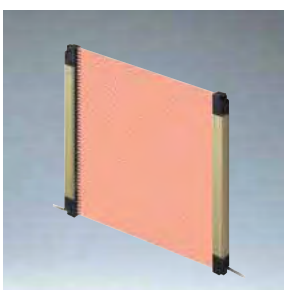
SUNX

NEW & KEY PRODUCTS



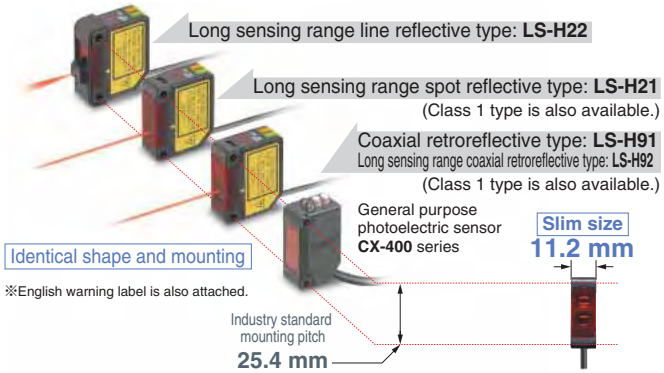
Laser Sensor Photoelectric Sensor

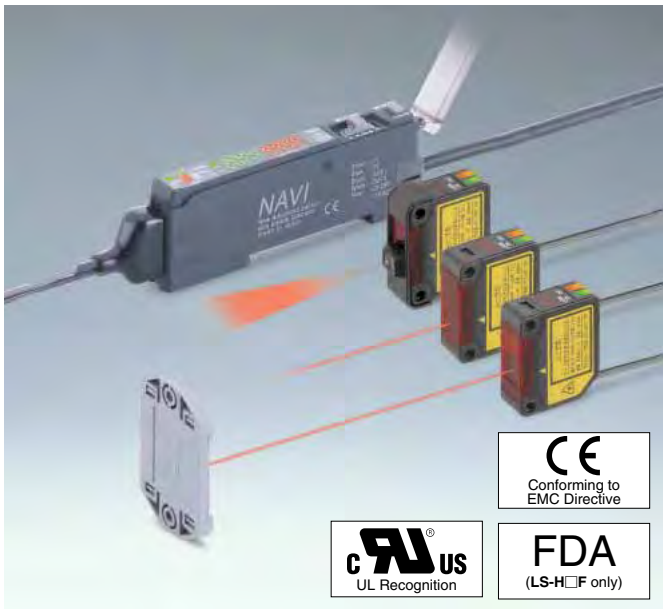
Digital
LS SERIES

User-friendly, high precision laser sensing!

4 types of identically sized sensor heads available

We designed 4 types of sensor heads. They are approximately the same size as general purpose photoelectric sensors and the mounting method identical.



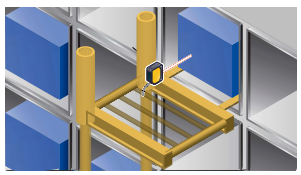


New coaxial reflective type with a long sensing range of 30 m LS-H92

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

• Sensing of projections from conveyor belts

• Sensing items inside large stockers



Spot size adjustment LS-H21, LS-H22

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.

Accurately sense the minutest variations (M.G.S. function)

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 effect the response time.

Sensor heads

Type	Coaxial retroreflective		Diffuse reflective	
		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 7 m (U-LG) 0.1 to 5 m (STD) 0.1 to 3 m (FAST / H-SP)	0.2 to 30 m (U-LG) 0.2 to 20 m (STD) 0.2 to 10 m (FAST / H-SP)	30 to 1,000 mm (U-LG) 30 to 500 mm (STD) 30 to 300 mm (FAST / H-SP)	30 to 1,000 mm (U-LG) 30 to 500 mm (STD) 30 to 300 mm (FAST / H-SP)
Ambient temperature	− 10 to + 55 °C			
Emitting element	Red semiconductor laser, Class 2 (**LS-H□**: IEC / JIS / GB, **LS-H□F**: FDA / IEC / JIS) [**LS-H91(F)-A, LS-H21(F)-A**: Class 1][Max. output: 3 mW or less (**LS-H91(F)-A, LS-H21(F)-A**: 1 mW or less), Peak emission wavelength: 655 nm]			
Dimensions	W11.2 × H31 × D25 mm			

Notes: 1) **LS-H□** conforms IEC / JIS / GB standards.
LS-H□F conforms FDA / IEC / JIS standards.
2) **LS-H91(F)-A**, **LS-H21(F)-A**: Class 1 type
3) **LS-H22(F)** is the set model No. for **LS-H21(F)** long sensing range spot reflective type sensor head combined with the **LS-MR1** lens attachment for line reflective.
LS-H21(F) