------------|---|-------------------------|--|--|
|                      |            |   |                |   | Spot reflective         | Convergent reflective spot             | Convergent reflective line spot        |
| Model no.            | NPN output | EX-L211   | EX-L212        | EX-L291   | EX-L221                 | EX-L261                                | EX-L262                                |
|                      | PNP output | EX-L211P  | EX-L212P       | EX-L291P  | EX-L221P                | EX-L261P                               | EX-L262P                               |
| Sensing range        |            | 1m  | 3m             | 4m  | 45 to 300mm             | 20 to 50mm                             | 20 to 70mm                             |
| Emission spot size   |            | 6x4mm at 1m   | 8x5.5mm at 1m  | 6x4mm at 1m   | Ø 1mm at 300mm          | Ø 1mm at 50mm (convergent point: 22mm) | 1x5mm at 50mm (convergent point: 22mm) |
| Object to be sensed  |            | Ø 2mm (opaque)                                      | Ø 3mm (opaque) | Ø 25mm (opaque)   | Opaque, transparent     |  |  |
| Power supply voltage |            | 12 to 24V DC ±10%                                   |                |   |                         |  |  |
| Output               |            | PNP / NPN open-collector transistor, max. 50mA      |                |   |                         |  |  |
| Response time        |            | Max. 0.5ms  |                |   |                         |  |  |
| Emitting element     |            | Red semiconductor laser (class 1)                   |                |   |                         |  |  |
| Protection           |            | IP67 (IEC)  |                |   |                         |  |  |
| Ambient temperature  |            | -10 to +55°C  |                |   |                         |  |  |
| Material             |            | Enclosure: PBT, front cover: acrylic; lenses: glass |                |   |                         |  |  |
| Connection method    |            | Cable, 2m   |                |   |                         |  |  |
| Dimensions (HxWxD)   |            | 25.9x 8.2x12mm                                      |                | 29.9x8.2x13mm   |                         | 29.9x8.2x13.5mm                        |  |
| Accessories          |            | Mounting plates <b>MS-EXL2-2</b> 2 pcs.             |                | Reflector RF330, mounting plate <b>MS-EX-L2-3</b> 1 pc. |                         | Mounting plate <b>MS-EX-L2-3</b> 1 pc. |  |

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Measurement Sensors

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Accessories

EX-L200

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Sensors

Accessories

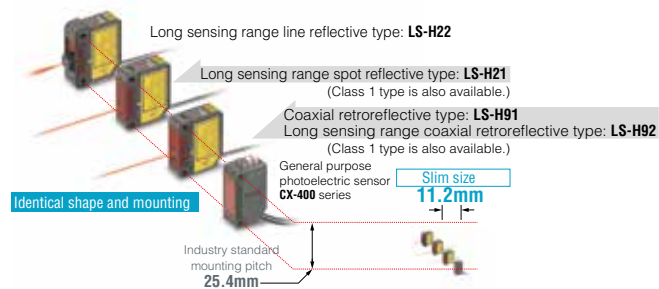
LS-400



## Features

### ■ 4 types of identically sized sensor heads available

They are approximately the same size as general purpose photoelectric sensors, and the mounting method is identical.



### ■ Coaxial reflective type with a long sensing range of 30m

The introduction of the LS-H92 long sensing range coaxial reflective type sensor means that even longer sensing ranges are now possible.

### ■ Spot size adjustment

The long sensing range spot reflective type and long sensing range line reflective type have a built-in spot-size adjuster that enables spot size adjustment according to the object for optimal setting.



# LS-400

User-friendly, advanced high precision laser sensing!

### ■ Accurately senses the minutest variations

When sensing at close range or when the target objects are transparent or minute, adjust the sensor receiving sensitivity to one of 3 levels for the optimal setting. In addition, changing the receiving sensitivity will not affect the response time.

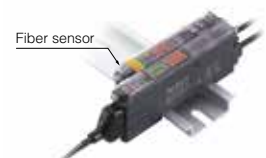
### ■ Easy setting, dual display

Equipped with 2 large 4-digit digital displays. While checking the current light-receiving amount (red display), the optimal threshold value (green display) can be set easily.



### ■ Wiring and space savings

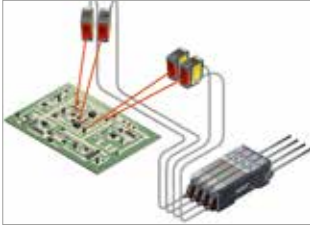
The quick-connection cables enable reductions in wiring (connector type). The connections and man hours for the intermediate terminal block setup can be reduced and valuable space saved. Also **LS-400** series amplifiers can be connected side-by-side with **FX-300/FX-500** series fiber sensors.



## Typical applications

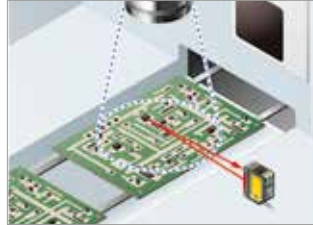
### Interference prevention

The automatic interference prevention function protects against interference among up to 4 sensors.



### Emission halt function

Using the emission halt function, the laser beam can be stopped via external input, e.g. when a spot appears within the visual range of an image processor.

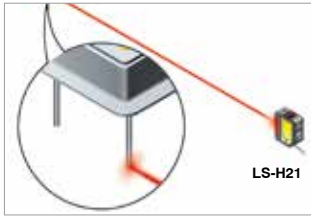


### External teaching function

Teaching can be conveniently performed externally for laser sensors installed inside a device.



### IC pin check from remote position



### Checking protrusion of glass substrate



## Technical specifications

### Sensor heads

| Type                | Coaxial retroreflective  |   | Diffuse reflective   |  |
|---------------------|--|---|--|--|
|                     | Standard   | Long sensing range type   | Long sensing range spot-reflective                                   | Long sensing range line reflective   |
| Model no. (note 1)  | LS-H91(F) (-A) (note 2)  | LS-H92(F)   | LS-H21(F) (-A) (note 2)  | LS-H22(F) (note 3)   |
| Sensing range       | 0.1 to 7m (U-LG)<br>0.1 to 5m (STD)<br>0.1 to 3m (FAST/H-SP)                           | 0.2 to 30m (U-LG)<br>0.2 to 20m (STD)<br>0.2 to 10m (FAST/H-SP) | 30 to 1.000mm (U-LG)<br>30 to 500mm (STD)<br>30 to 300mm (FAST/H-SP) | 30 to 1.000mm (U-LG)<br>30 to 500mm (STD)<br>30 to 300mm (FAST/H-SP)                   |
| Ambient temperature | -10 to +55°C   |   |  |  |
| Emitting element    | Red semiconductor laser, <b>LS-H□</b> : Laser class 2, <b>LS-H□-A</b> : Laser class 1, |   |  |  |
| Dimensions (W×H×D)  | 11.2×31×25mm   |   |  |  |
| Accessories         | Reflector <b>RF-330</b> 1 pc., warning label (English) 1 pc.                           | Reflector <b>RF-230</b> 1 pc., warning label (English) 1 pc.    | Warning label (English) 1 pc.  | <b>LS-MR1</b> Lens attachment for line reflective 1 pc., warning label (English) 1 pc. |

#### Notes:

- 1.) **LS-Hx** conforms to IEC/JIS/GB standards  
**LS-HxF** conforms to FDA/IEC/JIS standards
- 2.) **LS-H91(F)-A**, **LS-H21(F)-A**: Class 1 type
- 3.) **LS-H22(F)** = **LS-H21(F)** with the **LS-MR1** lens attachment for line reflective type

### Amplifiers

| Type                                       | Connector type (note)   | Cable type |
|--|---|------------|
| Model no.                                  | NPN output  | LS-401     |
|  | PNP output  | LS-401P    |
| Power supply voltage                       | 12 to 24VDC ±10%  |            |
| Output                                     | PNP / NPN open-collector transistor, max. 100mA   |            |
| Output operation                           | Selectable either Light-ON or Dark-ON, with jog switch  |            |
| Response time                              | max. 80μs (H-SP), max. max. 150μs (FAST), max. 500μs (STD), max. 4ms (U-LG), selectable with jog switch                                       |            |
| Digital display                            | 4 digit (green) and 4 digit (red) LED display   |            |
| Automatic interference prevention function | Incorporated (up to four sets of sensor heads can be mounted close together; however disabled when in H-SP mode)                              |            |
| Ambient temperature                        | -10 to +55°C<br>(If 4 to 7 sensors are mounted close together: -10 to +50°C)<br>(If 8 to 16 sensors are mounted close together: -10 to +45°C) |            |
| Connection method                          | Connector (note)  | Cable, 2m  |
| Dimensions (W×H×D)                         | 10×30×75mm  |            |

**Note:** The cable for amplifier connection is not supplied as an accessory with the connector type amplifier. Please select under accessories (page 129)

IO-Link  
Sensors

Photoelectric  
Sensors

Fiber-optic  
Sensors

Standard Fibers

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Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow Sensors

Inductive  
Proximity  
Sensors

Measurement  
Sensors

Ionizers/  
Electrostatic  
Sensors

Accessories

LS-400

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SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

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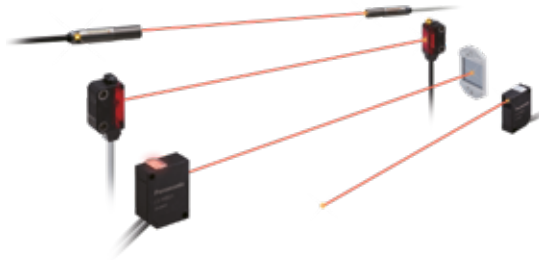
Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
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Electrostatic  
Sensors

Accessories

LS-500



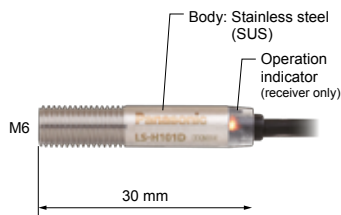
# LS-500

Miniature laser head with  
user-friendly amplifier

## Features

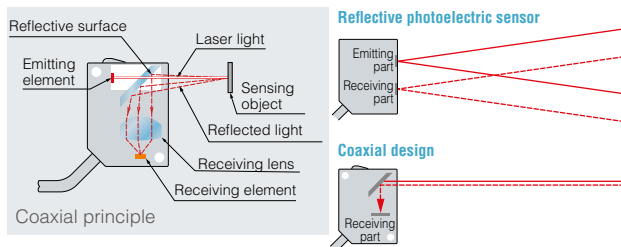
### ■ Different sensor heads available

The **LS-500** series of laser sensors offers four different laser heads. Select the appropriate shape of the heads depending on the requirements of your application.



### ■ Robust sensor head

The robust sensor head is made of stainless steel and can be used under rough mounting conditions. The type with M6 screws is mountable even in the smallest spaces. You can check immediately with the LED indicator at the receiver whether the light is received correctly.



### ■ Highest precision

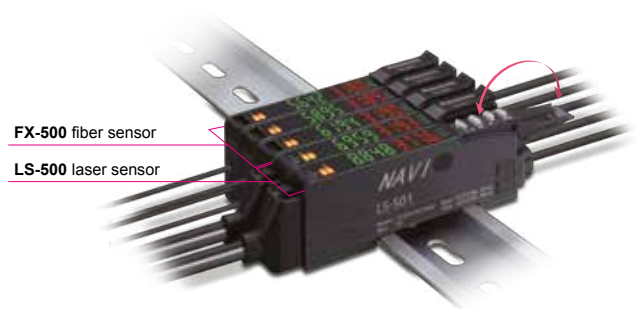
With the help of the coaxial precise light direction, the object sensing can be executed even through smallest openings. With a beam diameter of max. 6mm the retroreflective type has a sensing range of up to 2.5m.

### ■ Multifunctional amplifier

The LS-500 series amplifier with its clearly laid-out display offers a user-friendly design. The definition of settings, such as the adjustment of threshold values, database and logic functions, is quite simple. The model with the analog current output provides a comfortable reading out of measurement values.

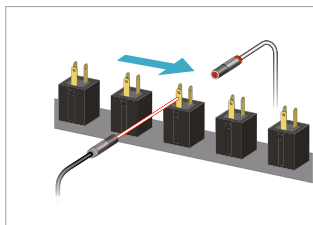
### ■ Easy to combine

Due to its design and the possibility to mount the sensor on a DIN rail, the LS-500 can be connected quickly and easily to other sensors such as fiber amplifiers or pressure sensors.

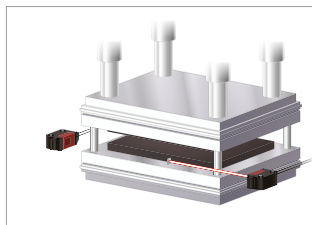


## Typical applications

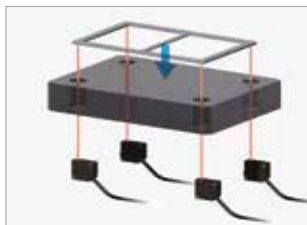
Position control of a workpiece



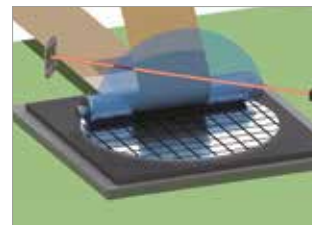
Detecting marks in a mold



Detecting workpieces through a worktop



Detection of a transparent foil



## Technical specifications

### ■ Sensor heads

| Type                       | Thru-beam   |  | Coaxial reflective type  | Coaxial retroreflective type  |
|----------------------------|---|--|--|---|
|                            | Cylindrical   | Rectangular  | —  | —   |
| Model no.                  | LS-H101   | LS-H102  | LS-H201  | LS-H901   |
|                            |  |  |  |  |
| Sensing range              | 1m  | 1m   | 600mm (U-LG), 300mm (STD), 150mm (H-SP)  | 0.01 to 2m (U-LG), 0.01-1m (STD), 0.01-1m (H-SP)                                      |
| Ambient temperature        | -10 to +55°C  |  |  |   |
| Emitting element           | Red semiconductor laser (laser class 1)   |  |  |   |
| Dimensions ( ØxD)/( HxWxD) | M6x30mm   | 8.2x26x12mm  | 6.4x24x18mm  |   |
| Accessories                | M6 screws, 4 pcs., washer, 2 pcs.   | MS-EXL2-2 (mounting plate) 2 pcs.  | MS-LS-1 (mounting bracket) 1 pc.   | MS-LS-1 (mounting bracket) 1 pc.<br>RF-330 (reflector) 1 pc.                          |

### ■ Amplifiers

| Type                                       |   | Connector type (note) | Cable type |
|--|---|-----------------------|------------|
| Model no.                                  | NPN output  | LS-501                | LS-501-C2  |
|  | PNP output  | LS-501P               | LS-501P-C2 |
| Supply voltage                             | 12 to 24V DC+10/-15%  |                       |            |
| Output                                     | PNP/NPN open-collector transistor, max. 50mA  |                       |            |
| Analog output                              | -   | 4 to 20mA             |            |
| Output operation                           | Selectable either Light-ON or Dark-ON   |                       |            |
| Response time                              | Max. 60µs (H-SP), 150µs (FAST), 250µs (STD), 500µs (LONG), 5ms (U-LG), 24ms (HYPR)  |                       |            |
| Digital display                            | 4 digit, dual LED display (green and red)   |                       |            |
| Automatic interference prevention function | Built-in (up to 4 sensors: STD, LONG, U-LG, H-SP; up to 2 sensors: FAST; 0 sensors: HYPR)   |                       |            |
| Ambient temperature                        | -10 to +55°C (if 4 to 7 units are mounted close together: -10 to +50°C, if 8 to 16 units are mounted close together: -10 to 45°C) |                       |            |
| Connection method                          | Connector (note)  | 2m cable              |            |
| Dimensions (HxWxD)                         | 10x32x77mm  |                       |            |

Note: Cable is not included in delivery. Please select under accessories (page 129)

IO-Link  
Sensors

Photoelectric  
Sensors

Fiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

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Inductive  
Proximity  
Sensors

Measurement  
Sensors

Ionizers/  
Electrostatic  
Sensors

Accessories

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Electrostatic  
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SF4D



# SF4D

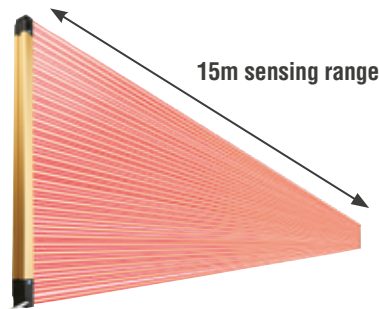
Typ 4 · PLe · SIL3

## Robust safety light curtain

### Features

#### ■ Easy installation of emitter and receiver thanks to improved optical properties

Thanks to a higher emission power, the **SF4D** not only works reliably on shorter distances, but also covers a longer sensing range up to 15m.



#### ■ Twisting- and bending-resistant design

The new interior design makes the safety light curtain more rigid and thus more robust. The SF4D does not bend or twist as easily when it comes into contact with other objects.



Resists twisting



Resists bending

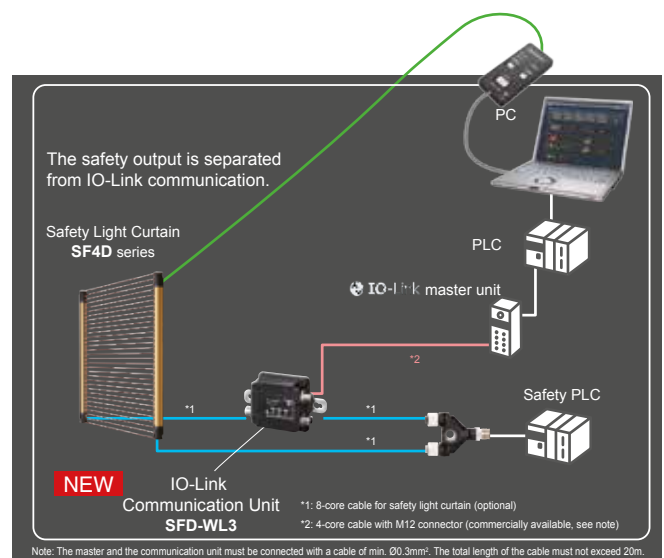


Resists shock

#### ■ Main functions

- › Operation monitoring
  - » Monitoring of the incident beam intensity and extraneous light
  - » I/O monitoring
- › Error history display
- › Light blockage history, unstable light incidence history
- › Muting setting function
- › Override setting function
- › Blanking setting function (both fixed and floating blanking)
- › External device monitoring setting function
- › Auxiliary output setting functions

Which functions are available depends on the synchronization method and the type of cables (5-core, 8-core, 12-core) used.





### ■ Finger protection type (min. object to be sensed $\varnothing$ 14mm, 10mm beam pitch)

| Model no. | Sensing range  | No. of beam axes | Protective height | Beam pitch |
|-----------|--|------------------|-------------------|------------|
| SF4D-F15  | 0 to 7m (short mode)<br>0 to 12m (long mode)<br>(selectable by DIP switch) | 15               | 150mm             | 10mm       |
| SF4D-F23  |  | 23               | 230mm             |            |
| SF4D-F31  |  | 31               | 310mm             |            |
| SF4D-F39  |  | 39               | 390mm             |            |
| SF4D-F47  |  | 47               | 470mm             |            |
| SF4D-F55  |  | 55               | 550mm             |            |
| SF4D-F63  |  | 63               | 630mm             |            |
| SF4D-F71  |  | 71               | 710mm             |            |
| SF4D-F79  |  | 79               | 790mm             |            |
| SF4D-F95  |  | 95               | 950mm             |            |
| SF4D-F111 |  | 111              | 1110mm            |            |
| SF4D-F127 |  | 127              | 1270mm            |            |

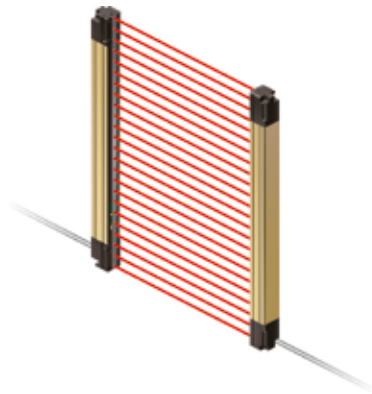
### ■ Hand protection type (min. object to be sensed $\varnothing$ 25mm, 20mm beam pitch)

| Model no. | Sensing range  | No. of beam axes | Protective height | Beam pitch |
|-----------|--|------------------|-------------------|------------|
| SF4D-H8   | 0 to 9m (short mode)<br>0 to 15m (long mode)<br>(selectable by DIP switch) | 8                | 150mm             | 20mm       |
| SF4D-H12  |  | 12               | 230mm             |            |
| SF4D-H16  |  | 16               | 310mm             |            |
| SF4D-H20  |  | 20               | 390mm             |            |
| SF4D-H24  |  | 24               | 470mm             |            |
| SF4D-H28  |  | 28               | 550mm             |            |
| SF4D-H32  |  | 32               | 630mm             |            |
| SF4D-H36  |  | 36               | 710mm             |            |
| SF4D-H40  |  | 40               | 790mm             |            |
| SF4D-H48  |  | 48               | 950mm             |            |
| SF4D-H56  |  | 56               | 1110mm            |            |
| SF4D-H64  |  | 64               | 1270mm            |            |
| SF4D-H72  |  | 72               | 1430mm            |            |
| SF4D-H80  |  | 80               | 1590mm            |            |
| SF4D-H88  |  | 88               | 1750mm            |            |
| SF4D-H96  |  | 96               | 1910mm            |            |

### ■ Arm / Foot protection type (min. object to be sensed $\varnothing$ 45mm, 40mm beam pitch)

| Model no. | Sensing range  | No. of beam axes | Protective height | Beam pitch |
|-----------|--|------------------|-------------------|------------|
| SF4D-A4   | 0 to 9m (short mode)<br>0 to 15m (long mode)<br>(selectable by DIP switch) | 4                | 150mm             | 40mm       |
| SF4D-A6   |  | 6                | 230mm             |            |
| SF4D-A8   |  | 8                | 310mm             |            |
| SF4D-A10  |  | 10               | 390mm             |            |
| SF4D-A12  |  | 12               | 470mm             |            |
| SF4D-A14  |  | 14               | 550mm             |            |
| SF4D-A16  |  | 16               | 630mm             |            |
| SF4D-A18  |  | 18               | 710mm             |            |
| SF4D-A20  |  | 20               | 790mm             |            |
| SF4D-A24  |  | 24               | 950mm             |            |
| SF4D-A28  |  | 28               | 1110mm            |            |
| SF4D-A32  |  | 32               | 1270mm            |            |
| SF4D-A36  |  | 36               | 1430mm            |            |
| SF4D-A40  |  | 40               | 1590mm            |            |
| SF4D-A44  |  | 44               | 1750mm            |            |
| SF4D-A48  |  | 48               | 1910mm            |            |





# SF4B (V2)

Type 4 · PLe · SIL3

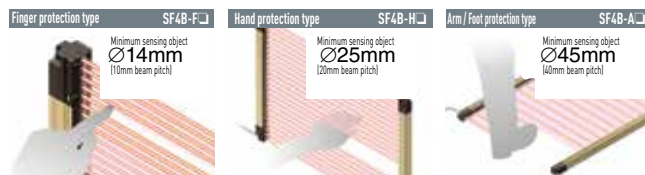
New concepts combining greater safety and higher productivity!

## Features

### ■ Sensor height = protective height

The length of the main unit equals the protective height so that installation is possible in places where space is limited. No blindzone occurs at the joints between light curtains when light curtains are connected in series.

### ■ Finger/hand and arm/foot protection available

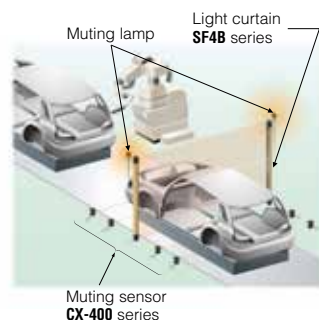


### ■ Response time of 14ms and constant safety distance

A fast response time of 14ms has been achieved regardless of the number of beam channels, the beam axis pitches and the number of units connected in series. This reduces calculation work required for the safety distances.

### ■ A muting control function is provided to increase both safety and productivity

The light curtain is equipped with a muting control function that causes the line to stop only when a person passes through the light curtain, not when an object passes through.



### ■ Built-in safety relay

The light curtain has a built-in external device monitoring (EDM) function and an interlock function. The safety circuit is constructed so that a separate safety relay unit is not needed, and the control board is also more compact, both of which contribute to lower costs.

### ■ Improved ambient light immunity

The integrated ELCA function (Extraneous Light Check & Avoid) prevents interference from ambient light or other light curtains and even from welding plants.

### ■ Digital error indicator

If an error occurs, details of the error appear on the digital display so that maintenance can be carried out more quickly.



### ■ Universal design that can be used anywhere in the world

The SF4B series combines PNP transistor output and NPN transistor output in a single model. Overseas equipment that uses PNP, replacement with NPN sensors, factories that are positively grounded, and transfer of equipment overseas are all situations where the control circuits for a single model are suitable for use worldwide.

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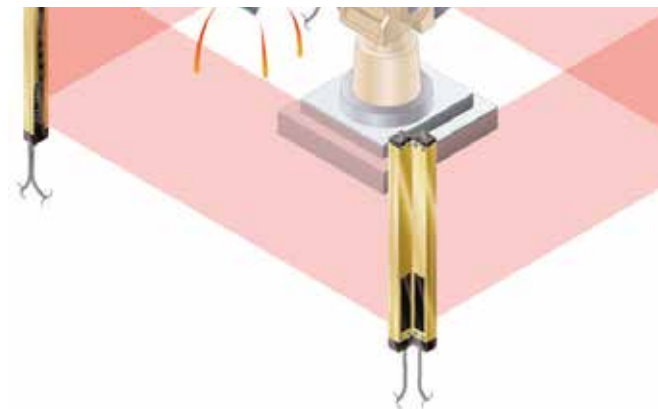
Accessories

SF4B (V2)

## Typical applications

### Guarding space around welding robot

A spatter protection hood type perfect for welding devices is also available.



## Technical specifications

| Type                | Finger protection type   | Hand protection type | Arm / Foot protection type |
|---------------------|--|----------------------|----------------------------|
| Model no.           | SF4B-F□(V2) (note)   | SF4B-H□(V2)          | SF4B-A□(V2)                |
| Safety category     | Type 4, PL e, SIL3   |                      |                            |
| Sensing height      | 230 to 1270mm  | 230 to 1910mm        |                            |
| Sensing range       | 0 to 7m (depending on type up to 9m)   |                      |                            |
| Resolution          | 10mm   | 20mm                 | 40mm                       |
| Object to be sensed | Min. Ø 14mm (opaque)   | Min. Ø 25mm (opaque) | Min. Ø 45mm (opaque)       |
| Power supply        | 24VDC +/-10%   |                      |                            |
| Response time       | ON → OFF: max. 14ms / OFF → ON: max. 90ms  |                      |                            |
| Control outputs     | OSSD1 and OSSD2 (2 x PNP or 2 x NPN open collector transistor, switchable), max. 200mA |                      |                            |
| Emitting element    | Infrared LED   |                      |                            |
| Protection          | IP67 / IP65 (IEC)  |                      |                            |
| Ambient temperature | -10 to +55°C   |                      |                            |
| Material            | Frame: Aluminium / Enclosures: Acrylic, Polycarbonate, ABS                             |                      |                            |
| Connection method   | Connector  |                      |                            |
| Dimensions (HxWxD)  | Hx30x28mm (H= protective height)   |                      |                            |

**Notes:** For a system configuration, please contact your sales office or service hotline: +49 89 45354-2737

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SF4B (V2)

## Sensing height

|                        | Sensing range              | Model no.     | Protective height (mm) | Installation height (mm) | No. of beam axes |   |
|------------------------|----------------------------|---------------|------------------------|--------------------------|------------------|---|
| Finger protection type | 0-7m                       | SF4B-F23(V2)  | 230                    | 286                      | 23               |   |
|                        |                            | SF4B-F31(V2)  | 310                    | 366                      | 31               |   |
|                        |                            | SF4B-F39(V2)  | 390                    | 446                      | 39               |   |
|                        |                            | SF4B-F47(V2)  | 470                    | 526                      | 47               |   |
|                        |                            | SF4B-F55(V2)  | 550                    | 606                      | 55               |   |
|                        |                            | SF4B-F63(V2)  | 630                    | 686                      | 63               |   |
|                        |                            | SF4B-F71(V2)  | 710                    | 766                      | 71               |   |
|                        |                            | SF4B-F79(V2)  | 790                    | 846                      | 79               |   |
|                        |                            | SF4B-F95(V2)  | 950                    | 1006                     | 95               |   |
|                        |                            | SF4B-F111(V2) | 1110                   | 1166                     | 111              |   |
|                        |                            | SF4B-F127(V2) | 1270                   | 1326                     | 127              |   |
| Hand protection type   | 0-9m                       | SF4B-H12(V2)  | 230                    | 286                      | 12               |   |
|                        |                            | SF4B-H16(V2)  | 310                    | 366                      | 16               |   |
|                        |                            | SF4B-H20(V2)  | 390                    | 446                      | 20               |   |
|                        |                            | SF4B-H24(V2)  | 470                    | 526                      | 24               |   |
|                        |                            | SF4B-H28(V2)  | 550                    | 606                      | 28               |   |
|                        |                            | SF4B-H32(V2)  | 630                    | 686                      | 32               |   |
|                        |                            | SF4B-H36(V2)  | 710                    | 766                      | 36               |   |
|                        |                            | SF4B-H40(V2)  | 790                    | 846                      | 40               |   |
|                        |                            | SF4B-H48(V2)  | 950                    | 1006                     | 48               |   |
|                        |                            | SF4B-H56(V2)  | 1110                   | 1166                     | 56               |   |
|                        |                            | SF4B-H64(V2)  | 1270                   | 1326                     | 64               |   |
|                        | 0-7m                       | SF4B-H72(V2)  | 1430                   | 1486                     | 72               |   |
|                        |                            | SF4B-H80(V2)  | 1590                   | 1646                     | 80               |   |
|                        |                            | SF4B-H88(V2)  | 1750                   | 1806                     | 88               |   |
|                        |                            | SF4B-H96(V2)  | 1910                   | 1966                     | 96               |   |
|                        | Arm / Foot protection type | 0-9m          | SF4B-A6(V2)            | 230                      | 286              | 6 |
|                        |                            |               | SF4B-A8(V2)            | 310                      | 366              | 8 |
| SF4B-A10(V2)           |                            |               | 390                    | 446                      | 10               |   |
| SF4B-A12(V2)           |                            |               | 470                    | 526                      | 12               |   |
| SF4B-A14(V2)           |                            |               | 550                    | 606                      | 14               |   |
| SF4B-A16(V2)           |                            |               | 630                    | 686                      | 16               |   |
| SF4B-A18(V2)           |                            |               | 710                    | 766                      | 18               |   |
| SF4B-A20(V2)           |                            |               | 790                    | 846                      | 20               |   |
| SF4B-A24(V2)           |                            |               | 950                    | 1006                     | 24               |   |
| SF4B-A28(V2)           |                            |               | 1110                   | 1166                     | 28               |   |
| SF4B-A32(V2)           |                            |               | 1270                   | 1326                     | 32               |   |
| 0-7m                   |                            | SF4B-A36(V2)  | 1430                   | 1486                     | 36               |   |
|                        |                            | SF4B-A40(V2)  | 1590                   | 1646                     | 40               |   |
|                        |                            | SF4B-A44(V2)  | 1750                   | 1806                     | 44               |   |
|                        |                            | SF4B-A48(V2)  | 1910                   | 1966                     | 48               |   |

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# SF4B-C

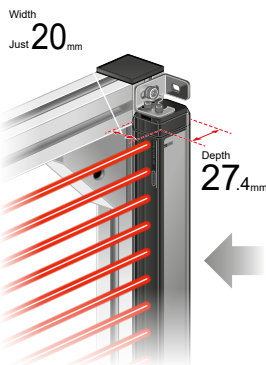
Type 4 · PLe · SIL3

Mounts flush on aluminum frames

## Features

### ■ Compact size

The **SF4B-C** series has been designed to mount flush with the aluminum frame. This means the machine opening will not be made any narrower. It can even be installed with zero blind zone.



### ■ Easy mounting on aluminum frame



### Buried mounting (side)

The light curtain mounts flush, even in installations with buried mounting.

- › There is no risk of workpieces bumping into the light curtain.

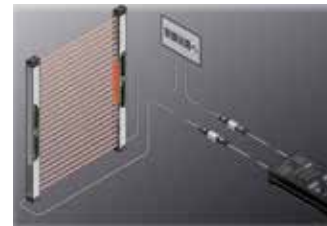
### Rear mounting

- › The light curtain fits onto a 20 × 20mm aluminum frame perfectly.



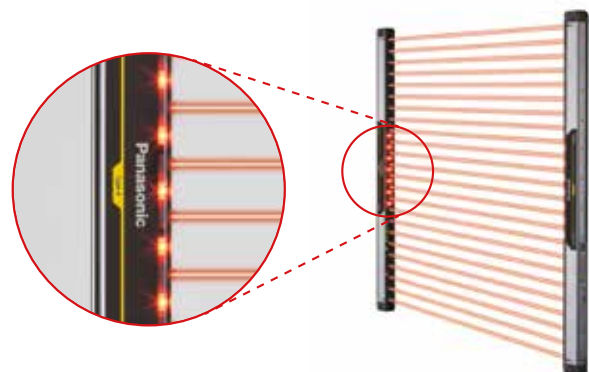
### ■ The SFB-HC handy controller (optional)

offers easy access to settings for a range of functionality.



### ■ With the pigtailed type, the large indicator is easy to see also from the side

The SF4B-C series incorporates a large multi-purpose indicator (orange) positioned at workers' eye level. The indicator signals the presence of the light curtain, helping to prevent stoppages due to inadvertent interruption of its beams. The indicator can be used in a variety of applications, including as a muting indicator or operation indicator. The large multi-purpose indicator shines brightly through the plastic body to ensure exceptional visibility from the side.



## Technical specifications

| Type                | Pigtailed type (note 1, 2)   |                      | Cable type           |                      |
|---------------------|--|----------------------|----------------------|----------------------|
|                     | Hand protection type   | Arm protection type  | Hand protection type | Arm protection type  |
| Model no.           | SF4B-H12CA-J05   | SF4B-A12CA-J05       | SF4B-H12C            | SF4B-A12C            |
| Safety category     | Type 4, PLe, SIL3  |                      |                      |                      |
| Protective height   | 263.4 to 1943.4mm  |                      |                      |                      |
| Sensing range       | 0 to 7m  |                      |                      |                      |
| Beam pitch          | 20mm   | 40mm                 | 20mm                 | 40mm                 |
| Object to be sensed | Min. Ø 25mm (opaque)   | Min. Ø 45mm (opaque) | Min. Ø 25mm (opaque) | Min. Ø 45mm (opaque) |
| Supply voltage      | 24V DC ±10%  |                      |                      |                      |
| Response time       | ON → OFF: max. 14ms / OFF → ON: max. 90ms  |                      |                      |                      |
| Control outputs     | OSSD1 and OSSD2 (2 x PNP or 2 x NPN open collector transistor, switchable), max. 200mA |                      |                      |                      |
| Emitting element    | Infrared LED, 850nm  |                      |                      |                      |
| Protection          | IP65 (IEC)   |                      |                      |                      |
| Ambient temperature | -10 to +55°C   |                      |                      |                      |
| Material            | Polycarbonate  |                      |                      |                      |
| Connection method   | 12-wire PVC cable with connector, 0.5m   |                      | 8-wire PVC cable, 5m |                      |
| Dimensions (HxWxD)  | Hx20x27.4mm (H= depending on protective height)  |                      |                      |                      |

### Notes:

- 1.) For a system configuration, please contact your sales office or service hotline: +49 (0) 89-45354-2737
- 2.) Integrated muting function

## Protective height

|                      | Model no.             |            | Protective height (mm) | Installation height (mm) (note) | No. of beam axes |
|----------------------|-----------------------|------------|------------------------|---------------------------------|------------------|
|                      | Pigtailed type (note) | Cable type |                        |                                 |                  |
| Hand protection type | SF4B-H12CA-J05        | SF4B-H12C  | 263.4                  | 294.4                           | 12               |
|                      | SF4B-H16CA-J05        | SF4B-H16C  | 343.4                  | 374.4                           | 16               |
|                      | SF4B-H20CA-J05        | SF4B-H20C  | 423.4                  | 454.4                           | 20               |
|                      | SF4B-H24CA-J05        | SF4B-H24C  | 503.4                  | 534.4                           | 24               |
|                      | SF4B-H28CA-J05        | SF4B-H28C  | 583.4                  | 614.4                           | 28               |
|                      | SF4B-H32CA-J05        | SF4B-H32C  | 663.4                  | 694.4                           | 32               |
|                      | SF4B-H36CA-J05        | SF4B-H36C  | 743.4                  | 774.4                           | 36               |
|                      | SF4B-H40CA-J05        | SF4B-H40C  | 823.4                  | 854.4                           | 40               |
|                      | SF4B-H48CA-J05        | SF4B-H48C  | 983.4                  | 1014.4                          | 48               |
|                      | SF4B-H56CA-J05        | SF4B-H56C  | 1143.4                 | 1174.4                          | 56               |
|                      | SF4B-H64CA-J05        | SF4B-H64C  | 1303.4                 | 1334.4                          | 64               |
|                      | SF4B-H72CA-J05        | SF4B-H72C  | 1463.4                 | 1494.4                          | 72               |
|                      | SF4B-H80CA-J05        | SF4B-H80C  | 1623.4                 | 1654.4                          | 80               |
|                      | SF4B-H88CA-J05        | SF4B-H88C  | 1783.4                 | 1814.4                          | 88               |
|                      | SF4B-H96CA-J05        | SF4B-H96C  | 1943.4                 | 1974.4                          | 96               |
| Arm protection type  | SF4B-A8CA-J05         | SF4B-A8C   | 343.4                  | 374.4                           | 8                |
|                      | SF4B-A12CA-J05        | SF4B-A12C  | 503.4                  | 534.4                           | 12               |
|                      | SF4B-A16CA-J05        | SF4B-A16C  | 663.4                  | 694.4                           | 16               |
|                      | SF4B-A20CA-J05        | SF4B-A20C  | 823.4                  | 854.4                           | 20               |
|                      | SF4B-A24CA-J05        | SF4B-A24C  | 983.4                  | 1014.4                          | 24               |
|                      | SF4B-A28CA-J05        | SF4B-A28C  | 1143.4                 | 1174.4                          | 28               |
|                      | SF4B-A32CA-J05        | SF4B-A32C  | 1303.4                 | 1334.4                          | 32               |
|                      | SF4B-A36CA-J05        | SF4B-A36C  | 1463.4                 | 1494.4                          | 36               |
|                      | SF4B-A40CA-J05        | SF4B-A40C  | 1623.4                 | 1654.4                          | 40               |
|                      | SF4B-A44CA-J05        | SF4B-A44C  | 1783.4                 | 1814.4                          | 44               |
| SF4B-A48CA-J05       | SF4B-A48C             | 1943.4     | 1974.4                 | 48                              |                  |

**Note:** The installation height depends on the mounting bracket. Specifications with standard mounting bracket **MS-SF4BC-1**

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SF4C



# SF4C

Type 4 · PLe · SIL3

Ultra-slim light curtain safeguards machines without sacrificing productivity

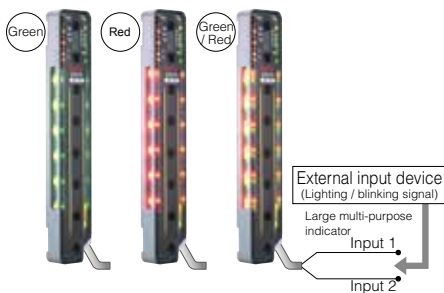
## Features

### Large, built-in, multi-purpose LED indicators

Large LED bars on each side of the light curtain provide a wide visibility indicator that can be customized for various applications by means of independent external inputs. The indicator can be used as an operation indicator (muting) or job indicator, etc.

### Finger/hand protection

The **SF4C** series covers a sensing height of 160mm to 640mm. This is true for the finger and hand protection types (resolution up to 10 or 20mm).



### Can be used in a variety of applications for simplified equipment (large multi-purpose indicator)

Wire-saving when connecting to safety devices. Contact outputs such as emergency stop switches or safety door switches can be connected to the light curtain. Also, by using the handy-controller **SFC-HC**, up to three sets of light curtains can be cascade connected for a consolidated safety output.

### IP67 (IEC)

An IP67 (IEC) rating is achieved with an ultra-slim size for protection from environmental factors.

### Mutual interference is reduced without need for interference prevention lines

The light curtain is equipped with the ELCA (Extraneous Light Check & Avoid) function, which has been proven to be strong against mutual interference. Because it automatically shifts the scanning time of the light curtain in order to avoid interference, it is not necessary to wire interference prevention lines between machinery.

### A fast response time of 7ms\* for all models

A fast response time of 7ms\* for all models regardless of the number of beam channels. This reduces the safety distance as well as the calculation work required for the safety distance among models with different beam channels.

\* When connecting safety sensors (light curtains, etc.) to the safety input, the response time will be the total time of connected units.

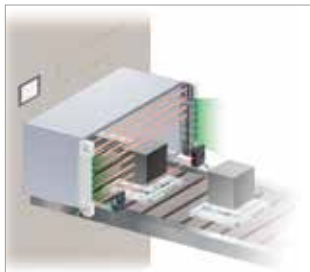
### Safety, productivity, and cost reduction [muting control function]

The muting sensors and muting lamps can be connected directly to the light curtain. Furthermore, the large multi-purpose indicators can be used as muting lamps, which contribute to less wiring troubles, improvement of safety, productivity, and cost reduction.

## Typical applications

### Use of internal muting lamp

There is no need to buy and install a separate muting lamp.



### Selective muting area

Separate muting control function for each beam channel.



### Industry first!

Wire-saving when connecting to safety devices (safety input function).



## Technical specifications

| Type                      | Finger protection type  | Hand protection type                   |
|---------------------------|---|--|
| Model no.                 | SF4C-F□ (note)  | SF4C-H□                                |
| Safety category           | Type 4, PLc, SIL3   |  |
| Sensing height            | Depending on types (160 to 640mm)   |  |
| Sensing range             | 0 to 3m   |  |
| Resolution                | 10mm  | 20mm                                   |
| Object to be sensed       | Min. Ø 14mm (opaque)  | Min. Ø 25mm (opaque)                   |
| Power supply              | 24VDC +10/-15%  |  |
| Control outputs           | OSSD1 and OSSD2 (2x PNP or 2x NPN transistor outputs with open collector, switchable, max. 200mA) |  |
| Response time             | ON → OFF max. 9ms / OFF → ON max. 90ms  | ON → OFF max. 7ms / OFF → ON max. 90ms |
| Rated current consumption | Max. 270mA (depending on type)  |  |
| Protection                | IP67 / IP65 (IEC)   |  |
| Ambient temperature       | -10 to +55°C  |  |
| Material                  | Polycarbonate   |  |
| Connection method         | Cable, 5m or 0.5m with connector  |  |
| Dimensions (HxWxD)        | Hx13.2x30mm (H= protective height)  |  |

Note: For a system configuration, please contact your sales office or service hotline: +49 89 45354-2737

### Sensing height

| Finger protection type | Model no.  |                      | Protective height (mm) | Installation height (mm) | No. of beam axes |
|------------------------|------------|----------------------|------------------------|--------------------------|------------------|
|                        | Cable type | Cable with connector |                        |                          |                  |
|                        | SF4C-F15   | SF4C-F15-J05         | 160                    | 160                      | 15               |
|                        | SF4C-F23   | SF4C-F23-J05         | 240                    | 240                      | 23               |
|                        | SF4C-F31   | SF4C-F31-J05         | 320                    | 320                      | 31               |
|                        | SF4C-F39   | SF4C-F39-J05         | 400                    | 400                      | 39               |
|                        | SF4C-F47   | SF4C-F47-J05         | 480                    | 480                      | 47               |
|                        | SF4C-F55   | SF4C-F55-J05         | 560                    | 560                      | 55               |
|                        | SF4C-F63   | SF4C-F63-J05         | 640                    | 640                      | 63               |

| Hand protection type | Model no.  |                      | Protective height (mm) | Installation height (mm) | No. of beam axes |
|----------------------|------------|----------------------|------------------------|--------------------------|------------------|
|                      | Cable type | Cable with connector |                        |                          |                  |
|                      | SF4C-H8    | SF4C-H8-J05          | 160                    | 160                      | 8                |
|                      | SF4C-H12   | SF4C-H12-J05         | 240                    | 240                      | 12               |
|                      | SF4C-H16   | SF4C-H16-J05         | 320                    | 320                      | 16               |
|                      | SF4C-H20   | SF4C-H20-J05         | 400                    | 400                      | 20               |
|                      | SF4C-H24   | SF4C-H24-J05         | 480                    | 480                      | 24               |
|                      | SF4C-H28   | SF4C-H28-J05         | 560                    | 560                      | 28               |
|                      | SF4C-H32   | SF4C-H32-J05         | 640                    | 640                      | 32               |

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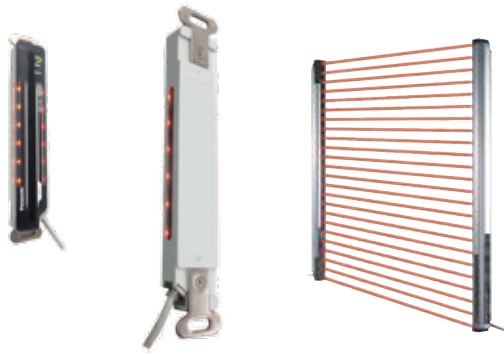
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SF2B/SF2C



# SF2B / SF2C

Safety category 2

Excellent basic functions at a reasonable price

## Features

### ■ We also offer safety light curtains with safety category 2

- › Protective height: 160 to 1912mm
- › Sensing range: 0 to 13m
- › Response time: max. 15ms (ON → OFF)
- › Arm and hand protection type
- › Integrated status LEDs and display
- › Series connection without blind zone
- › Features: Interference suppression, series connection, emission halt function

### ■ Arm / foot protection type SF2B-A□

Min. sensing object  $\varnothing$  47mm  
(beam pitch 40mm)



### ■ Hand protection type SF2B-H□

Min. sensing object  $\varnothing$  27mm  
(beam pitch 20mm)

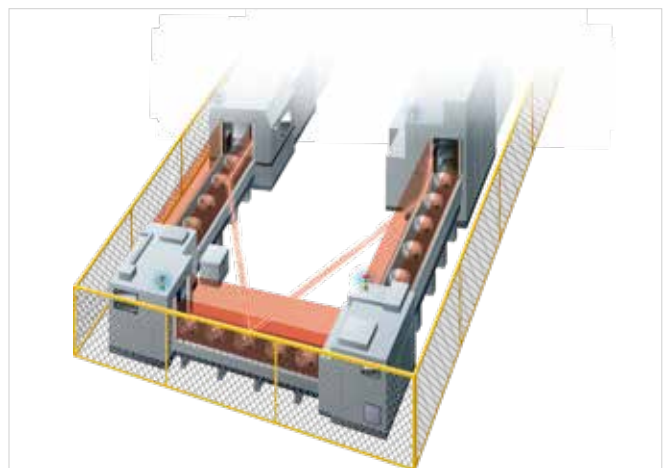


## Typical applications

Protection against malfunction caused by extraneous light



Protection against mutual interference thanks to interference prevention







## Customization of automation products

Panasonic has been perfecting the art of customization for over 10 years. Our experts work with customers, engineers, and purchasing and logistic departments to configure the most suitable customized solution in terms of product modification, packaging, labeling, pre-assembly and other features. High quality is assured thanks to multiple product tests that are conscientiously documented. Customized automation products can reduce your production costs, avoid production errors, and improve the quality of your final product.

- › Customized cabling and interfacing
- › Application specific setting of sensors
- › Re-packaging for immediate customer use
- › Sensors bundled with PLC/HMI as a solution
- › Customer specific mounting of connectors on Panasonic Industry sensors



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SG-P



# SG-P

## Non-contact safety door switch

### Features

#### ■ High visibility

Door switches installed on the inside of doors are difficult to see from the outside, so it is hard to check whether the doors are open or closed. The **SG-P** series units are highly visible from the outside, thus allowing reliable confirmation. The SG-P series eliminates the need to install switches on the outside of equipment, and it contributes to the simplification of equipment

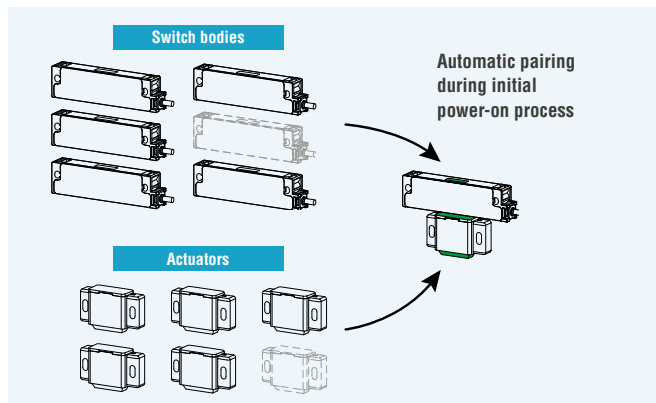


#### For frame-less doors

Compact type: SG-P1010-□ / SG-P2010-□

#### ■ No prior pairing

Each switch body and actuator can be easily paired by bringing them close to each other and supplying power during the initial setup. When the units are cascade-connected, turning on the power completes the pairing procedures in a batch, thus reducing the man-hours required for the setup.

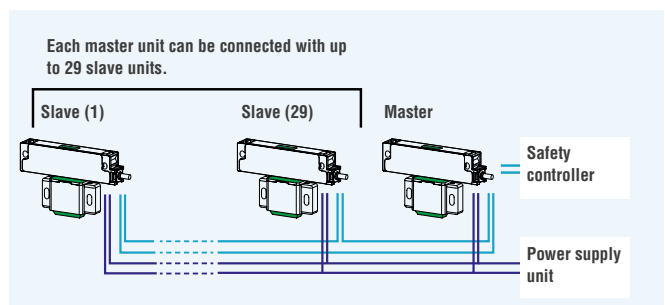


#### ■ High level coded actuator

Intentional deactivation of a safety switch can lead to serious accidents. The SG-P series with high level coded actuators models detect only the paired actuators. They support the ISO 14119 coding level and prevent intentional deactivation of safety switches.

#### ■ 30 units in series

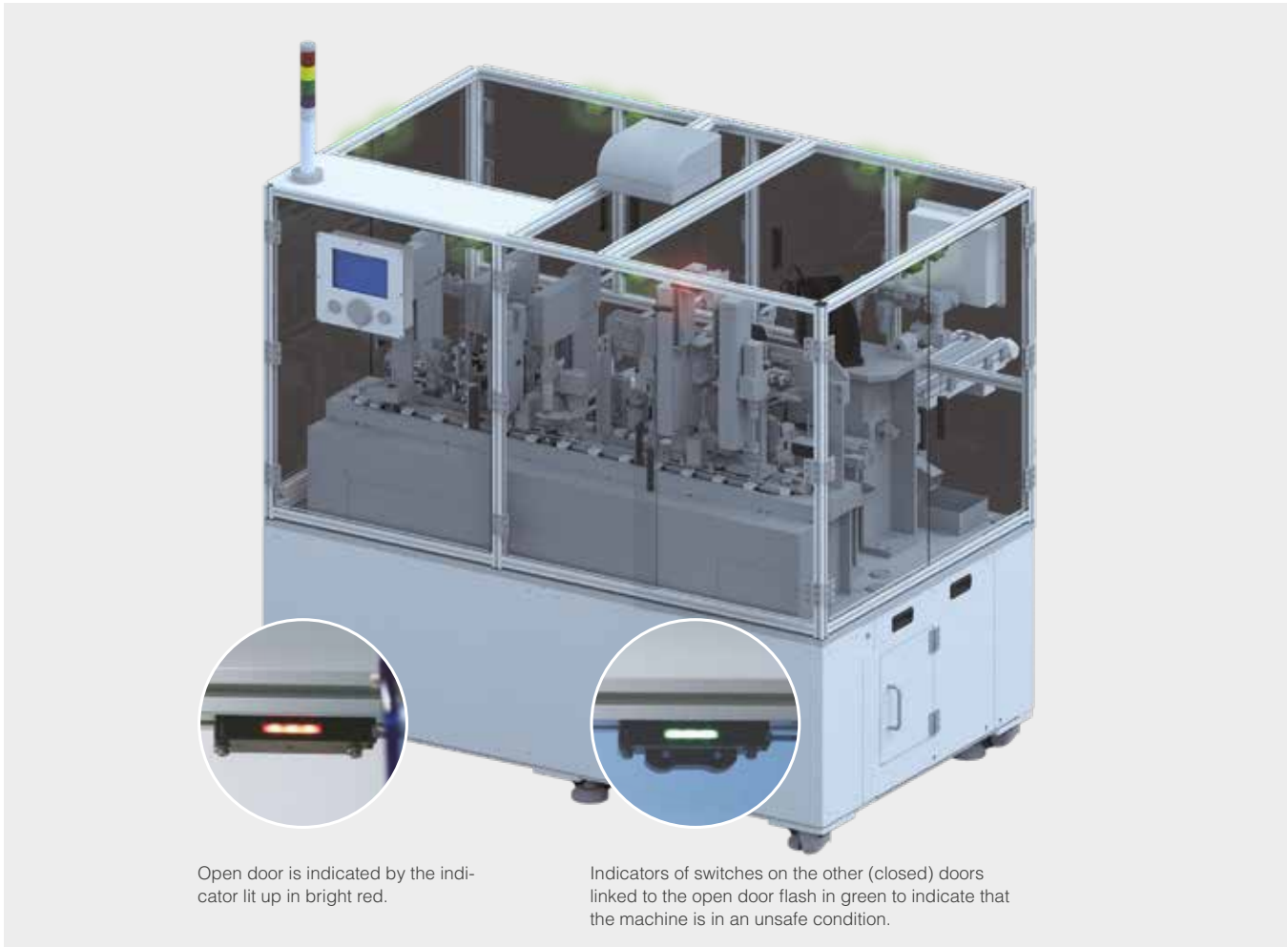
Previously, when cascade connection was used, extra man-hours were required for connecting wires to the switches for linked operation. When the SG-P series is installed, the standard model serves as a master unit and outputs safety signals (OSSD1 / 2) in a batch. No extra wiring work is necessary for cascade connection of the sub units that serve as slave units. A maximum of 30 units can be connected, thus contributing to the reduction of equipment wiring work.



## Large and bright indicators notify the open / Closed conditions of machine room doors

When any of the safety switches connected in series enters a non-detecting state, its indicator lights up in red and the

indicators of all other safety switches flash in green to notify the operator.



## Technical specifications

| Type                 | Master, PNP output  | Master, NPN output                            | Slave                     |
|----------------------|---|---|---------------------------|
| Model no.            | SG-P□-M-P   | SG-P□-M-N                                     | SG-P□-S                   |
| Applicable standards | ISO 13849-1 (Category 4, PL <sub>e</sub> ), IEC 61508-1 to 7 (SIL3), IEC 62061 (SIL3), IEC 60947-5-3, ISO 14119, EN 60947-5-3, EN 300 330, EN 301 489-1 |   |                           |
| Operating distance   | Sao (OFF→ON): 5mm, Sar (ON→OFF): 15mm   |   |                           |
| Power supply voltage | 24V DC  |   |                           |
| Output               | 2 x PNP open-collector transistor, max. 100mA   | 2 x NPN open-collector transistor, max. 100mA | –                         |
| Response time        | For single unit: ON→OFF max. 100ms, OFF→ON max. 100ms<br>For multiple units: Time for single unit + 5ms x (number of connected units - 1)               |   |                           |
| Material             | Switch body: PBT, PC, stainless steel, Silicone rubber. Actuator: PBT, PC (only visible type)   |   |                           |
| Connection method    | 6-core cab tire cable, 5m   |   | 4-core cab tire cable, 3m |
| Degree of protection | IP65 (IEC)  |   |                           |
| Pollution degree     | 3 inside 2  |   |                           |
| Dimensions (HxWxD)   | Compact type: 93x25x15mm; actuator: 56x13x15mm<br>Visible type: 93x25x15mm; actuator: 52x32x15mm  |   |                           |

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SG-P

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ST4



# ST4

Type 4 · PLe · SIL3

Cascadable thru-beam sensors

## Features

### ■ Series connection of six sets of sensor heads to one controller

The concept of connecting six sets of sensor heads to one controller in series offers you maximum flexibility to solve your safety application.

### ■ Beam axis alignment and operation confirmation

The beam interruption indicator is incorporated in both the emitter and receiver. This indicator can be used not only to confirm operation but also to align the beam axis.

### ■ Compact sensor head saves space

The size of this type 4 long sensing range type is similar to general purpose photoelectric sensors.

### ■ IP67 (IEC)

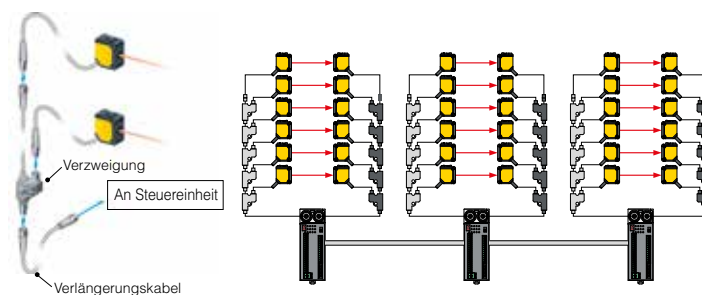
The sensor heads can be used safely even in rough production environments.

### ■ Interference prevention

The emission amount adjuster can be used to prevent interference to the surrounding sensors.

### ■ Supports both PNP and NPN polarities

A single unit supports both PNP and NPN polarities, easing stock management.

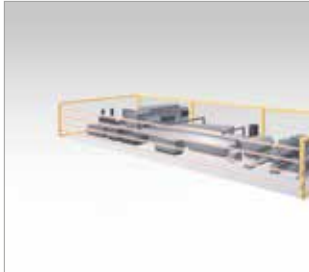


Emission amount adjustment function

## Typical applications

### Protection for long sensing ranges

Guard areas up to 15m in length, for example where protective fences are difficult to install.



### Protection for small openings

For small openings where light curtains do not fit, ST4 sensor heads ensure safety.



### Protection against non-authorized entry

Sensor heads can be mounted flexibly and muting control implemented easily.



## Technical specifications

### ■ Sensor heads

| Type                | Cable length 0.2m   |                           | Cable length 1.0m                   |                           |
|---------------------|---|---------------------------|-------------------------------------|---------------------------|
|                     | –   | With sensitivity adjuster | –                                   | With sensitivity adjuster |
| Model no.           | ST4-A1-J02  | ST4-A1-J02V               | ST4-A1-J1                           | ST4-A1-J1V                |
| Safety category     | Type 4, PL <sub>e</sub> , SIL3                                  |                           |                                     |                           |
| Cascading           | Up to 6 pieces to one controller                                |                           |                                     |                           |
| Power supply        | Supplied from controller ( <b>ST4-C11</b> or <b>ST4-C12EX</b> ) |                           |                                     |                           |
| Sensing range       | 0 to 15m  |                           |                                     |                           |
| Object to be sensed | Min. ø 9mm (opaque)   |                           |                                     |                           |
| Emitting element    | Infrared LED  |                           |                                     |                           |
| Protection          | IP67 (IEC)  |                           |                                     |                           |
| Ambient temperature | –10 to +55°C  |                           |                                     |                           |
| Material            | Enclosure: PBT/Cover: acrylic                                   |                           |                                     |                           |
| Connection method   | Cable with connector enclosed, 0.2m                             |                           | Cable with connector enclosed, 1.0m |                           |
| Dimensions (HxWxD)  | 31x14x28mm  |                           |                                     |                           |

### ■ Control device

| Type                | Standard  | High-functional                     |
|---------------------|---|-------------------------------------|
| Model no.           | ST4-C11   | ST4-C12EX                           |
| Safety category     | Type 4, PL <sub>e</sub> , SIL3  |                                     |
| Power supply        | 24VDC +10% / –15%   |                                     |
| Control outputs     | OSSD1 and OSSD2 (2x PNP or 2x NPN transistor outputs with open collector, switchable, max. 200mA) |                                     |
| Response time       | ON → OFF: max. 25ms, OFF → ON: max. 140ms   |                                     |
| Current consumption | Max. 100mA (excluding sensor heads)   | Max. 120mA (excluding sensor heads) |
| Protection          | Enclosure: IP40 (IEC), Terminal: IP20 (IEC)   |                                     |
| Ambient temperature | –10 to +55°C  |                                     |
| Material            | Enclosure: ABS  |                                     |
| Connection method   | Connector (sensors), terminal block   |                                     |
| Dimensions (HxWxD)  | 130x46x80mm   |                                     |

**Note:** For a system configuration, please contact your sales office or service hotline: +49 89 45354-2737

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ST4



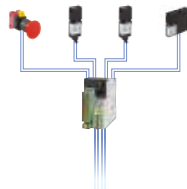
# SF-C21

Control unit for multiple safety solutions

## Features

### Space-saving and easy to wire

- › One **SF-C21** can do the work of four safety relay units.  
Input: 10 points / Output: 8 points
- › Compact size  
(height 97 mm × width 45 mm)



### Application-based customization

- › Easy to create reliable safety circuit
- › Configurator SF-C software to build own safety circuits



### Absolutely no programming skills required

- › Eight preset logics, safety-certified and compatible to control category 4 PLe
- › The OFF delay time can be easily set by turning the rotary switch
- › Password protection prevents inadvertent changes to the logic

### Easy to monitor status with a PLC

- › Four auxiliary outputs are provided
- › RS-485 communications (MODBUS RTU)



## Technical specifications

| Model. no.               | SF-C21  |   |
|--------------------------|---|---|
| Safety standards         | IEC 61508-1 to 7, EN 61508-1 to 7(SIL3), ISO 13849-1 (up to Category 4, PLe), IEC 61131-2, IEC 61010-2-201, IEC 62061(SILCL3), UL 61010-1, UL 61010-2-201             |   |
| EMC standards            | IEC 61000-6-2, IEC 61326-3-1, EN 55011  |   |
| Related standards        | IEC 60947-1, IEC 60947-5-1, IEC 60947-5-2, IEC 60947-5-5, IEC 60947-5-8, IEC 61496-1, IEC TS 62046, ISO 13851   |   |
| Safety input             | 2 × 4 inputs (ON → OFF max. 0.7ms; OFF → ON max. 10ms)  |   |
| Safety control output    | PNP open-collector transistor with 2 outputs × 2<br>(ON → OFF max. 10ms; OFF → ON max. 100ms)   |   |
| Auxiliary output         | PNP open-collector transistor with 1 output × 4<br>(Any of the auxiliary outputs can be customized using the software tool)   |   |
| Logic selection function | No. 0: Customization control<br>No. 2: Parallel muting control<br>No. 4: Partial stop control 1<br>No. 6: Two-hand control<br>No. 8: Operation mode selection control | No. 1: Overall stop control<br>No. 3: Sequential muting control<br>No. 5: Partial stop control 2<br>No. 7: OR control |
| Communication            | RS-485: Detachable spring-cage terminal block, USB: Mini-B male   |   |

**Note:** We also offer the safety control unit **SF-C10 series** (see next page), which is ideal for controlling Panasonic's safety light curtain, because its connectors make wiring easier



# SF-C10

Less setup time for safety light curtains

## Features

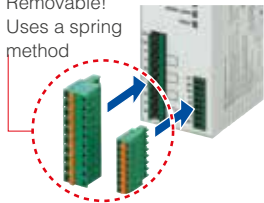
### ■ Supports both PNP and NPN polarities

A single unit can be used for PNP / NPN input switching, reducing the number of parts that need to be registered.

### ■ Removable terminal blocks reduce maintenance time

Removable terminal blocks are used. This reduces the work required for reconnecting wiring during maintenance

Removable!  
Uses a spring method



### ■ Metal enclosure with an IP65 (IEC) protective structure

The strong metal enclosure has a built-in safety relay. It has an IP65 protective structure so that it can be set up individually without needing to be inserted into a control panel.



Connector in metal housing

### ■ Slim design

22.5mm thickness for insertion even into narrow spaces inside panels.



### ■ Three safety circuit systems packaged into a single unit!

The unit has three different built-in safety circuits: Output circuit of the safety light curtain, muting safety circuit, and emergency stop safety circuit.



SF-C13

SF-C11

SF-C12

SF-C14EX

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SF-C10



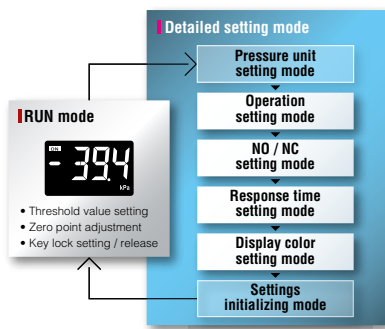
# DP-0

Compact and easy-to-use  
pressure sensor

## Features

### RUN and detailed setting mode

Pressure sensors of the DP-0 series operate in two different modes. RUN mode is used for quick access to settings like threshold values, zero point, and key lock functions. The detailed setting mode offers additional settings such as selecting the pressure unit or the response time. The two modes together help to achieve an optimum sensor performance.



### Functional design

The unit body is completely black to make the LCD display easier to see. The keys offer a firm and crisp clicking feel, thus making operating the sensor smooth and reliable.

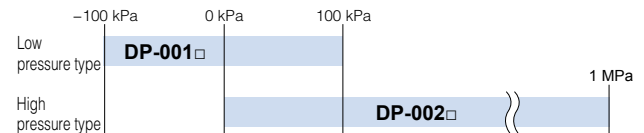
### Compact & lightweight design

The unit body measures only 24.9mm in depth, which allows installation in a narrow space. The body weighs only 25g. The low weight is very advantageous if the sensor has to be mounted on moving parts, e.g. robot arms.



### Low and high pressure type available

The low pressure type can be used with positive or negative pressure. It is ideal for suction applications where it indicates malfunctions due to pressure changes. The high pressure type is suitable for positive pressure of up to 1MPa. It is ideal for applications where a reference pressure needs to be checked.

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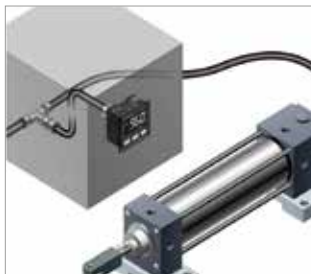
Accessories

DP-0

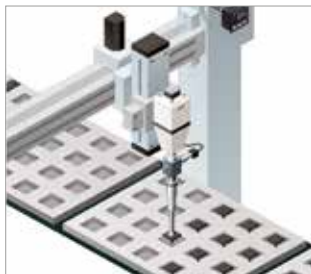


## Typical applications

### Monitoring suction pressure on electronic components



### Checking reference pressure



## Technical specifications

| Type                          |     | Low pressure type                           | High pressure type      |
|-------------------------------|-----|---|-------------------------|
| Model no.                     | PNP | DP-001-P                                    | DP-002-P                |
|                               | NPN | DP-001                                      | DP-002                  |
| Type of pressure              |     | Gauge pressure                              |                         |
| Rated pressure range (note 2) |     | -1 to +1bar (-100 to +100kPa)               | 0 to +10bar (0 to 1MPa) |
| Pressure withstandability     |     | 5bar (500kPa)                               | 15bar (1.5MPa)          |
| Applicable fluid              |     | Non-corrosive gas                           |                         |
| Supply voltage                |     | 12 to 24V DC ±10%                           |                         |
| Output                        |     | 3x NPN or PNP transistor, max. 50mA         |                         |
| Response time                 |     | 2.5, 25, 250ms (switchable)                 |                         |
| Pressure port                 |     | M5 female thread                            |                         |
| Degree of protection          |     | IP40  |                         |
| Ambient temperature           |     | -10 to +50°C                                |                         |
| Material                      |     | Resin body type                             |                         |
| Connection method             |     | Connector (note 1)                          |                         |
| Dimensions (HxWxD)            |     | 30x30x25mm                                  |                         |
| Accessories                   |     | CN-14A-C2 connector-attached cable 2m, 1 pc |                         |

**Notes:**

- 1.) The 2m cable CN-14A-C2 is included
- 2.) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20°C. Reference pressure 1atm

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DP-100



# DP-100

Pressure sensors with dual display

## Features

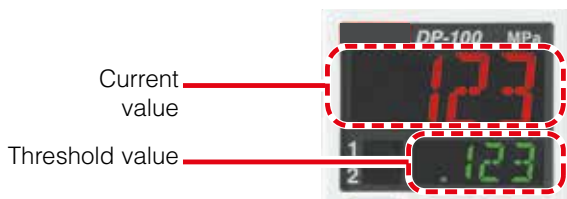
- **The current and threshold values can be checked at the same time!**



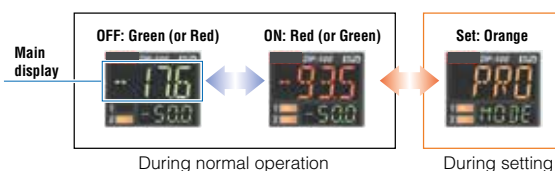
- **Dual display allows direct setting of threshold value**

Equipped with a 30mm square compact dual display. Because the current and threshold value can be checked at the same time, the threshold value can be set and checked smoothly without having to switch screen modes.

- **3-color display (red, green, orange)**



The main display color changes depending on the output status (ON/OFF operation) and while settings are being made. The sensor status can therefore be understood easily, and operating errors can be reduced.



- **Easy-to-read digital display!**

A clear 12-segment make numbers and letters easy to read.

- **High performance**



The low pressure type displays measurements in 0.1kPa at a resolution of 1/2000 and has a response time of 2.5ms (variable up to 5000ms). Moreover it boasts  $\pm 0.5\%$  F.S. temperature characteristics and  $\pm 0.1\%$  F.S. repeatability.

**For low pressure**

- **Copy function saves time and reduces human error**

Sensors can be connected to a master sensor one by one and settings copied to them. When making the same settings for multiple sensors, this prevents setting errors from occurring and reduces the number of changes required to instruction manuals when equipment designs are changed.



- **Equipped with auto-reference and remote zero-adjustment functions A precise pressure management is possible**

If the reference pressure of the device changes, the auto-reference function partially shifts the comparative output judgment level by the amount that the reference pressure shifts and resets the display value to zero. These functions are ideal for places where the reference pressure fluctuates wildly, or where fine settings are desired.

## Typical applications

### Confirming suction of electronic component



### Confirming reference pressure



### Leak test for PET bottles



## Technical specifications

### Cable types

| Type                          | Standard   |                 | High-function controller             |   |                                      |
|-------------------------------|--|-----------------|--------------------------------------|---|--------------------------------------|
| Model no.                     | Asian  | DP-101 (note 1) | DP-102                               | DP-101A                                 | DP-102A                              |
|                               | European   | DP-101-E-P      | DP-102-E-P                           | DP-101A-E-P                             | DP-102A-E-P                          |
|                               | M5 female thread    Short porttype   | DP-101-M-P      | DP-102-M-P                           | DP-101A-M-P                             | DP-102A-M-P                          |
| Rated pressure range (note 3) | -1bar to +1bar<br>(-100.0 to +100.0kPa)  |                 | -1bar to +10bar<br>(-0.1 to +1.0MPa) | -1bar to +1bar<br>(-100.0 to +100.0kPa) | -1bar to +10bar<br>(-0.1 to +1.0MPa) |
| Applicable fluid              | Non-corrosive gas  |                 |                                      |   |                                      |
| Power supply                  | 12 to 24V DC $\pm$ 10%   |                 |                                      |   |                                      |
| Output                        | PNP / NPN open-collector transistor, max. 100mA  |                 |                                      |   |                                      |
| Analog output                 | —  |                 |                                      | 4 to 20mA/0 to 10V                      |                                      |
| Response time                 | 2.5ms, 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1000ms, 5000ms, selectable by key operation     |                 |                                      |   |                                      |
| Display                       | 3-color LCD display, 12 segments, 4 digits   |                 |                                      |   |                                      |
| Pressure port                 | Asian: M5 female thread + R (PT) 1/8 male thread<br>European: M5 female thread + G 1/8 male thread |                 |                                      |   |                                      |
| Connection method             | Connector (note 2)   |                 |                                      |   |                                      |
| Dimensions (HxWxD)            | 30x30x42.5mm   |                 |                                      |   |                                      |
| Accessories                   | CN-14A-C2 Connector attached cable 2m, 1 pc.   |                 |                                      |   |                                      |

#### Notes:

- Suffix-E = Air supply M5 female thread and G 1/8 male thread  
Suffix-M = M5 short port type  
Suffix-P = PNP output
- CN-14A-C2 cable 2m is included in delivery
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20°C. Reference pressure=1atm

### M8 connector types

| Type                                 | Standard  |                                      | Multifunction                           |                                      |
|--------------------------------------|---|--------------------------------------|---|--------------------------------------|
| Model no.                            | DP-111-E-P-J  | DP-112-E-P-J                         | DP-111A-E-P-J                           | DP-112A-E-P-J                        |
| Rated pressure range (note 1)        | -1bar to +1bar<br>(-100.0 to +100.0kPa)   | -1bar to +10bar<br>(-0.1 to +1.0MPa) | -1bar to +1bar<br>(-100.0 to +100.0kPa) | -1bar to +10bar<br>(-0.1 to +1.0MPa) |
| Applicable fluid                     | Non-corrosive gas   |                                      |   |                                      |
| Power supply                         | 12 to 24V DC $\pm$ 10%  |                                      |   |                                      |
| Output                               | PNP open-collector transistor, max. 100mA   |                                      |   |                                      |
| Response time                        | 2.5ms, 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1000ms, 5000ms, selectable by key operation  |                                      |   |                                      |
| Analog volt. output / external input | —   |                                      | Incorporated                            |                                      |
| Ambient temperature                  | -10 to +50°C  |                                      |   |                                      |
| Pressure port                        | G1/8 male thread + M5 female thread   |                                      |   |                                      |
| Material                             | Enclosure: PBT (glass fiber reinforced); LCD display: Acrylic; Pressure port: Stainless steel (SUS303);<br>Thread part: Brass (nickel plated);<br>Switch part: Silicone rubber, M8 connector part: Nickel-plated brass/brass gold plated contacts |                                      |   |                                      |
| Connection method                    | M8 connector (note 2)   |                                      |   |                                      |
| Dimensions (HxWxD)                   | 30x30x47.5mm  |                                      |   |                                      |
| Accessories                          | Unit selection plate: 1 set   |                                      |   |                                      |

#### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20°C. Reference pressure=1atm
- Cable not included in delivery, please select under accessories (page 129)

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DPC-100/  
DPH-100

# DPC-100/ DPH-100

Single-axis type digital pressure sensor with optional dual 3-color display

## Features

### ■ Automatic sensor head recognition

The controller automatically recognizes sensor heads when they are connected, even if their rated pressure ranges are different.

### ■ Dual display and direct setting

The dual display allows you to check current and threshold values simultaneously.

To facilitate setting operations, three modes have been devised:

- › "RUN mode" is for operation settings that are carried out daily
- › "MENU SETTING mode" for basic settings
- › "PRO mode" for special and detailed settings

Controllers can be connected to a master controller one by one, and the master can transmit settings to the slave controllers. This significantly reduces time required when you need to make multiple, identical settings, or during production changeovers. Moreover, it reduces the possibility for error in such cases.

### ■ Direct installation using a hexagonal wrench

The sensor head is tightened with a hexagonal wrench, making installation easy, especially in tight spaces.



## Typical applications

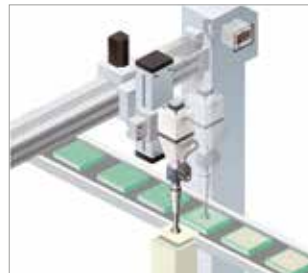
### Leak test



### Reference pressure checking



### Monitoring vacuum pressure



## Technical specifications

### Sensor heads

| Type                                     | Standard<br>±1bar (±100kPa)  |               |                 | Positive pressure<br>+1bar (+1.0MPa) |                 | Vacuum pressure<br>-1bar (-100kPa) |               |                  |
|--|--|---------------|-----------------|--------------------------------------|-----------------|------------------------------------|---------------|------------------|
| Model no.                                | DPH-101  | DPH-101-M3    | DPH-101-M5      | DPH-102                              | DPH-102-M5      | DPH-103                            | DPH-103-M3    | DPH-103-M5       |
| Type of pressure                         | Gauge pressure (note 1)  |               |                 |                                      |                 |                                    |               |                  |
| Rated pressure                           | -1 to +1bar (-100.0 to +100.0kPa)  |               |                 | 0 to 10bar (0 to +1.0MPa)            |                 | 0 to -1bar (0 to -100.0kPa)        |               |                  |
| Pressure resistance                      | 5bar (500kPa)  |               |                 | 15bar (1.5MPa)                       |                 | 5bar (500kPa)                      |               |                  |
| Applicable fluid                         | Air, non-corrosive gas   |               |                 |                                      |                 |                                    |               |                  |
| Power supply                             | 12 to 24VDC ±10%   |               |                 |                                      |                 |                                    |               |                  |
| Analog voltage output                    | Output voltage: 1 to 5V (overrated pressure range)   |               |                 |                                      |                 |                                    |               |                  |
| Protection                               | IP40 (IEC)   |               |                 |                                      |                 |                                    |               |                  |
| Ambient temperature                      | 0 to +50°C   |               |                 |                                      |                 |                                    |               |                  |
| Pressure port                            | <b>DPH-101</b> : R1/8 male thread + M5 female thread, <b>DPH-101-M3</b> : M3 male thread (for installing gasket)<br><b>DPH-101-M5</b> : M5 male thread (for installing gasket) |               |                 |                                      |                 |                                    |               |                  |
| Rated current consumption (without load) | Max. 15mA  |               |                 |                                      |                 |                                    |               |                  |
| Material                                 | Front case: PBT, Rear case: PBT (glass fiber reinforced),<br>Pressure port: stainless steel (SUS303), O-ring: NBR, Pressure element silicon diaphragm, PPS                     |               |                 |                                      |                 |                                    |               |                  |
| Connection method                        | Cable, 2m with attached connector  |               |                 |                                      |                 |                                    |               |                  |
| Dimensions (HxWxD)                       | 23x13.2x 23.4mm  | 17x10x 20.5mm | 17.5x10x 20.5mm | 23x13.2x 23.4mm                      | 17.5x10x 20.5mm | 23x13.2x 23.4mm                    | 17x10x 20.5mm | 17.5x 10x 20.5mm |
| Accessories                              | Connector (e-CON): 1 pc.   |               |                 |                                      |                 |                                    |               |                  |

### Controller

| Type                   | NPN output  | PNP output |
|------------------------|---|------------|
| Model no.              | DPC-101   | DPC-101-P  |
| Applicable sensor head | DPH-101□, DPH-102□, DPH-103□  |            |
| Rated pressure         | Compound pressure type: -1 to +1bar (-100.0 to +100.0kPa)<br>Positive pressure: 0 to 10bar (0 to +1.0MPa)<br>Vacuum pressure: 0 to -1bar (0 to -100.0kPa)   |            |
| Power supply           | 12 to 24VDC ±10%  |            |
| Output                 | PNP or NPN open-collector transistor, max. 100mA  |            |
| Power consumption      | Normal operation: max. 960mW (Current consumption max. 40mA at 24V supply voltage)<br>ECO mode (STD): max. 720mW (Current consumption max. 30mA at 24V supply voltage)<br>ECO mode (FULL): max. 600mW (Current consumption max. 25mA at 24V supply voltage)<br>Excluding the current consumption of sensor head and analog output current |            |
| Ambient temperature    | -10 to +50°C  |            |
| Material               | Enclosure: PBT (glass fiber reinforced),<br>LCD display: Acrylic,<br>Threaded part: Brass (nickel plated)<br>Switch part: Silicon rubber  |            |
| Protection             | IP40 (IEC)  |            |
| Connection method      | Connector (note 2)  |            |
| Dimensions (HxWxD)     | 30x30x29.2mm  |            |
| Accessories            | <b>CN-66A-C2</b> Cable (2m) with attached connector<br>Pressure unit label: 1 set   |            |

#### Notes:

- Reference pressure 1atm
- CN-66A-C2** cable 2m is included in delivery

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# DPC-L100 / DPH-L100

Powerful and simple high-precision  
detection of fluid and air pressure

## Features

### ■ Head-separated sensor

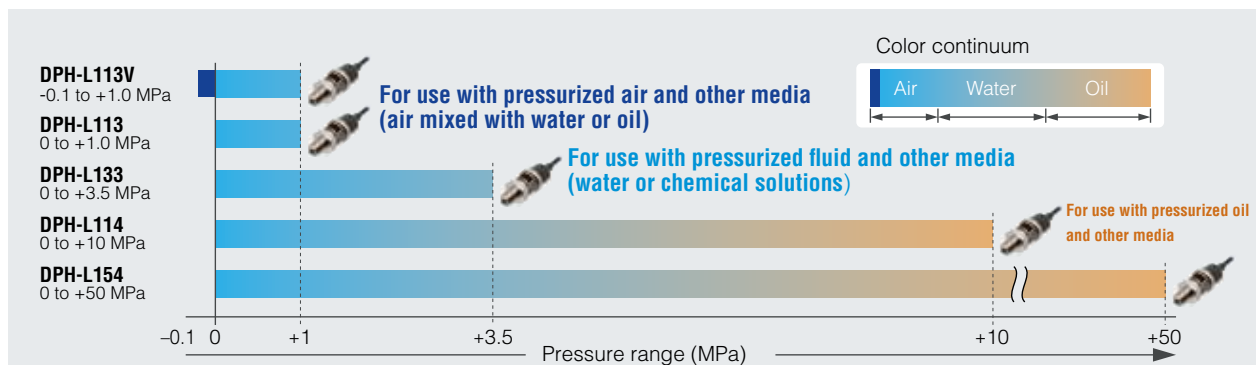
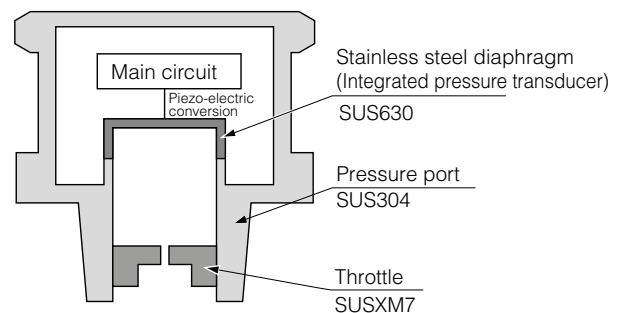
The sensor head is very flexible and can be used with or without the control unit. High-precision measuring is possible with an analog current output of 1 to 5V and extremely accurate detection of 1% F.S.

### ■ Stainless steel construction

The enclosure is made of stainless steel and hence suitable in a wide range of applications. An oil-less, hermetically enclosed diaphragm prevents the fluids from being polluted. An integrated throttle controls the pressure and prevents damage by excess pressure.

### ■ Wide pressure ranges

Various sensor heads for different pressure ranges from vacuum pressure to positive pressure (up to 500bar/50MPa) are available. With the control unit, the pressure range can be output linearly as voltage or current.



## Typical applications

Transport of glass sheets after washing (pressurized air containing water droplets)



Management of plastic filling machine pressure (pressurized fluid)



Management of press pressure (pressurized oil)



## Technical specifications

### Sensor heads

| Type                     | Compound pressure type  |                               | Positive pressure             |                                 |                                 |
|--------------------------|---|-------------------------------|-------------------------------|---------------------------------|---------------------------------|
|                          | DPH-L113V   | DPH-L113                      | DPH-L133                      | DPH-L114                        | DPH-L154                        |
| Model no.                | DPH-L113V   | DPH-L113                      | DPH-L133                      | DPH-L114                        | DPH-L154                        |
| Rated pressure           | -1 to +10bar<br>(-0.1 to +1.0MPa)   | 0 to +10bar<br>(0 to +1.0MPa) | 0 to +35bar<br>(0 to +3.5MPa) | 0 to +100bar<br>(0 to +10.0MPa) | 0 to +500bar<br>(0 to +50.0MPa) |
| Applicable fluid         | Gases and fluids that do not corrode SUS630, SUS304, or SUSXM7  |                               |                               |                                 |                                 |
| Power supply             | 9 to 36VDC  |                               |                               |                                 |                                 |
| Analog voltage output    | 1 to 5VDC overrated pressure range, Accuracy (note): $\pm 1\%$ F.S. (at $23\pm 2^\circ\text{C}$ )                         |                               |                               |                                 |                                 |
| Response time            | Max. 1ms  |                               |                               |                                 |                                 |
| Medium temperature range | -20 to +70°C  |                               |                               | -20 to +125°C                   |                                 |
| Pressure port            | R1/4 male thread ( (throttle embedded)  |                               |                               |                                 |                                 |
| Protection               | IP67 (IEC)  |                               |                               |                                 |                                 |
| Ambient temperature      | -20 to +70°C  |                               |                               | -20 to +80°C                    |                                 |
| Material                 | Diaphragm: stainless steel (SUS630); mounting threaded part: stainless steel (SUS304), Throttle: Stainless steel (SUSXM7) |                               |                               |                                 |                                 |
| Connection method        | Cable with connector enclosed, 2m   |                               |                               |                                 |                                 |
| Dimensions (ØxD)         | 24.3x73mm   |                               |                               |                                 |                                 |
| Accessories              | e- CON connector 1pc.   |                               |                               |                                 |                                 |

Note: Accuracy including linearity, hysteresis and repeatability

### Controller

| Type                   | NPN output   | DPC-L101                   |  |                                 |                                 |
|------------------------|--|----------------------------|--|---------------------------------|---------------------------------|
| Model no.              | PNP output   | DPC-L101P                  |  |                                 |                                 |
| Applicable sensor head | DPH-L113V  | DPH-L113                   | DPH-L133   | DPH-L114                        | DPH-L154                        |
| Rated pressure         | -1 to +10bar<br>(-0.1 to +1.0MPa)  | 0 to +10bar (0 to +1.0MPa) | 0 to +35bar (0 to +3.5MPa)   | 0 to +100bar<br>(0 to +10.0MPa) | 0 to +500bar<br>(0 to +50.0MPa) |
| Power supply           | 12 to 24VDC $\pm 10\%$   |                            |  |                                 |                                 |
| Output                 | 2 PNP or NPN open-collector transistors, max. 50mA   |                            |  |                                 |                                 |
| Analog voltage output  | Output voltage 1 to 5V<br>Zero point: within $1V \pm 5\%$ F.S. (note 1)<br>Span: $4V \pm 0.5\%$ F.S.<br>Linearity: within $\pm 0.1\%$ F.S.<br>Load impedance: approx. $1k\Omega$ |                            | Output current: 4 to 20mA<br>Zero point: within $4mA \pm 1.0\%$ F.S. (note 2)<br>Span: $16mA \pm 1.5\%$ F.S.<br>Linearity: within $\pm 0.1\%$ F.S.<br>Load resistance: max. $250k\Omega$ |                                 |                                 |
| Response time          | 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1000ms, 5000ms selectable by key operation   |                            |  |                                 |                                 |
| Protection             | IP40 (IEC)   |                            |  |                                 |                                 |
| Ambient temperature    | -10 to +50°C   |                            |  |                                 |                                 |
| Material               | Enclosure: PBT, LCD display: acrylic; Mounting threaded part: brass (nickel plated), Switch part: silicone rubber  |                            |  |                                 |                                 |
| Connection method      | Connector  |                            |  |                                 |                                 |
| Dimensions (HxWxD)     | 30x30x25.5mm   |                            |  |                                 |                                 |
| Accessories            | CN-66A-C2 Cable, 2m with connector attached, Pressure unit label: 1 set  |                            |  |                                 |                                 |

#### Notes:

- 1.) DPH-L113V: Zeropoint within  $1.364V \pm 0.5\%$  F.S.
- 2.) DPH-L113V: Zeropoint within  $5.465mA \pm 1.0\%$  F.S.

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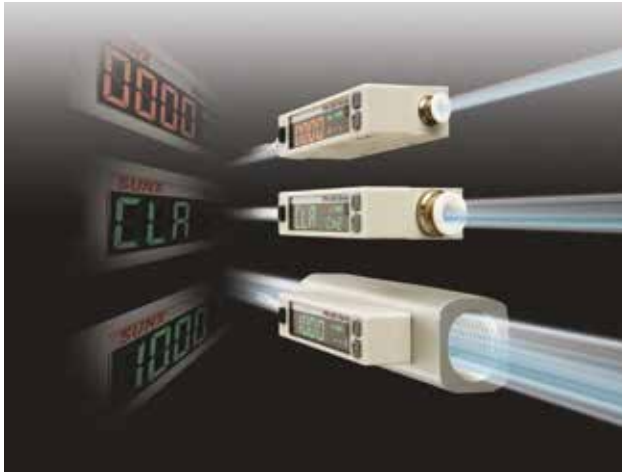
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FM-200



# FM-200

Flow sensor with dual display

## Features

### ■ Easy-to-read, 2-color display with sub display

The 2-color digital display lets you check the operation status of the **FM-200** at a glance. The use of color makes it easy to distinguish between measurement values and functionality.

### ■ High precision of $\pm 3\%$ F.S.

Micro Electro Mechanical System (MEMS) technology allows the sensor to be mounted on a silicon sensor chip. The advantages are as follows: an extremely small heat capacity, a high precision of  $\pm 3\%$  F.S., and a high-speed response time. Two temperature sensors, one on either side of the heater, detect heat distribution and make bidirectional detection possible.

### ■ One sensor for both intake and exhaust

A single sensor can detect flows bidirectionally, or the forward or reverse direction only, making it suitable for a variety of applications.

### ■ Analog voltage output

1 to 5V analog voltage output is incorporated.

### ■ Integrated output and pulse output mode incorporated

The FM-200 series can control and manage flows for a wide variety of applications. The integrated output mode will turn the output ON or OFF at the specified integrated value, allowing you to control air blowing volumes, for example. In pulse output mode, a pulse is generated once at each specified integrated value, allowing you to monitor the amount of air consumed, for example with an ECO-POWER METER.

### ■ Integrated value reset function

In integrated mode, values accumulate over time. As soon as the limit is reached, the digital output is set. This limit value can also be reset by an external input.

### ■ Rattle prevention function

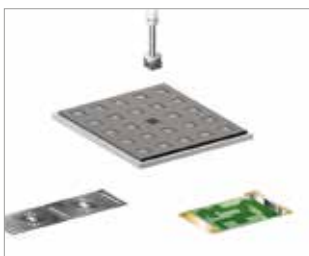
To prevent rattling from rapid changes in flow or from noise, the response time can be set to one of seven steps, from 50ms to approximately 1500ms. The display update period can be changed to 250ms, 500ms or 1000ms in order to eliminate flickering.

### ■ ECO mode

In ECO mode, the backlight is turned off after approximately one minute if no operation occurs to reduce power consumption.

## Typical applications

### Checking suction



### Checking seating



### Monitoring air blowing and purge gas





## Technical specifications

| Type                                     |            | Plastic housing  |            |            |            |            |            |
|--|------------|--|------------|------------|------------|------------|------------|
| Model no.                                | PNP output | FM-252-4-P   | FM-213-4-P | FM-253-4-P | FM-214-4-P | FM-254-8-P | FM-215-8-P |
|  | NPN output | FM-252-4   | FM-213-4   | FM-253-4   | FM-214-4   | FM-254-8   | FM-215-8   |
| Full scale flow rate                     |            | 500ml/min  | 1.0l/min   | 5l/min     | 10l/min    | 50l/min    | 100l/min   |
| Display range                            |            | ±9999999ml   |            | ±99999.99l |            | ±999999.9l |            |
| Setting and display resolution           |            | 1ml/min  |            | 0.01l/min  |            | 0.1l/min   |            |
| Rated pressure                           |            | -0.9 to +7bar (-0.09 to +0.7MPa)   |            |            |            |            |            |
| Pressure resistance                      |            | 10bar (1.0MPa)   |            |            |            |            |            |
| Applicable fluid                         |            | Clean air, compressed air, nitrogen gas  |            |            |            |            |            |
| Linearity                                |            | 3%FS.  |            |            |            |            |            |
| Response time                            |            | 50ms to 1.5s selectable  |            |            |            |            |            |
| Power supply                             |            | 12 to 24VDC ±10%   |            |            |            |            |            |
| Output                                   |            | PNP or NPN open-collector transistor, max. 50mA  |            |            |            |            |            |
| Output modes                             |            | Output OFF mode, window comparator mode, hysteresis mode, integrated output mode, integrated pulse output mode |            |            |            |            |            |
| Analog voltage output                    |            | 1.0 to 5.0V  |            |            |            |            |            |
| Rated current consumption (without load) |            | Normal mode: max. 60mA, ECO mode: max. 40mA  |            |            |            |            |            |
| Protection                               |            | IP40 (IEC)   |            |            |            |            |            |
| Ambient temperature                      |            | 0 to +50°C   |            |            |            |            |            |
| Material                                 |            | Plastic  |            |            |            |            |            |
| Connection method                        |            | Cable with connector enclosed, 1m  |            |            |            |            |            |
| Dimensions (HxWxD)                       |            | 37x55x17mm   |            |            |            | 43x55x17mm |            |
| Temperature characteristics              |            | Within ±0.2% F.S./°C (+15°C to +35°C)  |            |            |            |            |            |
| Port size                                |            | ø4 push-in   |            |            |            | ø8 push-in |            |

| Type                                     |            | Aluminum housing   |                  |                   |                  |
|--|------------|--|------------------|-------------------|------------------|
| Model no.                                | PNP output | FM-255-AR2-P   | FM-255-AG2-P     | FM-216-AR2-P      | FM-216-AG2-P     |
|  | NPN output | FM-255-AR2   | -                | FM-216-AR2        | -                |
| Full scale flow rate                     |            | 500l/min   |                  | 1000l/min         |                  |
| Display range                            |            | ±999999.9l   |                  |                   |                  |
| Setting and display resolution           |            | 1l/min   |                  |                   |                  |
| Rated pressure                           |            | -0.9 to +7bar (-0.09 to +0.7MPa)   |                  |                   |                  |
| Pressure resistance                      |            | 10bar (1.0MPa)   |                  |                   |                  |
| Applicable fluid                         |            | Clean air, compressed air, nitrogen gas  |                  |                   |                  |
| Linearity                                |            | 3%FS.  |                  |                   |                  |
| Response time                            |            | 50ms to 1.5s selectable  |                  |                   |                  |
| Power supply                             |            | 12 to 24VDC ±10%   |                  |                   |                  |
| Output                                   |            | PNP or NPN open-collector transistor, max. 50mA  |                  |                   |                  |
| Output modes                             |            | Output OFF mode, window comparator mode, hysteresis mode, integrated output mode, integrated pulse output mode |                  |                   |                  |
| Analog voltage output                    |            | 1.0 to 5.0V  |                  |                   |                  |
| Rated current consumption (without load) |            | Normal mode: max. 60mA, ECO mode: max. 40mA  |                  |                   |                  |
| Protection                               |            | IP40 (IEC)   |                  |                   |                  |
| Ambient temperature                      |            | 0 to +50°C   |                  |                   |                  |
| Material                                 |            | Resin/Aluminum body type   |                  |                   |                  |
| Connection method                        |            | Cable with connector enclosed, 1m  |                  |                   |                  |
| Dimensions (HxWxD)                       |            | 50x80x30mm   |                  |                   |                  |
| Temperature characteristics              |            | Within ±0.2% F.S./°C (+15°C to +35°C)  |                  |                   |                  |
| Port size                                |            | Rc½ female thread  | G½ female thread | Rc½ female thread | G½ female thread |
| Accessories                              |            | CN-F15-C1 cable, 1m with attached connector  |                  |                   |                  |

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GX-300



# GX-300

## Cylindrical inductive sensor with IO-Link

### Features

#### High Response frequency

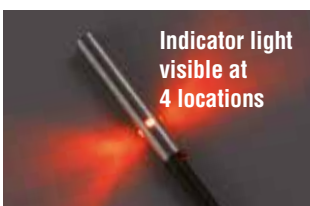
The **GX-303S** boasts a response frequency of 5kHz and realizes high speed response. The response frequency of other sensor models has been also improved by up to 4 times as compared to our conventional models. Since the GX-300 series responds quickly to sensor ON/OFF judgement, it works well with a high-speed application and contributes to the reduction of equipment cycle time.



#### Indicator visible 360 degrees

In the small-diameter type sensors, the indicator light is visible at 4 locations. In the M8 and larger threaded type sensors, the high-brightness indicator and the resin containing dispersing agent allow the confirmation of the indicator from any angle to facilitate the cumbersome adjustment of installation position. The green indicator flashes during IO-Link communication.

##### Small-diameter type



##### M8 / M12 / M18 / M30 threaded type



| Type                                     | Response frequency of our conventional model | Significant improvement over conventional models! | Response frequency of GX-300 standard sensing range type |
|--|--|---|--|
| ø3mm                                     | —  |   | 5kHz (GX-303S)   |
| ø4 mm* Conventional model: ø3.8 / ø4.4mm | 1kHz   | 4 times   | 4kHz (GX-304S)   |
| ø5.4 mm                                  | 1.5kHz                                       | 2.7 times   | 4kHz (GX-305S)   |
| M5 threaded                              | 1kHz   | 4 times   | 4kHz (GX-305M)   |
| M8 threaded                              | 1kHz   | 2 times   | 2kHz (GX-308M)   |
| M12 threaded                             | 450Hz  | 3.3 times   | 1,500Hz (GX-312M)  |
| M18 threaded                             | 300Hz  | 2 times   | 600Hz (GX-318M)  |

#### Extensive line up

The **GX-300** series includes 310 different sensor models. We offer various types of sensor models such as the cable type (cable length: 2m or 5m) connector type and pigtailed type. Furthermore, we can supply bending-resistant cable type models (cable length : 2m or 5m), which are suitable for installation on moving parts.

##### Cable type



##### Connector type



##### Pigtailed type



## IOT ready

With the implemented IO-Link technology network integration is easy. The IO-Link models can be used as normal digital PNP output sensors or providing information about the sensor level

or the current sensor condition via IO-Link interface. This is perfect for predictive maintenance and applications with higher expectations.

## Typical applications



IO-Link Sensors

Photoelectric Sensors

Fiber-optic Sensors

Standard Fibers

Fiber Sensors Communication Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &amp; Flow Sensors

Inductive Proximity Sensors

Measurement Sensors

Ionizers / Electrostatic Sensors

Accessories

## Technical specifications

### DC 3-wire type (Small-diameter, shielded type)

| Type                             | Non-threaded type   |             |             | Threaded type |             |
|----------------------------------|---|-------------|-------------|---------------|-------------|
| Model No. (note 2)               | Normally Open   | GX-303S-A-□ | GX-304S-A-□ | GX-305S-A-□   | GX-305M-A-□ |
|                                  | Normally closed   | GX-303S-B-□ | GX-304S-B-□ | GX-305S-B-□   | GX-305M-B-□ |
| Rated sensing distance           | 0.8mm   | 1.0mm       | 1.2mm       | 1.0mm         |             |
| Stable sensing distance (note 3) | 0 to 0.56mm   | 0 to 0.84mm | 0 to 0.7mm  | 0 to 0.84mm   |             |
| Standard sensing object (note 7) | 3x3mm   | 4x4mm       | 5.4x5.4mm   | 4x4mm         |             |
| Hysteresis                       | Max. 15% of measurement distance  |             |             |               |             |
| Supply voltage (note 4)          | 10-30V DC ±10% (note1)  |             |             |               |             |
| Current consumption              | max. 10mA   |             |             |               |             |
| Control output                   | PNP / NPN open-collector transistor, 100mA (note2)  |             |             |               |             |
| Response Frequency (note 5)      | 5kHz  | 4kHz        |             |               |             |
| Protection                       | IP67 (IEC)  |             |             |               |             |
| Ambient temperature              | -25 to +70°C  |             |             |               |             |
| Dimension (HxWxD)                | Ø3x27.1mm   | Ø4x25.1mm   | Ø5.4x25.1mm | M8x25.1mm     |             |
| Material                         | Case: Stainless steel (SUS303) [Brass (Nickel plated) for GX-305S],<br>Sensing part: Heat-resistant ABS |             |             |               |             |
| Connection method (note 6)       | Cable, 2m or 5m; M12 connector type; pigtail type   |             |             |               |             |

#### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -N =NPN type, Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable  
Suffix -J = Pigtail 0.3m with M12 connector  
Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm

GX-300

### DC 3-wire type (Shielded type)

| Type  |                             | Threaded type  |             |             |             |
|---|-----------------------------|--|-------------|-------------|-------------|
| Model No. (note 2)                              | Normally Open               | GX-308M-A-□  | GX-312M-A-□ | GX-318M-A-□ | GX-330M-A-□ |
|   | Normally closed             | GX-308M-B-□  | GX-312M-B-□ | GX-318M-B-□ | GX-330M-B-□ |
| Rated sensing distance                          |                             | 1.5mm  | 2.0mm       | 5mm         | 10mm        |
| Stable sensing distance (note 3)                |                             | 0 to 1.2mm   | 0 to 1.6 mm | 0 to 4 mm   | 0 to 8mm    |
| Standard sensing object (note 7)                |                             | 8x8mm  | 12x12mm     | 18x18mm     | 30x30mm     |
| Hysteresis                                      |                             | Max. 10% of measurement distance   |             |             |             |
| Supply voltage (note 4)                         |                             | 10-30V DC ±10% (note1)   |             |             |             |
| Current consumption                             |                             | max. 16mA  |             |             |             |
| Control output                                  |                             | PNP / NPN open-collector transistor, 200mA (note 2)  |             |             |             |
| Switching and communication line (C/Q) (note 8) | Communication specification | IO-Link specification V1.1   |             |             |             |
|   | Baud rate                   | COM3 (230.4kbit/s)   |             |             |             |
|   | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |             |             |             |
|   | Transmission cycle time     | 0.4ms  |             |             |             |
| Response Frequency (note 5)                     |                             | 2kHz   | 1.5kHz      | 0.6kHz      | 0.4kHz      |
| Protection                                      |                             | IP67 (IEC)   |             |             |             |
| Ambient temperature                             |                             | -40 to +85°C   |             |             |             |
| Dimension (HxWxD)                               |                             | M8x37.8mm  | M12x47.1mm  | M18x55.3mm  | M30x60.3mm  |
| Material  |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |             |             |             |
| Connection method (note 6)                      |                             | Cable, 2m or 5m; M12 connector type; pigtail type  |             |             |             |

#### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -N = NPN type, Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable / Suffix -J = Pigtail 0.3m with M12 connector / Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm
- IO-Link type only integrated in Normally open and PNP types = **GX-3□M-A-P**

### DC 3-wire type (Non-shielded type)

| Type  |                             | Threaded type   |              |              |              |
|---|-----------------------------|---|--------------|--------------|--------------|
| Model No. (note 2)                              | Normally Open               | GX-308ML-A-□  | GX-312ML-A-□ | GX-318ML-A-□ | GX-330ML-A-□ |
|   | Normally closed             | GX-308ML-B-□  | GX-312ML-B-□ | GX-318ML-B-□ | GX-330ML-B-□ |
| Rated sensing distance                          |                             | 2.0mm   | 5.0mm        | 10mm         | 18mm         |
| Stable sensing distance (note 3)                |                             | 0 to 1.6 mm   | 0 to 4 mm    | 0 to 8 mm    | 0 to 14.4 mm |
| Standard sensing object (note 7)                |                             | 8x8mm   | 12x12mm      | 18x18mm      | 30x30mm      |
| Hysteresis                                      |                             | Max. 10% of measurement distance  |              |              |              |
| Supply voltage (note 4)                         |                             | 10-30V DC ±10% (note1)  |              |              |              |
| Current consumption                             |                             | max. 16mA   |              |              |              |
| Control output                                  |                             | PNP / NPN open-collector transistor, 200mA (note 2)   |              |              |              |
| Switching and communication line (C/Q) (note 8) | Communication specification | IO-Link specification V1.1  |              |              |              |
|   | Baud rate                   | COM3 (230.4kbit/s)  |              |              |              |
|   | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)  |              |              |              |
|   | Transmission cycle time     | 0.4ms   |              |              |              |
| Response Frequency (note 5)                     |                             | 1kHz  | 0.8kHz       | 0.4kHz       | 0.1kHz       |
| Protection                                      |                             | IP67 (IEC)  |              |              |              |
| Ambient temperature                             |                             | -40 to +85°C  |              |              |              |
| Dimension (HxWxD)                               |                             | M8x37.8mm   | M12x47.1mm   | M18x55.3mm   | M30x60.3mm   |
| Material  |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308ML(K)-□],<br>Sensing part: Polybutylene terephthalate (PBT) |              |              |              |
| Connection method (note 6)                      |                             | Cable, 2m or 5m; M12 connector type; pigtail type   |              |              |              |

#### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -N = NPN type, Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable / Suffix -J = Pigtail 0.3m with M12 connector / Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm
- IO-Link type only integrated in Normally open and PNP types = **GX-3□ML-A-P**

## DC 3-wire type (Shielded type, long sensing range)

| Type  |                             | Threaded type  |              |              |              |
|---|-----------------------------|--|--------------|--------------|--------------|
| Model No. (note 2)                              | Normally Open               | GX-308MK-A-□   | GX-312MK-A-□ | GX-318MK-A-□ | GX-330MK-A-□ |
|   | Normally closed             | GX-308MK-B-□   | GX-312MK-B-□ | GX-318MK-B-□ | GX-330MK-B-□ |
| Rated sensing distance                          |                             | 2.0mm  | 4.0mm        | 8mm          | 15mm         |
| Stable sensing distance (note 3)                |                             | 0 to 1.6mm   | 0 to 3.2mm   | 0 to 6.4mm   | 0 to 12mm    |
| Standard sensing object (note 7)                |                             | 8x8mm  | 12x12mm      | 18x18mm      | 30x30mm      |
| Hysteresis                                      |                             | Max. 15% of measurement distance   |              |              |              |
| Supply voltage (note 4)                         |                             | 10-30V DC ±10% (note1)   |              |              |              |
| Current consumption                             |                             | max. 16mA  |              |              |              |
| Control output                                  |                             | PNP / NPN open-collector transistor, 200mA (note 2)  |              |              |              |
| Switching and communication line (C/Q) (note 8) | Communication specification | IO-Link specification V1.1   |              |              |              |
|   | Baud rate                   | COM3 (230.4kbit/s)   |              |              |              |
|   | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |              |              |              |
|   | Transmission cycle time     | 0.4ms  |              |              |              |
| Response Frequency (note 5)                     |                             | 1.5kHz   | 1.kHz        | 0.5kHz       | 0.25kHz      |
| Protection                                      |                             | IP67 (IEC)   |              |              |              |
| Ambient temperature                             |                             | -40 to +85°C   |              |              |              |
| Dimension (HxWxD)                               |                             | M8x37.8mm  | M12x47.1mm   | M18x55.3mm   | M30x60.3mm   |
| Material  |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□] Sensing part: Polybutylene terephthalate (PBT) |              |              |              |
| Connection method (note 6)                      |                             | Cable, 2m or 5m; M12 connector type; pigtail type  |              |              |              |

### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -N = NPN type, Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable / Suffix -J = Pigtail 0.3m with M12 connector / Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm
- IO-Link type only integrated in Normally open and PNP types = **GX-3□MK-A-P**

## DC 3-wire type (Non-shielded type, long sensing range)

| Type  |                             | Threaded type  |               |               |               |
|---|-----------------------------|--|---------------|---------------|---------------|
| Model No. (note 2)                              | Normally Open               | GX-308MLK-A-□  | GX-312MLK-A-□ | GX-318MLK-A-□ | GX-330MLK-A-□ |
|   | Normally closed             | GX-308MLK-B-□  | GX-312MLK-B-□ | GX-318MLK-B-□ | GX-330MLK-B-□ |
| Rated sensing distance                          |                             | 4mm  | 8mm           | 16mm          | 30mm          |
| Stable sensing distance (note 3)                |                             | 0 to 3.2 mm  | 0 to 6.4 mm   | 0 to 12.8 mm  | 0 to 24 mm    |
| Standard sensing object (note 7)                |                             | 12x12mm  | 24x24mm       | 48x48mm       | 90x90mm       |
| Hysteresis                                      |                             | Max. 15% of measurement distance   |               |               |               |
| Supply voltage (note 4)                         |                             | 10-30V DC ±10% (note1)   |               |               |               |
| Current consumption                             |                             | max. 16mA  |               |               |               |
| Control output                                  |                             | PNP / NPN open-collector transistor, 200mA (note 2)  |               |               |               |
| Switching and communication line (C/Q) (note 8) | Communication specification | IO-Link specification V1.1   |               |               |               |
|   | Baud rate                   | COM3 (230.4kbit/s)   |               |               |               |
|   | Process data                | PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE2_2)   |               |               |               |
|   | Transmission cycle time     | 0.4ms  |               |               |               |
| Response Frequency (note 5)                     |                             | 1.5kHz   | 1.kHz         | 0.5kHz        | 0.25kHz       |
| Protection                                      |                             | IP67 (IEC)   |               |               |               |
| Ambient temperature                             |                             | -40 to +85°C   |               |               |               |
| Dimension (HxWxD)                               |                             | M8x37.8mm  | M12x47.1mm    | M18x55.3mm    | M30x82.3mm    |
| Material  |                             | Case: Nickel-plated brass [stainless steel (SUS303) for GX-308M(K)-□] Sensing part: Polybutylene terephthalate (PBT) |               |               |               |
| Connection method (note 6)                      |                             | Cable, 2m or 5m; M12 connector type; pigtail type  |               |               |               |

### Notes:

- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C
- Suffix -N = NPN type, Suffix -P = PNP type
- The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- When used at a power of 12 V, the product is less susceptible to the effects of internal self-heat generation and therefore a more stable repeat accuracy can be obtained
- The response frequency is an average value.
- Suffix -C5 = 5m cable / Suffix -J = Pigtail 0.3m with M12 connector / Suffix -Z = M12 connector type
- Standard sensing object = sheet steel, thickness: 1mm
- IO-Link type only integrated in Normally open and PNP types = **GX-3□MLK-A-P**

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GX-M



# GX-M

Cylindrical inductive sensors

## Features

### ■ 2- and 3-wire types

The **GX-M** series consists of 2- and 3-wire types. The 3-wire type is available as a shielded or non-shielded type. The 2-wire type is available as a shielded type and long-range type (up to 15mm). Reduced wiring efforts and space-saving installation reduce costs.

### ■ Various cylinder and thread types

M8, M12, M18 and M30 types means the GX-M series can be used to solve a wide range of automation task. Space-saving, case-by-case integration in production lines, testing and manual work stations.

### ■ Several connection possibilities

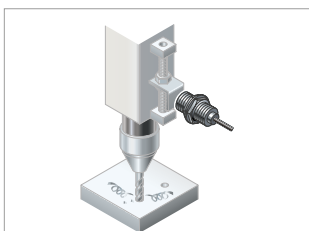
You can connect the GX-M sensor with either a 2m cable or M12 plug-in connector.

### ■ Special applications

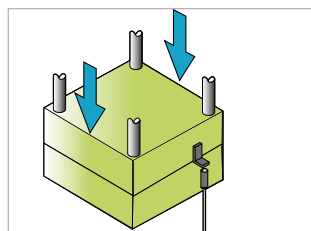
IP69K (DIN) and IP68 (IEC) types are also available, e.g. for use in machine systems, i.e. the food processing machinery.

## Typical applications

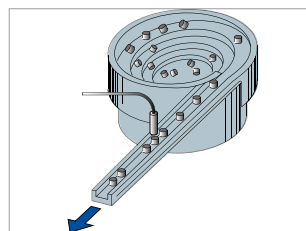
### Control drilling depth



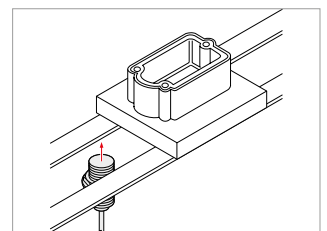
### Detect how far press lowers



### Count parts



### Control position of components



## Technical specifications

### 3-wire type

| Type                             | Shielded  |  |                        |                        | Unshielded              |                         |                         |          |
|----------------------------------|---|--|------------------------|------------------------|-------------------------|-------------------------|-------------------------|----------|
|                                  | GX-M8 (-A/-B)(-P)(-Z) (note 1,2,3)                                      | GX-M12 (-A/-B)(-P)(-Z)   | GX-M18 (-A/-B)(-P)(-Z) | GX-M30 (-A/-B)(-P)(-Z) | GX-MK12 (-A/-B)(-P)(-Z) | GX-MK18 (-A/-B)(-P)(-Z) | GX-MK30 (-A/-B)(-P)(-Z) |          |
| Rated sensing distance (note 4)  | 1.5mm ±10%  | 2mm ±10%   | 5mm ±10%               | 10mm ±10%              | 7mm ±10%                | 12mm ±10%               | 22mm ±10%               |          |
| Stable sensing distance (note 5) | 0 to 1.2mm  | 0 to 1.6mm   | 0 to 4mm               | 0 to 8mm               | 0 to 5.6mm              | 0 to 9.6mm              | 0 to 17.6mm             |          |
| Standard sensing object (note 6) | 8x8mm   | 12x12mm  | 18x18mm                | 30x30mm                | 24x24mm                 | 24x24mm                 | 45x45mm                 |          |
| Hysteresis                       | Max. 15% of measurement distance  |  |                        |                        |                         |                         |                         |          |
| Repeatability                    | Along sensing axis: max. 5% of measurement distance                     |  |                        |                        |                         |                         |                         |          |
| Power supply                     | 12 to 24VDC ±10%  |  |                        |                        |                         |                         |                         |          |
| Output                           | Open collector transistor max. 200mA (note 2)                           |  |                        |                        |                         |                         |                         |          |
| Output operation                 | Normally closed (N.C.) or Normally open (N.O.) (note 1)                 |  |                        |                        |                         |                         |                         |          |
| Switching frequency              | 5kHz  | 5kHz   | 2kHz                   | 1kHz                   | 2.5kHz                  | 1kHz                    | 0.5kHz                  |          |
| Protection                       | IP67 (IEC)  | IP69K (DIN), IP68 (IEC) 2m cable type; IP67 (IEC) M12 connector type |                        |                        |                         |                         |                         |          |
| Ambient temperature              | -25 to +70°C  |  |                        |                        |                         |                         |                         |          |
| Material                         | Enclosure: Brass (nickel plated), Sensing part: PPS (polyphenylsulfide) |  |                        |                        |                         |                         |                         |          |
| Connection method                | Cable, 2m or M12 plug-in connector type (note 3)                        |  |                        |                        |                         |                         |                         |          |
| Dimensions (ØxL)                 | 2m cable  | M8x33mm  | M12x35mm               | M18x39mm               | M30x43mm                | M12x55mm                | M18x60mm                | M30x63mm |
|                                  | M12 connector   | M8x45mm  | M12x50mm               | M18x50mm               | M30x55mm                | M12x66mm                | M18x72mm                | M30x74mm |
| Accessories                      | Nuts 2 pcs.   |  |                        |                        |                         |                         |                         |          |

#### Notes:

- 1.) Suffix-A = Normally open type, suffix B= Normally closed type; i.e. **GX-M8B**
- 2.) Suffix-P = PNP type, without suffix = NPN type; i.e. **GX-M8B**
- 3.) Without suffix = 2m cable, suffix -Z = M12 connector type; i.e. **GX-M8B-P-Z**
- 4.) The specified rated sensing distance refers to the standard sensing object
- 5.) The specified stable sensing distance is the range in which the sensor works reliably even in case of deviations in temperature or voltage
- 6.) Standard sensing object = sheet steel, thickness: 1mm

### 2-wire type

| Type                             | Shielded  |  |                      |                      |                        |  |                       |                        |          |
|----------------------------------|---|--|----------------------|----------------------|------------------------|--|-----------------------|------------------------|----------|
|                                  | Standard sensing distance   |  |                      |                      | Large sensing distance |  |                       |                        |          |
| Model no.                        | GX-M8(-A/-B)-U (note 1, 2)  | GX-M12(-A/-B)-U (-Z)   | GX-M18(-A/-B)-U (-Z) | GX-M30(-A/-B)-U (-Z) | GX-ML8(-A/-B)-U        | GX-ML12(-A/-B)-U (-Z)                            | GX-ML18(-A/-B)-U (-Z) | GX-ML30 (-A/-B)-U (-Z) |          |
| Rated sensing distance (note 3)  | 1.5mm ±10%  | 2mm ±10%   | 5mm ±10%             | 10mm ±10%            | 2.5mm ±10%             | 4mm ±10%   | 8mm ±10%              | 15mm ±10%              |          |
| Stable sensing distance (note 4) | 0 to 1.2mm  | 0 to 1.6mm   | 0 to 4mm             | 0 to 8mm             | 0 to 2mm               | 0 to 3.2mm                                       | 0 to 6.4mm            | 0 to 12mm              |          |
| Standard sensing object (note 5) | 8x8mm   | 12x12mm  | 18x18mm              | 30x30mm              | 8x8mm                  | 12x12mm  | 18x18mm               | 30x30mm                |          |
| Hysteresis                       | Max. 15% of measurement distance  |  |                      |                      |                        |  |                       |                        |          |
| Repeatability                    | Along sensing axis: max. 5% of measurement distance                                       |  |                      |                      |                        |  |                       |                        |          |
| Power supply                     | 12 to 24VDC ±10%  |  |                      |                      |                        |  |                       |                        |          |
| Output                           | Non-contact DC 2-wire type, sink current 1.5 to 100mA, residual voltage max 4.2V (note 6) |  |                      |                      |                        |  |                       |                        |          |
| Output operation                 | Normally closed (N.C.) or Normally open (N.O.) (note 1)                                   |  |                      |                      |                        |  |                       |                        |          |
| Switching frequency              | 1kHz  | 1kHz   | 1.2kHz               | 1.3kHz               | 1.1kHz                 | 1.3kHz   | 1.5kHz                | 0.8kHz                 |          |
| Protection                       | IP67 (IEC)  | IP69K (DIN), IP68 (IEC) 2m cable type; IP67 (IEC) M12 connector type |                      |                      |                        |  |                       |                        |          |
| Ambient temperature              | - 25 to +70°C   |  |                      |                      |                        |  |                       |                        |          |
| Material                         | Enclosure: Brass (nickel plated), Sensing part: PPS (polyphenylsulfide)                   |  |                      |                      |                        |  |                       |                        |          |
| Connection method                | Cable, 2m   | Cable, 2m or M12 plug-in connector type (note 2)                     |                      |                      | Cable, 2m              | Cable, 2m or M12 plug-in connector type (note 2) |                       |                        |          |
| Dimensions (ØxL)                 | 2m cable  | M8x33mm  | M12x35mm             | M18x39mm             | M30x43mm               | M8x33mm  | M12x35mm              | M18x39mm               | M30x43mm |
|                                  | M12 connector   | -  | M12x50mm             | M18x50mm             | M30x55mm               | -  | M12x50mm              | M18x50mm               | M30x55mm |
| Accessories                      | Nuts 2 pcs.   |  |                      |                      |                        |  |                       |                        |          |

#### Notes:

- 1.) Suffix-A = Normally open type, suffix B= Normally closed type; i.e. **GX-M8B-U**
- 2.) Without suffix = 2m cable, suffix -Z = M12 connector type; i.e. **GX-M8B-P-Z**
- 3.) The specified rated sensing distance refers to the standard sensing object
- 4.) The specified stable sensing distance is the range in which the sensor works reliably even in case of temperature or voltage deviations
- 5.) Standard sensing object = sheet steel, thickness: 1mm
- 6.) If you extend the cable residual voltage may rise

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Measurement Sensors

Ionizers / Electrostatic Sensors

Accessories

GX-M



# GX-F/H

Stable sensing of work pieces

## Features

### ■ Environmental resistance

This sensor has a long stable sensing range. It is easy to install.

- › IP68g protection: water and oil-resistant
- › Space-saving installation
- › A metal sleeve ensures a secure installation

The new, integrated construction method improves environmental resistance performance.

### ■ The LED indicators are easy to see

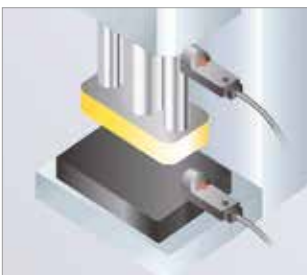
A prism with a wide field of view has been developed, thereby greatly improving the visibility of the operation indicators.

### ■ Stable detection

- › Large sensing range
- › Max. deviation at max. sensing range:  $\pm 8\%$
- › Max. deviation with temperature changes:  $\pm 8\%$

## Typical applications

### Checking up/down operation of compact molding equipment



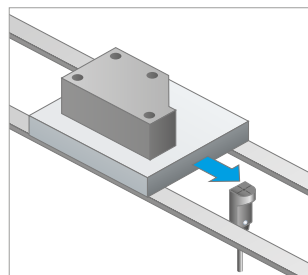
Shock resistance: 5000G

### Sensing presence of metallic objects on a part feeder

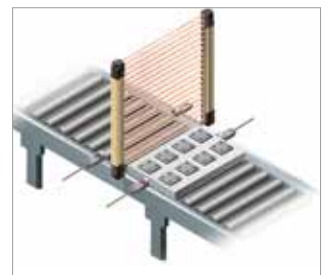


Vibration resistance: 500Hz

### Positioning metal pallets



### Muting control with light curtains





## Technical specifications

| Model no.                           | Side sensing  | GX-F6 (-A/-B)(-I)(-P)<br>(note 1,2,3) | GX-F8 (-A/-B)(-I)(-P) | GX-F12 (-A/-B)(-I)(-P) | GX-F15(-A/-B)(-I)(-P)  | GX-FL15 (-A/-B)(-I)(-P) |
|-------------------------------------|---|---------------------------------------|-----------------------|------------------------|------------------------|-------------------------|
|                                     | Top sensing   | GX-H6 (-A/-B)(-I)(-P)                 | GX-H8 (-A/-B)(-I)(-P) | GX-H12 (-A/-B)(-I)(-P) | GX-H15 (-A/-B)(-I)(-P) | GX-HL15 (-A/-B)(-I)(-P) |
| Max. operating distance<br>(note 4) |   | 1.6mm ±8%                             | 2.5mm ±8%             | 4mm ±8%                | 5mm ±8%                | 8mm ±8%                 |
| Stable sensing distance<br>(note 5) |   | 0 to 1.3mm                            | 0 to 2.1mm            | 0 to 3.3mm             | 0 to 4.2mm             | 0 to 6.7mm              |
| Standard sensing object<br>(note 6) |   | 12x12mm                               | 15x15mm               | 20x20mm                | 20x20mm                | 30x30mm                 |
| Repeatability                       | Min. 0.04mm   |                                       |                       |                        |                        |                         |
| Interference prevention             | Alternate frequency (note 2)                        |                                       |                       |                        |                        |                         |
| Power supply                        | 12 to 24V DC +10% / -15%                            |                                       |                       |                        |                        |                         |
| Output                              | PNP / NPN open-collector transistor, 100mA (note 3) |                                       |                       |                        |                        |                         |
| Output operation                    | Normally closed (NC) or Normally open (NO) (note 1) |                                       |                       |                        |                        |                         |
| Switching frequency                 | 400Hz   | 500Hz                                 |                       | 250Hz                  | 150Hz                  |                         |
| Protection                          | IP68 (IEC)  |                                       |                       |                        |                        |                         |
| Ambient temperature                 | -25 to +70°C  |                                       |                       |                        |                        |                         |
| Material                            | Enclosure: PBT, display: polyester                  |                                       |                       |                        |                        |                         |
| Connection method                   | Cable, 1m   |                                       |                       |                        |                        |                         |
| Dimensions<br>(HxWxD)               | Side sensing  | 6x6x24.5mm                            | 7.4x8x23mm            | 7.1x12x27.8mm          | 8x15x31.5mm            |                         |
|                                     | Top sensing   | 6x6x25mm                              | 8.2x8x25mm            | 12x12x27.4mm           | 16.5x15x29.5mm         |                         |

### Notes:

- 1.) Suffix-A = Normally open type, suffix B= Normally closed type; i.e. **GX-F6B**
- 2.) Suffix-I = Alternate frequency type (interference prevention) i.e. **GX-F6BI**
- 3.) Without suffix = NPN type, P = PNP type; i.e. **GX-F6BI-P**
- 4.) The specified rated sensing distance refers to the standard sensing object
- 5.) The specified stable sensing distance is the range in which the sensor works reliably even in case of temperature or voltage deviations
- 6.) Standard sensing object = sheet steel, thickness: 1mm

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HG-S



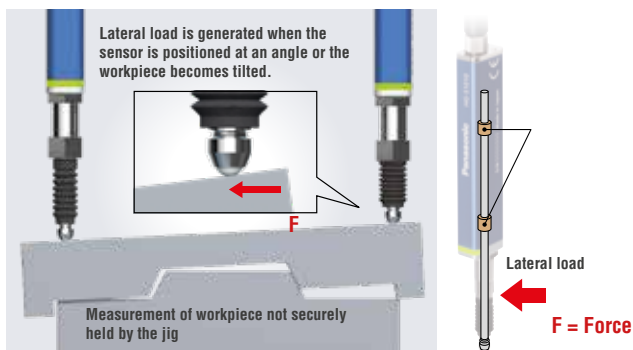
# HG-S

Slim and robust contact  
measurement sensor

## Features

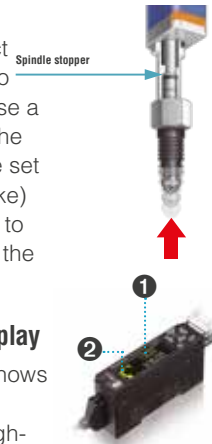
### ■ Larger measurement range

The new sensor head **HG-S1032** has a measurement range of 32mm with an indication accuracy of 3µm. All types are equipped with two plain bearings, one at the top and one at the bottom. The sensor can withstand more than 100 million sliding operations under application of lateral load (reference value). The two plain bearings increase the resistance to mechanical stress from the side and ensure the accuracy of measuring results even under lateral load.



### ■ Spindle stopper against damage

Even when a sudden upward thrust impact occurs, the resulting load is applied only to the lower section of the sensor unit because a spindle stopper minimizes the impact on the glass scales. Additionally an alarm can be set to notify the user of an upward thrust (stroke) that exceeds the set level. This allows you to conduct a preventive maintenance before the sensor head generates a malfunction.



- 1.) Dual display for more flexibility
- 2.) Copy function from master to slave units

### ■ Easy-to-understand 2-line digital display

The 2-line digital display simultaneously shows head measurement (measured value) and judgment value (calculated value). The high-contrast LCD provides sharp and clear indications and offers a wide viewing angle. Secondary display line: Displays sensor head measurement and other data. Main display line: displays judgment value.

### ■ Serial connection of up to 15 slave units

One master unit can be connected in series with up to 15 slave units in any order. This allows easy multi-point calculations. End plates (optional) must be mounted on both sides of the controller after the connection of slave units.



## Typical applications

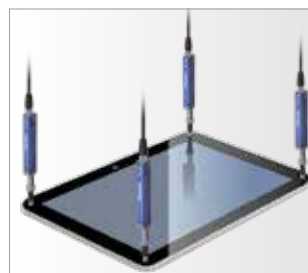
### Coupling assembly inspection



### Transmission parts height measurement



### Flat screen flatness measurement



## Technical specifications

### Sensor heads

| Type                             | General purpose  |                            |  | High precision   |                            |  | General purpose  |                             |
|----------------------------------|--|----------------------------|--|--|----------------------------|--|--|-----------------------------|
|                                  | Standard type  | Low measuring force type   | Air driven type  | Standard type  | Low measuring force type   | Air driven type  |  | Standard type               |
| Model no.                        | HG-S1010   | HG-S1010R                  | HG-S1010-AC  | HG-S1110   | HG-S1110R                  | HG-S1110-AC  | HG-S1032   |                             |
| Measurement range                | 10mm (note 1)  |                            |  |  |                            |  | 32mm   |                             |
| Measuring force (note 2, note 3) | Downward mount   | Max. 1.65N, 1.1N (note 4)  | Max. 0.35N, 0.3N (note 4)  | 0.14 to 0.16 MPa<br>Dependent on applied pressure  | Max. 1.65N, 1.1N (note 4)  | Max. 0.35N, 0.3N (note 4)  | 0.14 to 0.16 MPa<br>Dependent on applied pressure  | Max. 2.97N, 1.90N (note 4)  |
|                                  | Upward mount   | Max. 1.35N, 0.85N (note 4) | –  |  | Max. 1.35N, 0.85N (note 4) | –  |  | Max. 2.09N, 1.19N (note 4)  |
|                                  | Side mount   | Max. 1.5 N, 0.95N (note 4) | Max. 0.25N, 0.2N (note 4)  |  | Max. 1.5 N, 0.95N (note 4) | Max. 0.25N, 0.2N (note 4)  |  | Max. 2.53 N, 1.50N (note 4) |
| Resolution                       | 0.5µm  |                            |  | 0.1µm  |                            |  | 0.5µm  |                             |
| Accuracy                         | Full range: max. 2.0µm<br>Narrow range: max. 1.0µm (any 60µm)  |                            | Full range: 2.0 µm,<br>Limited range: 1.0 µm   | Full range: max. 1.0µm<br>Narrow range: max. 0.5µm (any 60µm)  |                            | Full range: 1.0 µm<br>Limited range: 0.5 µm  | Full range: max. 3.0 µm<br>Narrow range: max. 2.0µm (any 60µm)   |                             |
| Protection                       | IP67 (IEC, note 5)   |                            | IP67 (IEC) (Note 8)  | IP67 (IEC, note 5)   |                            | IP67 (IEC) (Note 8)  | IP67 (IEC, note 5)   |                             |
| Ambient temperatur               | -10 to +55°C   |                            |  |  |                            |  |  |                             |
| Material                         | Body: zinc, holder: stainless steel; spindle: tool steel; probe (note 6): ceramic; rubber bellows: NBR (black) |                            | Body: zinc, holder: stainless steel, spindle: tool steel, probe (note 7): ceramic, Air tube clamp: S60CM | Body: zinc, holder: stainless steel; spindle: tool steel; probe (note 6): ceramic; rubber bellows: NBR (black) |                            | Body: zinc, holder: stainless steel, spindle: tool steel, probe (note 7): ceramic, Air tube clamp: S60CM | Body: zinc, holder: stainless steel; spindle: tool steel; probe (note 6): ceramic; rubber bellows: NBR (black) |                             |
| Connection method                | Connector (note 7)   |                            |  |  |                            |  |  |                             |
| Dimensions (HxWxD)               | 135.5x11x18mm  |                            | 125x11x18mm  | 135.5x11x18mm  |                            | 125x11x18mm  | 217x17.5x27mm  |                             |

#### Notes:

- 1.) 5 to 10mm range when low measurement force type (HG-S1010R / HG-S1110R / HG-S1032) is mounted in upward mount
- 2.) Measured at an ambient temperature of +20°C
- 3.) In the case of low measuring force type (HG-S1010R / HG-S1110R), measurements were obtained with products in standard configuration without rubber bellows
- 4.) Typical value near center of measurement
- 5.) Excludes damage and deterioration to rubber bellows due to external causes
- 6.) Different probes (optional) are also available
- 7.) Please order sensor head connection cable separately
- 8.) Seal Cap has to be applied

### Controllers

| Type                         | Master unit   |            | Slave unit    |            |
|------------------------------|---|------------|---------------|------------|
|                              | High-performance type   |            | Standard type |            |
| Model no.                    | NPN output  | HG-SC101   | HG-SC111      | HG-SC112   |
|                              | PNP output  | HG-SC101-P | HG-SC111-P    | HG-SC112-P |
| Supply voltage               | 24V DC ±10% (note1)   |            |               |            |
| Current consumption (note 2) | Max. 70mA when sensor head is connected                         |            |               |            |
| Response time                | 3ms, 5ms, 10ms, 100ms, 500ms, 1000ms switching type             |            |               |            |
| Control output               | NPN or PNP open collector transistor, max. 50 mA                |            |               |            |
| Analog output (note 3)       | 4-20mA  |            |               |            |
| Protection                   | IP40 (IEC)  |            |               |            |
| Ambient temperature          | -10 to +50°C  |            |               |            |
| Dimension (HxWxD)            | 43.1x86x21.1mm  |            |               |            |
| Material                     | Case: Polycarbonate, Cover: Polycarbonate, Switches: Polyacetal |            |               |            |
| Connection method            | Cable, 2m   |            |               |            |

#### Notes:

- 1.) Where measurement conditions have not been specified precisely, the conditions used were as follows: supply voltage 24 V DC, ambient temperature +20°C
- 2.) Current consumption does not include analog current output
- 3.) Linearity F.S. = 16 mA, and is linearity with respect to digitally measured values

### Sensor head connection cable

| Type      | Straight connector  |          |          | L-shaped connector  |           |            |
|-----------|---|----------|----------|---|-----------|------------|
|           | CN-HS-C3  | CN-HS-C7 | CN-HS-C7 | CN-HS-C3L   | CN-HS-C7L | CN-HS-C20L |
| Model no. |   |          |          |   |           |            |
|           |  |          |          |  |           |            |
| Length    | 3m  | 7m       | 20m      | 3m  | 7m        | 20m        |

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HG-S



# HG-C

Reliable detection with repeatability of 10 $\mu$ m

## Features

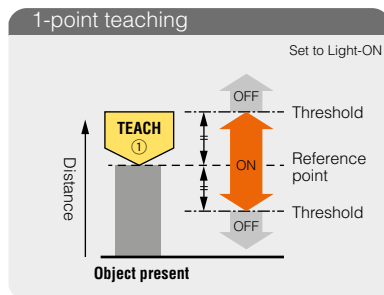
### ■ Equipped with 0-5V analog output

The sensor not only indicates measured values in mm, but also outputs analog voltage. The data can be used for various calculations and storage (logging) when the output is sent to a PLC + analog unit.

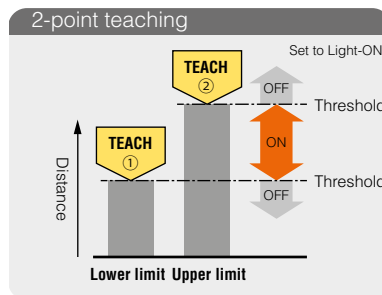
### ■ Configurable external input

The external input can be configured to perform one of four functions: "zero set", "teaching", "emission stop" and "selecting trigger function".

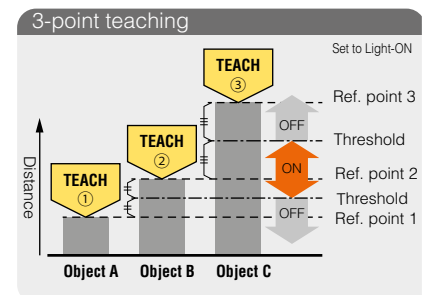
### ■ Teaching & window comparator mode



Perform 1-point teaching and the threshold range is set for the distance from the reference surface of the object to be detected.



Press TEACH once for the lower (first point) and once for the upper limit (second point). This is useful for detecting objects at different distances.



This is the method to set the threshold range by conducting the teaching at 3 points (detecting object A, B and C). After teaching, the reference points are automatically sorted in ascending order (reference point 1, 2 and 3). The thresholds are set at the midpoints between reference point 1 and 2, and 2 and 3, respectively. This is useful for detecting objects at different distances.

## Typical applications

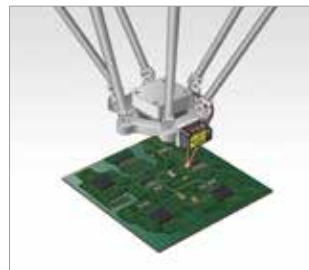
### Measuring the hoop slack



### Checking for presence of O ring



### Controlling the height of a robot



### Controlling the dispenser head height



## Technical specifications

| Measurement center type  | 30mm  | 50mm         | 100mm         | 200mm         | 400mm  |
|--------------------------|---|--------------|---------------|---------------|--|
| NPN output               | HG-C1030  | HG-C1050     | HG-C1100      | HG-C1200      | HG-C1400   |
| PNP output               | HG-C1030-P  | HG-C1050-P   | HG-C1100-P    | HG-C1200-P    | HG-C1400-P                                       |
| Applicable standards     | Conforming to EMC Directive and FDA Standard  |              |               |               |  |
| Sensing range            | 30±5mm  | 50±15mm      | 100±35mm      | 200mm ±80mm   | 400mm ±200mm                                     |
| Repeatability            | 10µm  | 30µm         | 70µm          | 200µm         | 300µm (200-400mm)<br>800µm (400-600mm)           |
| Linearity                | ±0.1% F.S.  |              |               | ±0.2% F.S.    | ±0.2% F.S. (200-400mm)<br>±0.3% F.S. (400-600mm) |
| Beam diameter            | Approx. 50µm  | Approx. 70µm | Approx. 120µm | Approx. 300µm | Approx. 500µm                                    |
| Supply voltage           | 12 to 24V DC ±10%   |              |               |               |  |
| Control output           | PNP or NPN open-collector transistor  |              |               |               |  |
| Output operation         | Either Light-ON or Dark-ON  |              |               |               |  |
| Short circuit protection | Incorporated (auto-reset)   |              |               |               |  |
| Analog output            | Voltage output: 0 to 5V (at alarm: +5.2V). Load impedance: 100Ω<br>Analog current output: Output range: 4 to 20mA (at alarm: 0mA)<br>Output impedance: 300Ω or less |              |               |               |  |
| Response time            | Switchable between high speed (1.5ms), standard (5ms), and high precision (10ms)  |              |               |               |  |
| Degree of protection     | IP67 (IEC)  |              |               |               |  |
| Ambient temperature      | -10 to +45°C (no dew condensation or icing allowed), storage: -20 to +60°C  |              |               |               |  |
| Ambient humidity         | 35 to 85% RH, at storage: 35 to 85% RH  |              |               |               |  |
| Ambient illumination     | 3000lx max. (Illumination level of light receiving surface under incandescent light)  |              |               |               |  |
| Cable                    | 5-core cable, 2m  |              |               |               |  |
| Material                 | Enclosure: die-cast aluminum, front cover: acrylic  |              |               |               |  |
| Dimensions (HxWxD)       | 44x20x25mm  |              |               |               |  |

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HL-G1



# HL-G1

Precision laser displacement  
sensors

## Features

### All-In-One Concept

All processing electronics are incorporated in a robust sensor housing. All settings can be made directly on the sensor. A 7-segment LED-display makes it easy to configure sensor operation while checking displacement values.

### Compact and lightweight body

With its lightweight plastic body, weighing just 70g and dimensions of 20.4 x 60 x 57mm, it is easy to integrate the sensor in machines and production lines where space is tight.

### Extended product range

With the extension of the HL-G1 series it is now possible to measure on specular surfaces with a high accuracy. Models with different measurement distances up to 82mm are available. Suitable applications can be for example in the semiconductor industry with specular wafer surfaces or other polished metal parts.

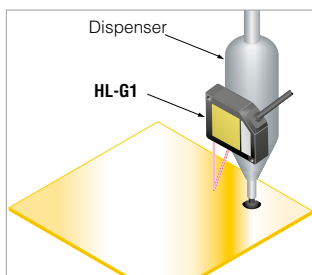
### User-friendly

The **HL-G1** series can be operated directly, by touch terminal (GT02/GT12 series) or Windows software via RS-422/RS-485.

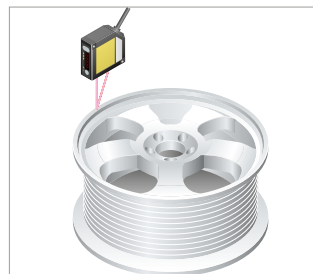


## Typical applications

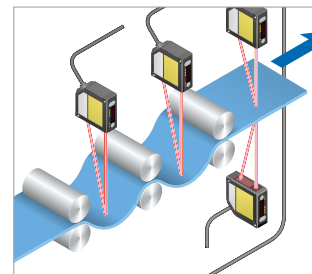
### Control of dispenser height



### Detection of aluminum wheel grooves



### Measuring sheet slack and thickness



### Measuring the eccentricity of a metal shaft



## Technical specifications

### Standard type

| Type                  | Diffuse reflective type   |              |              |              |              | Specular reflective type |               |            |
|-----------------------|---|--------------|--------------|--------------|--------------|--------------------------|---------------|------------|
| Model no.             | HL-G103-A-C5  | HL-G105-A-C5 | HL-G108-A-C5 | HL-G112-A-C5 | HL-G125-A-C5 | HL-G103-RA-C5            | HL-G105-RA-C5 | HL-G-RA-C5 |
| Sensing range         | 30±4mm  | 50±10mm      | 85±20mm      | 120±60mm     | 250±150mm    | 26.3±2mm                 | 47.3±5mm      | 82.9±10mm  |
| Emission spot size    | 0.1x0.1mm   | 0.5x1mm      | 0.75x1.25mm  | 1.0x1.5mm    | 1.75x3.5mm   | 0.1x0.1mm                |               | 0.2x0.2mm  |
| Power supply          | 24V DC ±10%   |              |              |              |              |                          |               |            |
| Analog voltage output | 0 to 10V / 4 to 20mA  |              |              |              |              |                          |               |            |
| Response time         | 200µs, 500µs, 1ms, 2ms (selectable)                                   |              |              |              |              |                          |               |            |
| Resolution            | 0.5µm   | 1.5µm        | 2.5µm        | 8µm          | 20µm         | 0.5µm                    | 1.5µm         | 2.5µm      |
| Linearity             | ±0.1%F.S.   |              |              |              | ±0.3%F.S.    | ±0.2%F.S.                |               |            |
| Emitting element      | Red laser diode, 655nm (class 2)                                      |              |              |              |              |                          |               |            |
| Output                | PNP or NPN open-collector transistor, max. 50mA (selection by wiring) |              |              |              |              |                          |               |            |
| Protection            | IP67 (IEC)  |              |              |              |              |                          |               |            |
| Ambient temperature   | -10 to +45°C  |              |              |              |              |                          |               |            |
| Material              | Enclosure: PBT / Front cover: Acrylic / Cable: PVC                    |              |              |              |              |                          |               |            |
| Connection method     | Cable, 5m   |              |              |              |              |                          |               |            |
| Dimensions (HxWxD)    | 60x20.4x57mm  |              |              |              |              |                          |               |            |
| Accessories           | Warning label (English): 1 set  |              |              |              |              |                          |               |            |

### Multifunction type

| Type                  | Diffuse reflective type   |             |             |             |             | Specular reflective type |              |              |
|-----------------------|---|-------------|-------------|-------------|-------------|--------------------------|--------------|--------------|
| Model no.             | HL-G103-S-J   | HL-G105-S-J | HL-G108-S-J | HL-G112-S-J | HL-G125-S-J | HL-G103-RS-J             | HL-G105-RS-J | HL-G108-RS-J |
| Sensing range         | 30±4mm  | 50±10mm     | 85±20mm     | 120±60mm    | 250±150mm   | 26.3±2mm                 | 47.3±5mm     | 82.9±10mm    |
| Emission spot size    | 0.1x0.1mm   | 0.5x1mm     | 0.75x1.25mm | 1.0x1.5mm   | 1.75x3.5mm  | 0.1x0.1mm                |              | 0.2x0.2mm    |
| Power supply          | 24V DC ±10%   |             |             |             |             |                          |              |              |
| Analog voltage output | 0 to 10V / 4 to 20mA  |             |             |             |             |                          |              |              |
| Interfaces            | RS-485 / RS-422   |             |             |             |             |                          |              |              |
| Response time         | 200µs, 500µs, 1ms, 2ms (selectable)                                   |             |             |             |             |                          |              |              |
| Resolution            | 0.5µm   | 1.5µm       | 2.5µm       | 8µm         | 20µm        | 0.5µm                    | 1.5µm        | 2.5µm        |
| Linearity             | ±0.1%F.S.   |             |             |             | ±0.3%F.S.   | ±0.2%F.S.                |              |              |
| Emitting element      | Red laser diode, 655nm (class 2)                                      |             |             |             |             |                          |              |              |
| Output                | PNP or NPN open-collector transistor, max. 50mA (selection by wiring) |             |             |             |             |                          |              |              |
| Protection            | IP67 (IEC)  |             |             |             |             |                          |              |              |
| Ambient temperature   | -10 to +45°C  |             |             |             |             |                          |              |              |
| Material              | Enclosure: PBT / Front cover: Acrylic / Cable: PVC                    |             |             |             |             |                          |              |              |
| Connection method     | Cable with connector, 0.5m (note)                                     |             |             |             |             |                          |              |              |
| Dimensions (HxWxD)    | 60x20.4x57mm  |             |             |             |             |                          |              |              |
| Accessories           | Warning label (English): 1 set  |             |             |             |             |                          |              |              |

Note: Cable is not included in delivery. Please select under accessories (page 129)

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HL-C2



# HL-C2

Ultra high-speed, precision laser displacement sensors

## Features

- **Excellent basic performance**
- **Sampling rate 100kHz**

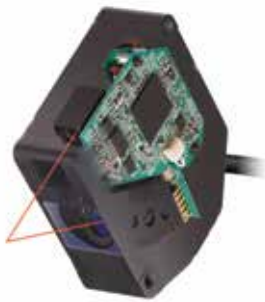
The HDLC-CMOS sensors were developed especially for the **HL-C2** series. The high-resolution chip together with a very short processing time enables maximum resolution and speed.

- **Resolution up to 0.01 $\mu$ m, linearity up to  $\pm 0.02\%$ F.S.**

Superior resolution of 0.01 $\mu$ m. Linearity of  $\pm 0.02\%$ F.S. enabled by latest high resolution lens technology.

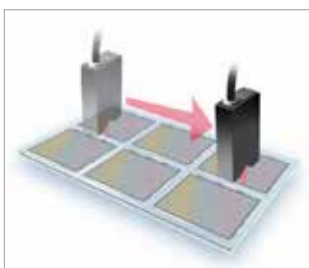
- **Compact but with a wide array of functions**

You can connect two sensor heads and a variety of devices to the ultra compact controller. Measurement values can be analyzed and displayed while the sensors are being controlled.



## Typical applications

**Measurement of the position of patterned glass**



**Control of the camera focus**



**Measurement of the shape of a camshaft**



**Measurement of the heights of chip parts**





## Specifications

### Sensor heads

| Measuring range    | 10±1mm               |           |                       |              | 30±5mm  |           |                       |              |
|--------------------|----------------------|-----------|-----------------------|--------------|---|-----------|-----------------------|--------------|
| Model no.          | HL-C201F             | HL-C201FE | HL-C201F-MK           | HL-C201FE-MK | HL-C203F                                      | HL-C203FE | HL-C203F-MK           | HL-C203FE-MK |
| Type               | Small beam spot type |           | Linear beam spot type |              | Small beam spot type                          |           | Linear beam spot type |              |
| Measuring range    | 10±1 mm              |           |                       |              | 30±5 mm (specular reflective mode 26.4±4.6mm) |           |                       |              |
| Resolution         | 0.01µm               | 0.25µm    | 0.01µm                | 0.25µm       | 0.025µm                                       | 0.25µm    | 0.025µm               | 0.25µm       |
| Laser class        | Class 1              |           |                       |              | Class 2                                       |           |                       |              |
| Beam size          | Ø20µm                |           | 20x700µm              |              | Ø30µm   |           | 30x1200µm             |              |
| Linearity          | ±0.02% F.S.          |           |                       |              | ±0.03% F.S.                                   |           |                       |              |
| Dimensions (HxWxD) | 54x20x95mm           |           |                       |              | 80x26x70mm                                    |           |                       |              |

| Measuring range: | 50±5mm  |                                       |                                 |                                       | 85±20mm  |                                       |                                 |                                       |
|------------------|---|---------------------------------------|---------------------------------|---------------------------------------|--|---------------------------------------|---------------------------------|---------------------------------------|
| Model no.        | HL-C205B<br>(HL-C205BE, note 1)                   | HL-C205B-MK<br>(HL-C205BE-MK, note 1) | HL-C205C<br>(HL-C205CE, note 1) | HL-C205C-MK<br>(HL-C205CE-MK, note 1) | HL-C208B<br>(HL-C208BE, note 1)                        | HL-C208B-MK<br>(HL-C208BE-MK, note 1) | HL-C208C<br>(HL-C208CE, note 1) | HL-C208C-MK<br>(HL-C208CE-MK, note 1) |
| Type             | Spot type   | Linear beam spot type                 | Spot type                       | Linear beam spot type                 | Spot type  | Linear beam spot type                 | Spot type                       | Linear beam spot type                 |
| Measuring range  | 50±5mm (specular reflective mode 46±5mm) (note 2) |                                       |                                 |                                       | 85±20 mm (specular reflective mode 81.4±6mm) ( note 2) |                                       |                                 |                                       |
| Resolution       | 0.05µm  |                                       |                                 |                                       | 0.15µm   |                                       |                                 |                                       |
| Laser class      | Class 2   |                                       | Class 3R                        |                                       | Class 2  |                                       | Class 3R                        |                                       |
| Beam size        | Ø70µm   | 70x1000µm                             | Ø70µm                           | 70x1000µm                             | Ø100µm   | 100x1200µm                            | Ø100µm                          | 100x1200µm                            |
| Linearity        | ±0.03% F.S.                                       |                                       |                                 |                                       | ±0.03 % F.S. (specular reflective mode ±0.1 % F.S.)    |                                       |                                 |                                       |
| Dimensions       | 90x26x74mm  |                                       |                                 |                                       |  |                                       |                                 |                                       |

| Measuring range: | 110±15mm  |           |           |              |                       |              |              |               |
|------------------|---|-----------|-----------|--------------|-----------------------|--------------|--------------|---------------|
| Model no.        | HL-C211F  | HL-C211FE | HL-C211F5 | HL-C211FE-MK | HL-C211F-MK           | HL-C211FE-MK | HL-C211F5-MK | HL-C211F5E-MK |
| Type             | Spot type   |           |           |              | Linear beam spot type |              |              |               |
| Measuring range  | 110±15mm (specular reflective mode 106±14.7mm) (note 2) |           |           |              |                       |              |              |               |
| Resolution       | 0.1µm   | 0.25µm    | 0.1µm     | 0.25µm       | 0.1µm                 | 0.25µm       | 0.1µm        | 0.25µm        |
| Laser class      | Class 2   |           | Class 3R  |              | Class 2               |              | Class 3R     |               |
| Beam size        | Ø80µm   |           |           |              | Ø80x1700µm            |              |              |               |
| Linearity        | ±0.03% F.S.   |           |           |              |                       |              |              |               |
| Dimensions       | 90x26x74mm  |           |           |              |                       |              |              |               |

| Measuring range: | 350±200mm  |                       |
|------------------|--|-----------------------|
| Model no.        | HL-C235CE-W  | HL-C235CE-WMK         |
| Type             | Spot type  | Linear beam spot type |
| Measuring range  | 350±200 mm   |                       |
| Resolution       | 2µm  |                       |
| Laser class      | Class 3R   |                       |
| Beam size        | Ø400µm   | 400x6500µm            |
| Linearity        | ±0.04% F.S. (-200 to 0mm), ±0.08% F.S. (0 to +200mm) |                       |
| Dimensions       | 90x26x74mm   |                       |

#### Notes:

- Models with a minimum resolution of 0.25µm are subject to the Japanese export controls, defined in the "Foreign Exchange and Foreign Trade Act". This is not true for the model nos. in brackets if the laser heads are ordered in combination with a controller (i.e. HL-C2CE)
- If the light reflection in "specular reflective mode" is too high, please use the optional filter (HL-C2F01)

### Common technical data

|                      |   |
|----------------------|---|
| Emitting element     | Red laser diode, 658nm  |
| Degree of protection | IP67 (IEC)  |
| Ambient temperature  | 0 to +45°C  |
| Material             | Enclosure: Die-cast aluminum / optical window: glass                            |
| Connection method    | 0.5m cable with attached connector (extension cables, see page 129 (HL-G1CCJ□)) |

### Controllers

| Type                | RS232C interface  |          |                |           | Ethernet interface |           |                |            |
|---------------------|---|----------|----------------|-----------|--------------------|-----------|----------------|------------|
|                     | NPN   |          | PNP            |           | NPN                |           | PNP            |            |
|                     | High resolution   |          | Low resolution |           | High resolution    |           | Low resolution |            |
| Model no.           | HL-C2C  | HL-C2C-P | HL-C2CE        | HL-C2CE-P | HL-C21C            | HL-C21C-P | HL-C21CE       | HL-C21CE-P |
| Supply voltage      | 24V DC (±10%)   |          |                |           |                    |           |                |            |
| Analog output       | ±5V/F.S., 4-20mA F.S.                                   |          |                |           |                    |           |                |            |
| Output              | NPN or PNP open collector transistor, max 100mA         |          |                |           |                    |           |                |            |
| Inputs              | Timing input, zero set, remote interlock, reset         |          |                |           |                    |           |                |            |
| USB interface       | USB 2.0   |          |                |           |                    |           |                |            |
| Serial input/output | RS232C (9.6-115.2kbps)                                  |          |                |           |                    |           |                |            |
| Current consumption | With 1 sensor head: 350mA<br>With 2 sensor heads: 500mA |          |                |           |                    |           |                |            |
| Ambient temperature | 0 to +50°C  |          |                |           |                    |           |                |            |
| Material            | Polycarbonate   |          |                |           |                    |           |                |            |
| Connection method   | Connector (sensors), terminal block                     |          |                |           |                    |           |                |            |
| Dimensions (HxWxD)  | 130x59x105.5mm  |          |                |           |                    |           |                |            |

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HG-T



# HG-T

## Laser thru-beam sensor

### Features

#### High precision

The laser thru-beam sensor of the HG-T series works with a belt-shaped laser beam with a width of 10mm for measuring an area, e.g. for checking the contours of an edge.

The sensor achieves a repeatability of  $> 1\mu\text{m}$  and has a linearity of less than  $\pm 12\mu\text{m}$  over the whole measurement range.

The thru-beam sensor has a sensing range of 500mm, which means that a larger variety of applications can be realized than with sensors with a shorter sensing range.

#### Flexible mounting

The HG-T series comes with two different sensor heads, which differ in their dimensions. The slim type receiver is 10mm less wide than the standard type and fits well into machines with very limited space.

#### Sensor heads



##### Standard type:

Emitter: 8x30x60mm (WxDxH)

Receiver: 8x30x60mm (WxDxH)



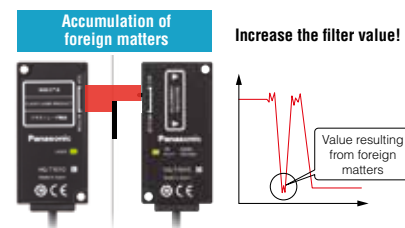
##### Slim type:

Emitter: 8x30x60mm (WxDxH)

Receiver: 8x20x60mm (WxDxH)

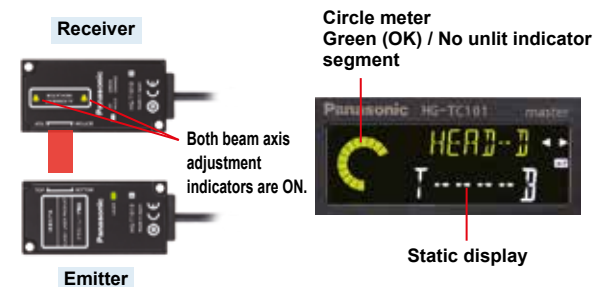
#### Optical features

Thanks to functions like filters, edge detection, light intensity checks and averaging of measurement values (up to 1024), the measurements are very reliable. These functions help you to detect at an early stage when the measuring process does not run smoothly anymore and the system needs to be modified.



#### Easy installation of multiple sensors

The master-slave system makes it easy to connect up to 15 sensors in series. Another feature increasing ease-of-use is the possibility to copy settings from the master to the slave units. A LED indicates when copying is in progress.

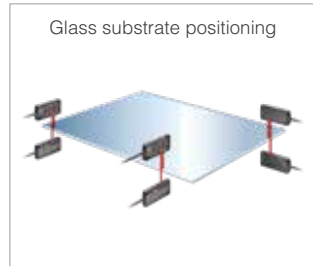


## Typical applications

### Highly precise measuring and checking of web edges



### Measuring the flatness of glass sheets for transport



### Measuring of diameters



## Technical specifications

### ■ Sensor heads

| Type                                    | Standard type  | Slim type                                 |
|---|--|---|
| Model no.                               | HG-T1010   | HG-T1110                                  |
| Measurement range (width of laser belt) | 10mm   |   |
| Measurement range                       | 0 to 500mm   |   |
| Repeatability                           | max. 1µm   |   |
| Protection                              | IP67   |   |
| Ambient temperatur                      | -10 to +45°C   |   |
| Material                                | Housing: Die-cast aluminum, light emitting and receiving surfaces: Glass |   |
| Connection method                       | cable with connector 0.2m (connection cable not included)                |   |
| Dimensions (HxWxD)                      | Emitter: 8x30x60mm<br>Receiver: 8x30x60mm                                | Emitter: 8x30x60mm<br>Receiver: 8x20x60mm |

### ■ Controllers

| Type                        | Master unit   |            | Slave units |            |          |
|-----------------------------|---|------------|-------------|------------|----------|
| Model no.                   | HG-TC101  | HG-TC101-P | HG-TC111    | HG-TC111-P | HG-TC113 |
| Supply voltage              | 24V DC  |            |             |            |          |
| Current consumption (note ) | Max. 100mA (when sensor head is connected)                  |            |             |            |          |
| Sampling cycle              | 1ms (standard sampling) / 0.5ms (high-speed sampling)       |            |             |            |          |
| Control output              | NPN or PNP open collector transistor, max. 50 mA            |            |             |            |          |
| Analog output (note 3)      | 4 to 20mA, 0 to 5V (Switchable)                             |            |             |            |          |
| Protection                  | IP40  |            |             |            |          |
| Ambient temperature         | -10 to +50°C  |            |             |            |          |
| Dimension (HxWxD)           | 43.1x21.1x86  |            |             |            |          |
| Material                    | Case: polycarbonate, cover: polycarbonate, keys: polyacetal |            |             |            |          |
| Connection method           | Connector   |            |             |            |          |

Notes: Current consumption does not include analog current output

### ■ Sensor head connection cable The sensor head connection cable has to be ordered separately.

| Model No. | CN-HT-C2 | CN-HT-C5 |
|-----------|----------|----------|
| Length    | 2m       | 5m       |

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GP-X



# GP-X

Eddy current analog sensor for  
high-speed sampling

## Features

- Ultra high-speed response time of 25 $\mu$ s
- Extremely low temperature deviations (0,07% F.S.°C)
- Predefined material characteristics

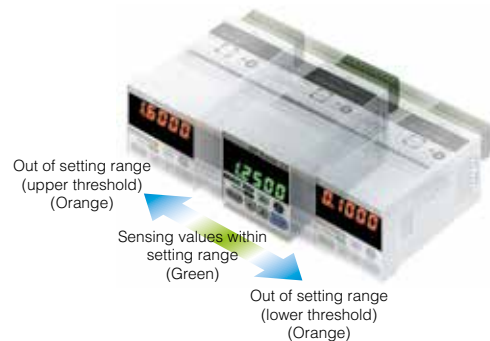
The sensor exhibits  $\pm 0.3\%$  F.S. linearity deviation when used on iron and stainless steel. Furthermore, characteristics for other materials are already programmed in the controller, making selection easy. Of course, the settings can also be customized.

### ■ Serial interface

The controller can be connected with a personal computer via an RS-232 interface. GP-XAiME, the software included, simplifies data visualization and analysis. Moreover, several systems can be combined and then easily configured at the same time.

- The 5-digit, dual, 2-color digital display offers great visibility

If the measurement results fall within the setting range (GO), they will appear on the lower digital display in green. If they are out of setting range (HI, LO), they will be displayed in the upper digital display in orange. The display position and color change permit accurate visibility even for momentary changes.



## Typical applications

### Stroke end sensing



### Eccentricity sensing



### Height sensing



## Technical specifications

| Type                    |                    | Cylindrical heads  |           |          | Heads with thread |            |            |
|-------------------------|--------------------|--|-----------|----------|-------------------|------------|------------|
| Model no.               | NPN output         | GP-XC3SE<br>(note 2)   | GP-XC5SE  | GP-XC8S  | GP-XC10M          | GP-XC12ML  | GP-XC22KL  |
|                         | PNP output         | GP-XC3SEP  | GP-XC5SEP | GP-XC8SP | GP-XC10MP         | GP-XC12MLP | GP-XC22KLP |
| Sensing range           |                    | 0 to 0.8mm   | 0 to 1mm  | 0 to 2mm | 0 to 2mm          | 0 to 5mm   | 0 to 10mm  |
| Standard sensing object |                    | Stainless steel (SUS304) / Iron sheet, cold rolled carbon steel (SPCC) 60x60x1mm   |           |          |                   |            |            |
| Power supply            |                    | 24VDC ±10%   |           |          |                   |            |            |
| Analog voltage output   |                    | -5V to +5V (note 1)  |           |          |                   |            |            |
| Sampling rate           |                    | 40kHz (25µs)   |           |          |                   |            |            |
| Resolution              |                    | GP-XC3SE / GP-XC5SE: 0.04% F.S. (64 times average processing) GP-XC8S / GP-XC10M / GP-XC12ML / GP-XC22KL: 0.02% F.S. (64 times average processing) |           |          |                   |            |            |
| Output                  |                    | 3x NPN or PNP open-collector transistor, max. 100mA  |           |          |                   |            |            |
| Protection              |                    | Sensor head: IP67 (IEC)  |           |          |                   |            |            |
| Ambient temperature     |                    | Sensor head: -10 to +55°C, Controller: 0 to +50°C  |           |          |                   |            |            |
| Material                |                    | Sensor head: stainless steel (SUS303), GP-XC12ML□, GP-XC22KL□: brass (nickel plated), Switch part: PC  |           |          |                   |            |            |
| Connection method       |                    | Terminal block   |           |          |                   |            |            |
| Dimensions              | Sensor head (ØxD)  | 3.8x17mm   | 5.4x17mm  | 8x17mm   | M10x17mm          | M12x21mm   | M12x35mm   |
|                         | Controller (HxWxD) | 48x48x83mm   |           |          |                   |            |            |
| Accessories             |                    | Controller mounting frame, 1 pc.   |           |          |                   |            |            |

### Notes:

- 1.) Factory setting: 0 to +5V
- 2.) Model no. for one set (sensor head and controller)

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ER-Q



# ER-Q

Miniature ionizer with fan

## Features

### ■ Small dimensions

Simple and space-saving installation on production lines and manual workstations.

### ■ Adjustable

A continuously variable adjuster ensures the production of the required air volume.

### ■ Unit for demanding industrial environments

The LED displays the required maintenance steps or failures; this also can be queried via the outputs of a PLC. Parts for maintenance are easy to get at and replace.



## Technical specifications

| Type  | Standard type   |
|---|---|
| Model no.   | ER-Q  |
| Charge removal time ( $\pm 1000 \rightarrow \pm 100V$ ) | Approx. 1.5s  |
| Discharge output voltage                                | $\pm 2kV$   |
| Ion balance   | Max. $\pm 10V$  |
| Discharge method  | High frequency AC method  |
| Power supply  | 24V DC $\pm 10\%$   |
| Power consumption                                       | Max. 200mA  |
| Fan rotation speed                                      | Continuously variable adjustable (potentiometer)                                |
| Outputs   | ERROR and CHECK<br>NPN open-collector transistor, max. 50mA                     |
| Status indicator / Monitoring function                  | Ready/Discharging (DSC/green), Discharge error (red), Fan error (blinking red)  |
| Ambient temperature                                     | 0 to $+50^{\circ}C$   |
| Ambient humidity  | 35 to 65%RH   |
| Material  | Enclosure: PBT, Discharge electrode needles: tungsten                           |
| Dimensions (HxWxD)                                      | 60x33x65mm  |
| Accessories   | I/O connector set manufactured by MOLEX, Inc.: Housing 5557-08P, terminal 5556T |



# ER-F

## Features

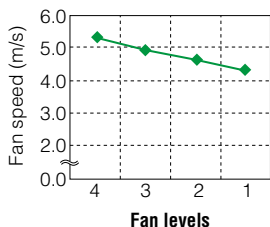
### Two types

Low volume fan type. This type generates only the half of the air volume as the standard type, which is required for small components and thin film. Four different speeds can be selected for the fan.

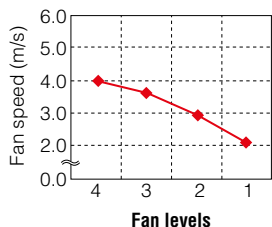
### Easy maintenance

Because the discharge electrode needle unit is attached to the louver, exchange or maintenance of the electrode needles is made easy without touching the main unit. A safe design: once the louver is removed, the high-voltage circuit is broken and the fan halts. Simply replace the louver to change configuration between long distance and wide area ionization. The two louvers come with the ionizer main body.

Standard fan type  
ER-F12



Low-volume fan type  
ER-F12S



Straight louver removes charges at great distances



Neutralizes static charges quickly from a great distance

Angled louver removes charges over wide area



Neutralizes static charges; wide area ionizer



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## Technical specifications

| Type   | Standard  | Low-volume fan |
|--|---|----------------|
| Model no.  | ER-F12A   | ER-F12SA       |
| Discharge time ( $\pm 1000 \rightarrow \pm 100V$ ) | Approx. 1s  | Approx. 1.5s   |
| Discharge output voltage                           | $\pm 2kV$   |                |
| Ion balance  | Max. $\pm 10V$  |                |
| Discharge method                                   | High-frequency AC   |                |
| Power supply                                       | 24V DC $\pm 10\%$   |                |
| Power consumption                                  | Max. 700mA  | Max. 400mA     |
| Fan rotation speed                                 | Adjustable at 4 levels  |                |
| Output   | ERROR, NPN open-collector transistor, max. 50mA   |                |
| Input terminal                                     | Discharge stop = connected to 0V / Start= open  |                |
| Status indicators / Monitoring functions           | Power supply (Power / green), Discharging (DSC / green), Discharge error (DSC red), Fan error (FAN red)                             |                |
| Ambient temperature                                | 0 to $+50^{\circ}C$   |                |
| Ambient humidity                                   | 35 to 65%RH   |                |
| Material   | Enclosure / Louver: ABS, Fitting of discharge electrode needles: PBT, Discharge electrode needles: tungsten, Mounting bracket: DC03 |                |
| Dimensions (HxWxD)                                 | 166x161x60mm  |                |
| Accessories  | Straight louver (note): 1 pc. Angle louver: 1 pc.; Caution label: 1 set; Rubber cushion: 1 pc.                                      |                |

**Note:** The discharge electrode needle set is mounted at the louver

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ER-F





# ER-X

Area ionizer for fast applications

## Features

### ■ Quick charge removal

Thanks to the pulse AC method, the **ER-X** series is well suited for high-speed applications as found in the packaging and semiconductor industries, where charge removal time is directly linked to productivity. In addition, discharge frequencies can be adjusted from between 1 and 100Hz, maximizing flexibility. Thanks to a built-in feedback system, the ionizer can even adjust the discharge frequency automatically during operation.

### ■ Feedback system

Individual displays for discharge, error messages and electrode needle control are provided on the controller. Furthermore, you can activate settings for frequency, ion balance or limits directly via a potentiometer and DIP switches.

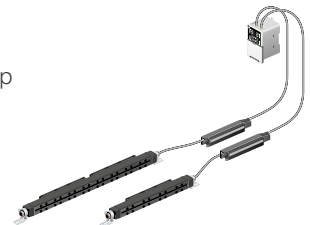


### ■ Airless operation

The area ionizer of the ER-X series ionizers can be operated with or without air pressure. This technology opens up applications in fields such as the coating industry, as well as the production and packaging of microelectronic components that otherwise are blown around by whirling air.

### ■ Flexible system configuration

The system consists of a sensor head and a controller. The sensor head is available in different sizes. You can connect parallel up to 2 heads to the controller. This enlarges the working area of the system up to 1.2m.



## Typical applications

### Neutralization of foils



### Charge removal from ICs



### Charge removal from miniaturized electronic components



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Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

### Sensor heads

| Model no.   | Spot   | Area       |         |         |         |         |
|---|--|------------|---------|---------|---------|---------|
|   | ER-X001  | ER-X008    | ER-X016 | ER-X032 | ER-X048 | ER-X064 |
| Effective charge removal width                          | Spot type  | 80mm       | 160mm   | 320mm   | 480mm   | 640mm   |
| Charge removal time ( $\pm 1000 \rightarrow \pm 100V$ ) | Max. 0.5s  | Approx. 1s |         |         |         |         |
| Discharge output voltage                                | $\pm 7kV$  |            |         |         |         |         |
| Ion balance   | Max. $\pm 30V$   |            |         |         |         |         |
| Discharge method  | Pulse AC method  |            |         |         |         |         |
| Maximum air pressure                                    | 5bar (0.5MPa)  |            |         |         |         |         |
| Ambient temperature                                     | 0 to $+50^{\circ}C$  |            |         |         |         |         |
| Ambient humidity  | 35 to 65%RH  |            |         |         |         |         |
| Material  | Enclosure: PPS, Stainless steel; Mounting bracket, Stainless steel; Electrode needle: tungsten |            |         |         |         |         |

### Controller

|  |  |
|--|--|
| Model no.  | ER-XC02  |
| Power supply   | 24V DC $\pm 10\%$  |
| Power consumption                                    | 1 head: max. 450mA; 2 heads: max. 800mA                                |
| Outputs  | Alarm, Error; PhotoMOS, max. 50mA                                      |
| Status display / Monitor functions of discharge unit | Discharge (DSC)  |
| Ambient temperature                                  | 0 to $+50^{\circ}C$  |
| Ambient humidity                                     | 35 to 65%RH  |
| Material   | ABS  |
| Dimensions (HxWxD)                                   | 90x53x64mm   |
| Accessories  | MOLEX-plug (Housing 5557-10R, Terminal 5556TL) 1 pc., Ground wire 1pc. |

### Sensor head connector cables

| Model no. | ER-XCCJ2H  | ER-XCCJ5H | ER-XCCJ10H |
|-----------|--|-----------|------------|
| Image     |  |           |            |
| Length    | 2m   | 5m        | 10m        |

Note: Cable is not included in delivery. Please order separately

ER-X



# ER-VW

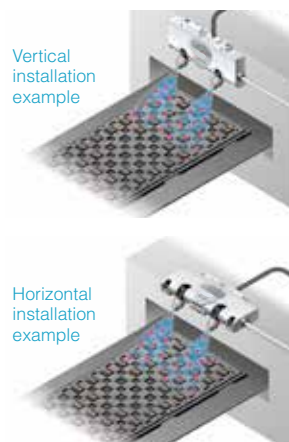
## Nozzle angle adjustment

### Features

#### ■ Nozzle angle adjustment

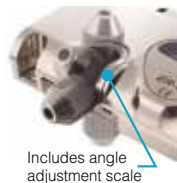
The angles of the two nozzles can be adjusted within a range of approximately 190° by screwing down the ends of the nozzles.

#### Installation examples



#### ■ Compact and ultrathin design

The thickness of the unit is 18.9mm. Since the nozzle angles can be adjusted, they can be installed in tight spaces, such as when other equipment is present.

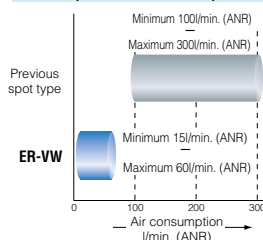


Includes angle adjustment scale

#### ■ Minimum air consumption 15ℓ/min.

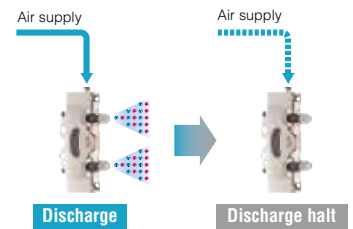
The ER-VW series can utilize air flow levels starting from a minimum of 15 l/min. Because the amount of air consumed is so low, the loads placed on air supply equipment can be reduced.

#### Comparison of air consumption



#### ■ Air supply monitoring function

This function causes discharging to stop automatically if the supply of air drops below a certain pressure. Notification of this is given when the AIR indicator lights up and the discharge output (DSC) turns off. This prevents objects which are not charged from being overlooked when the air supply has been stopped.

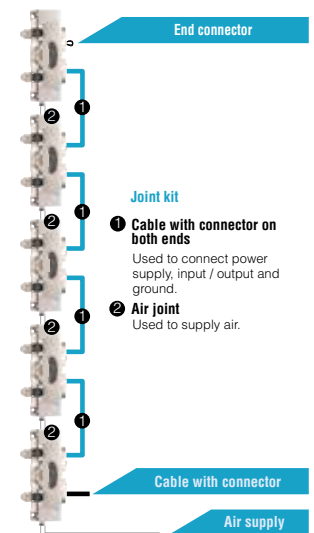
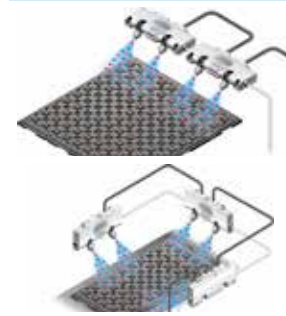


#### ■ Easy connection possible

The joint kit (optional) can be used to connect up to a maximum of 5 ER-VW units. The air supply part is connected via quick connection joints, and the power supply and input/output signals can also be connected easily using connection cables with connectors at both ends.

Multiple ER-VW units can be connected to provide charge removal layouts that suit the target equipment.

#### Connection application example



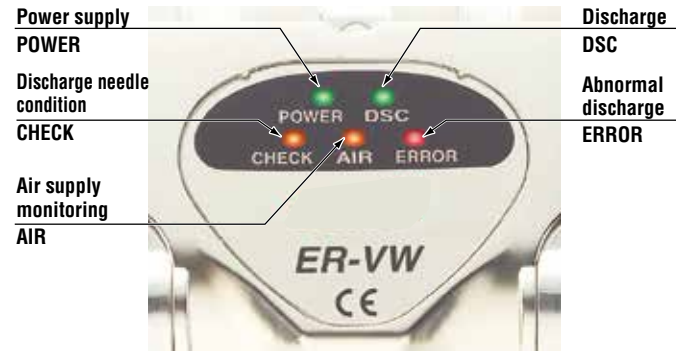
- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

ER-VW

- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers/ Electrostatic Sensors
- Accessories
- ER-VW**

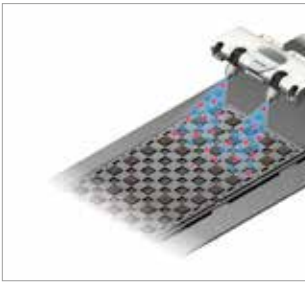
**Functions to support accurate charge removal**

In addition to the air supply monitoring function, the ER-VW is equipped with the following functions to ensure accurate charge removal.

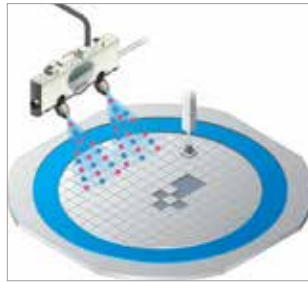


**Typical applications**

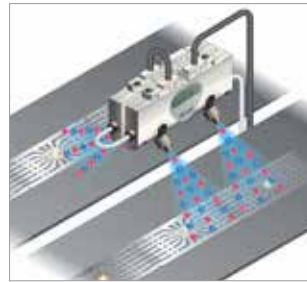
Charge removal of ICs



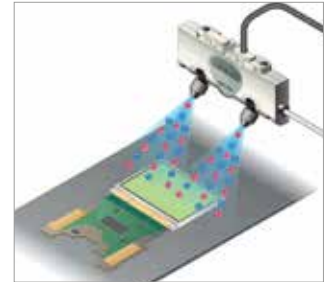
Removing charge during pickup from dicing type



Parallel discharging on two assembly lines



Removing charges from LCD transport brackets



**Technical specifications**

|   |   |
|---|---|
| Type  | Spot  |
| Model no.   | ER-VW   |
| Charge removal time ( $\pm 1000 \rightarrow \pm 100V$ ) | Max. 1s   |
| Discharge output voltage                                | $\pm 2kV$   |
| Ion balance   | Max. $\pm 10V$  |
| Discharge method  | High frequency AC method  |
| Power supply  | 24VDC $\pm 10\%$  |
| Power consumption                                       | Max. 120mA  |
| Air pressure  | 0.5 to 5bar (0.05 to 0.50MPa)   |
| Inputs  | Reset and discharge stop = connected to 0V / Start= open  |
| Outputs   | Discharging (DSC), ERROR and CHECK; NPN open collector transistor; max. 50mA  |
| Status indicators / Monitoring functions                | Supply voltage (Power / green), Discharging (DSC / green), Checking electrode needles (Check / orange), Monitoring air pressure (Air / orange), Failure (Error / red) |
| Ambient temperature                                     | 0 to $+55^{\circ}C$   |
| Ambient humidity  | 35 to 65%RH   |
| Material  | Enclosure: ABS (nickel plated), nozzles / nozzle mount, Screws: stainless steel, Discharge electrode needles: tungsten  |
| Dimensions (HxWxD)                                      | 19x133x65mm   |
| Accessories   | Connector cable with 8 pins, 0.5m, Terminating plug with 9 pins, Ground wire  |



# ER-V

## Ultra compact high-performance ionizer

### Features

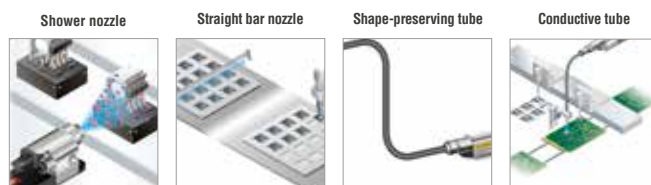
#### ■ Produces excellent ion balance

The adoption of high-frequency AC method allows extremely stable ion balance to be achieved. Because the ion balance is not affected by the pressure of air supplied or by the setup distance, no troublesome adjustments are required after setup.

#### ■ High performance but no controller needed

A full range of functions have been provided with full consideration given to ease of use in the workplace. No separate controller is needed.

#### ■ Nozzle variations can be selected to suit the application



#### ■ Ultra compact design accurately removes charges of objects even from narrow spaces

The main unit is merely 28x27x111.6mm so it can easily be combined with other devices and also be installed as an add-on. Furthermore, the high-voltage power supply is built-in so no extra space is required except for the ionizer itself.



It can be installed in places where the conventional bar type cannot so it can be placed closer to the object for more accurate charge removal.

### Typical applications

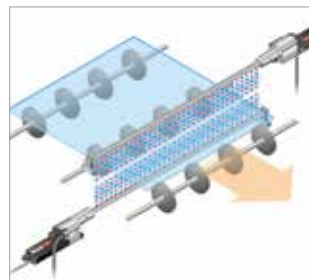
#### Change removal and dust removal of lenses



#### Prevent discharge damage in circuit board LEDs



#### Charge removal glass surfaces

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories







ER-V

## Technical specifications

|                                   |
|-----------------------------------|
| IO-Link Sensors                   |
| Photoelectric Sensors             |
| Fiber-optic Sensors               |
| Standard Fibers                   |
| Fiber Sensors Communication Units |
| Mark Sensors                      |
| Laser Sensors                     |
| Safety Sensors                    |
| Pressure & Flow Sensors           |
| Inductive Proximity Sensors       |
| Measurement Sensors               |
| Ionizers/ Electrostatic Sensors   |
| Accessories                       |
| ER-V                              |


|  |   |
|--|---|
| Type                                     | Spot  |
| Model no.                                | ER-VS02   |
| Charge removal time (±1000 → ±100V)      | Max. 1s   |
| Discharge output voltage                 | ±2kV  |
| Ion balance                              | Max. ±10V   |
| Discharge method                         | High frequency AC method  |
| Power supply                             | 24V DC ±10%   |
| Power consumption                        | Max. 70mA   |
| Maximum air pressure                     | 0.5 to 7bar (0,05 to 0.7MPa)  |
| Inputs                                   | Reset and discharge stop = connected to 0V / Start= open  |
| Outputs                                  | Error (ERROR) and check (CHECK)<br>NPN open-collector transistor, max. 50mA   |
| Status indicators / Monitoring functions | Supply voltage (Power / green), Discharging (DSC / green), Checking electrode needles (Check / orange), Error (Error / red) |
| Ambient temperature                      | 0 to +55°C  |
| Ambient humidity                         | 35 to 65%RH   |
| Material                                 | Enclosure: PPS, Cover: stainless steel, Discharge electrode needles: tungsten   |
| Dimensions (HxWxD)                       | 28x27x111.6mm   |
| Accessories                              | I/O connector set manufactured by MOLEX, Inc.: Housing 5557-08P, terminal 5556TL  |

### Nozzles

| Type        | Shower nozzle   | Straight bar nozzle   |                                       |                                       | Shape-preserving tube   |   |   |                   | Conductive tube   |   |   |
|-------------|---|---|---------------------------------------|---------------------------------------|---|---|---|-------------------|---|---|---|
|             |   | ER-VAS  | ER-VAB020                             | ER-VAB032                             | ER-VAB065   | ER-VAJK   | ER-VAK10  | ER-VAK30          | ER-VAK50  | ER-VAJT-64  | ER-AT50   |
| Image       |  |  |                                       |                                       |  |                          |   |                   |   |  |  |
| Length      | Shower nozzle   | Effective charge removal length 200mm   | Effective charge removal length 320mm | Effective charge removal length 650mm | Tube nozzle adapter for main system and shape-preserving tube                       | Tube length 112mm   | Tube length 312mm                                 | Tube length 512mm | Tube nozzle adapter for main system and conductive tube | Tube length 500mm   |   |
| Description |   | Straight bar nozzle containing a series of holes                                    |                                       |                                       |   | Bends easily and holds its bent shape so the tube does not need to be secured. (Minimum bending radius: 40mm) | Flexible, free-cut (Minimum bending radius: 15mm) |                   |   |   |   |

Note: Nozzles are not supplied with the ionizer main unit. Please order them separately.

### Cable with connector

| Model no.   | ER-VCCJ2   | ER-VCCJ5     | ER-VCCJ9     |
|-------------|--|--------------|--------------|
| Image       |  |              |              |
| Length      | 2m   | 5m           | 9m           |
| Net weight  | approx. 52g  | approx. 120g | approx. 240g |
| Description | 0.15mm <sup>2</sup> 8-core cable with connector<br>Cable outer diameter: Ø4.2mm      |              |              |

Note: The cable with connector is not supplied with the ionizer main unit. Please order it separately.



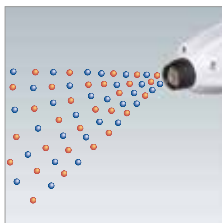
# EC-G

## Pulse air-gun ionizer

### Features

#### ■ Direct ionized air emission from air gun

With the new pulse air-gun ionizer operators can comfortably neutralize static electricity while manually cleaning.



#### ■ Pulsed ionized air

Instant pulse air emission with high air pressure removes dust all at once. Its lightweight construction, ergonomic design and 2m cable make the air gun the perfect ionizer for manual jobs.



#### ■ White LED illumination

A convenient white LED on the front of the gun illuminates target objects.



### Technical specifications

| Type  | Air gun type   |
|---|--|
| Model no.   | EC-G02   |
| Charge removal time ( $\pm 1000 \rightarrow \pm 100V$ ) | Average 0.5s   |
| Discharge output voltage                                | $\pm 1kV$  |
| Ion balance   | Max. $\pm 10V$   |
| Discharge method  | High frequency AC method   |
| Power supply  | Input voltage: 100 to 240V AC, output voltage: 24V DC $\pm 10\%$   |
| Power consumption                                       | Max. 30VA  |
| Maximum air pressure                                    | 0.5 to 5bar (0.05 to 0.50MPa)  |
| Input terminal  | Charge removal start = connected to 0V   |
| Modes   | Pulse 1 (long) and Pulse 2 (short) / CONT (continuous) selectable by switch  |
| LED illumination mode                                   | White LED  |
| Status indicator / Monitoring function                  | Valve illumination (orange)  |
| Ambient temperature                                     | 0 to $+50^{\circ}C$  |
| Ambient humidity  | 35 to 65% RH (no condensation allowed)   |
| Material  | Enclosure: ABS, Nozzle: Stainless steel, Nozzle guard: NBR, Discharge electrode needle: tungsten   |
| Weight  | approx. 270g   |
| Accessories   | AC adapter, 1 pc.; Exclusive intermediate cable, 2m; Straight joints to couple air tubes $\varnothing 8-8mm$ (note) and $\varnothing 8-6mm$ type, Connector connection terminal from MOLEX |

Note: Straight joint to couple air tubes,  $\varnothing 8mm$ , is attached at shipment

### Typical applications

#### Remove charge and dust on PCB



#### Remove charge and dust on flat screens



#### Remove dust before painting

IO-Link  
SensorsPhotoelectric  
SensorsFiber-optic  
Sensors

Standard Fibers

Fiber Sensors  
Communication  
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

EC-G

- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers/ Electrostatic Sensors
- Accessories



# EF-S1

Constant monitoring of static charges on production lines

## Features

- **Maintains and regulates product quality by preventing damage from static electric**

Static electricity that can build up in various places along a process line can be monitored constantly so that abnormalities can be prevented before they occur, ensuring quality.

- **Reduces time for ionizer inspections**

The de-ionizing effectiveness of ionizers can be understood in real-time so that things such as ionizer damage and the replacement period for worn components can be checked objectively, reducing the time required for inspection and testing.

## Technical specifications

- **Sensor head**

|                 |  |
|-----------------|--|
| Type            | Spot type                                    |
| Model no.       | EF-S1HS                                      |
| Measuring range | 8.0 to 20.5mm (±1kV)<br>21.0 to 100mm (±2kV) |

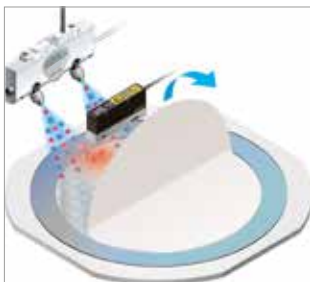
- **Controller**

|                                   |   |
|-----------------------------------|---|
| Type                              | Spot type   |
| Model no.                         | EF-S1C  |
| Power supply                      | 24VDC ±10%  |
| Display range (Measurement range) | -1000 to 1000 (±1kV)<br>-1999 to 1999 (±2kV)          |
| Judgment output                   | NPN open-collector transistor, max. 100mA             |
| Analog voltage output             | Output voltage 1 to 5V<br>Load impedance approx. 100Ω |

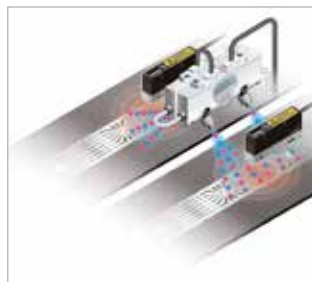
EF-S1

## Typical applications

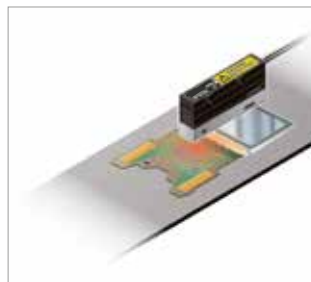
**Measuring surface potential when removing BG sheets**



**Measuring static electric charge in lead frames**









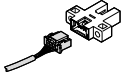
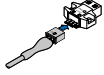








**Measuring frictional electrification of LCD modules**












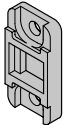

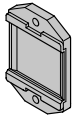


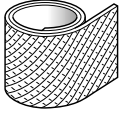
**Cables**

| Picture   | Description                                    | Model no.         | Applicable sensors                             |
|---|--|-------------------|--|
|    | 4-pin M8 connector cable, 2m                   | <b>UZZ80820D</b>  | CX-4□□Z, FX101□□Z, FX102□□Z, DP11□□EPJ         |
|    | 4-pin M8 connector cable (elbow type 90°), 2m  | <b>UZZ80821D</b>  | CX-4□□Z, FX101□□Z, FX102□□Z, DP11□□EPJ         |
|    | 4-pin M8 connector cable, 5m                   | <b>UZZ80850D</b>  | CX-4□□Z, FX101□□Z, FX102□□Z, DP11□□EPJ         |
|    | 4-pin M8 connector cable (elbow type 90°), 5m  | <b>UZZ80851D</b>  | CX-4□□Z, FX101□□Z, FX102□□Z, DP11□□EPJ         |
|    | 4-pin M12 connector cable, 2m                  | <b>UZZ81220D</b>  | LX-101□□Z, CX-4□□Z, EQ-30, CY-1□□Z, GX-M□□-Z   |
|    | 4-pin M12 connector cable (elbow type 90°), 2m | <b>UZZ81221D</b>  | LX-101□□Z, CX-4□□Z, EQ-30, CY-1□□Z, GX-M□□-Z   |
|    | 4-pin M12 connector cable, 5m                  | <b>UZZ81250D</b>  | LX-101□□Z, CX-4□□Z, EQ-30, CY-1□□Z, GX-M□□-Z   |
|   | 4-pin M12 connector cable (elbow type 90°), 5m | <b>UZZ81251D</b>  | LX-101□□Z, CX-4□□Z, EQ-30, CY-1□□Z, GX-M□□-Z   |
|  | 4-wire cable with connector, 2m                | <b>CN14AC2</b>    | PM-□□65, DP-100, DP-0                          |
|   | 4-wire cable with connector, 5m                | <b>CN14AC5</b>    | PM-□□65, DP-100, DP-0                          |
|  | 3-wire cable with connector, 1m                | <b>CN13C1</b>     | PM2  |
|   | 3-wire cable with connector, 3m                | <b>CN13C3</b>     | PM2  |
|  | 3-wire main cable, 2m                          | <b>CN73C2</b>     | FX-301□, FX311, FX-5□□1□, FX-CH2□, SC-GU-1-485 |
|   | 3-wire main cable, 5m                          | <b>CN73C5</b>     | FX-301□, FX311, FX-5□□1□, FX-CH2□, SC-GU-1-485 |
|  | 1-wire sub cable, 2m                           | <b>CN71C2</b>     | FX-301□, FX-311, FX-501□                       |
|   | 1-wire sub cable, 5m                           | <b>CN71C5</b>     | FX-301□, FX-311, FX-501□                       |
|  | 4-wire main cable, 2m                          | <b>CN74C2</b>     | FX-305□, FX-502□, LS-401□, LS-501□             |
|   | 4-wire main cable, 5m                          | <b>CN74C5</b>     | FX-305□, FX-502□, LS-401□, LS-501□             |
|  | 2-wire sub cable, 2m                           | <b>CN72C2</b>     | FX-305□, FX-502□, LS-401□, LS-501□             |
|   | 2-wire sub cable, 5m                           | <b>CN72C5</b>     | FX-305□, FX-502□, LS-401□, LS-501□             |
|  | 14-wire connecting cable, 2m                   | <b>HL-G1CCJ2</b>  | HL-G1□-S-J                                     |
|   | 14-wire connecting cable, 5m                   | <b>HL-G1CCJ5</b>  | HL-G1□-S-J                                     |
|   | 14-wire cable, 10m                             | <b>HLG1CCJ10</b>  | HL-G1□-S-J                                     |
|   | 14-wire cable, 20m                             | <b>HLG1CCJ20</b>  | HL-G1□-S-J                                     |
|  | 14-wire cable, 2m                              | <b>HL-C2CCJ2</b>  | HL-C2□   |
|   | 14-wire cable, 5m                              | <b>HL-C2CCJ5</b>  | HL-C2□   |
|   | 14-wire cable, 10m                             | <b>HL-C2CCJ10</b> | HL-C2□   |
|   | 14-wire cable, 20m                             | <b>HL-C2CCJ20</b> | HL-C2□   |
|   | 14-wire cable, 30m                             | <b>HL-C2CCJ30</b> | HL-C2□   |

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- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

**Cables**

## Reflectors

| Picture   | Description  | Model no.       | Applicable reflectors     |
|---|--|-----------------|---------------------------|
|    | Reflection foil: 8x30mm, thickness 0.7mm             | <b>RF11</b>     | CX-400, EX-20, NX5        |
|    | Reflection foil: 25x30mm, thickness 0.7mm            | <b>RF12</b>     | CX-400, EX-20, NX5        |
|    | Reflection foil: 30x30mm, thickness 0.5mm            | <b>RF13</b>     | CX-400                    |
|    | Reflective area: 9.6x17.5mm                          | <b>RF200</b>    | EX-20                     |
|   | Reflective area: 12.8x33.3mm                         | <b>RF210</b>    | CX-400, EX-L200, NX5      |
|  | Reflective area: 42.3x35.3mm                         | <b>RF220</b>    | CX-400, NX5               |
|  | Reflective area: 59.3x50.3mm                         | <b>RF230</b>    | CX-400, LS-H921, NX5      |
|  | Reflective area: 7x8mm                               | <b>RF310</b>    | LS                        |
|  | Reflection foil: 27.8 x25.2mm                        | <b>RF33</b>     | LS                        |
|  | Reflective area: 23x24mm                             | <b>RF330</b>    | EX-L200, LS-H911, LS-H901 |
|  | Reflective area: 24x21mm                             | <b>RF-420</b>   | CY-100                    |
|  | Reflective area: 50x47mm                             | <b>RF-410</b>   | CY-100                    |
|  | Adhesive reflection tape: 22mm x 5m, thickness 0.4mm | <b>RF-40RL5</b> | CY-100                    |

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SensorsFiber-optic  
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Fiber Sensors  
Communication  
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







Safety Sensors

Pressure &  
Flow SensorsInductive  
Proximity  
SensorsMeasurement  
SensorsIonizers/  
Electrostatic  
Sensors

Accessories

Reflectors

## ■ Mounting brackets

| Picture   | Description  | Model no.        | Applicable reflectors |
|---|--|------------------|-----------------------|
|    | L-shaped mounting bracket  | <b>MS-EXL2-1</b> | EX-L200, LS-H102      |
|    | Mounting plate   | <b>MSLX1</b>     | LX-100                |
|    | Mounting bracket   | <b>MSCX1</b>     | CX-400, LS-400        |
|    | Mounting bracket   | <b>MSCX21</b>    | CX-400                |
|    | Mounting bracket   | <b>MSNX51</b>    | NX5                   |
|    | Mounting bracket   | <b>MS-EXZ-2</b>  | EX-Z Top sensing      |
|    | Mounting bracket   | <b>MS-EXZ-2</b>  | EX-Z Side sensing     |
|   | Mounting bracket   | <b>MSEX101</b>   | EX-10                 |
|  | Mounting bracket   | <b>MSEX201</b>   | EX-20 Top sensing     |
|  | Mounting bracket   | <b>MSEX202</b>   | EX-20 Side sensing    |
|  | Mounting set, 4 mounting brackets M4 (l=15mm) 4pcs., M4 (l=18mm) 8pcs. | <b>MSNA11</b>    | NA1-11                |
|  | Mounting bracket   | <b>MSEQ501</b>   | EQ-500                |
|  | Mounting bracket   | <b>MSEQ31</b>    | EQ-30                 |
|  | Mounting bracket   | <b>MSDIN4</b>    | FX-100                |
|  | Mounting bracket   | <b>MSDIN2</b>    | FX-300, FX-500        |
|  | Mounting bracket   | <b>MS-FM2-1</b>  | FM-200                |
|  | Mounting bracket   | <b>MSDP11</b>    | DP-100, DP-0          |
|  | Mounting bracket   | <b>MS-DP1-6</b>  | DPC-100, DPC-L100     |
|  | Mounting bracket, stainless steel                                      | <b>MS-CY1-1</b>  | CY-100                |
|  | Mounting bracket for beam axis alignment, plastic                      | <b>MS-CY1-2</b>  | CY-100                |

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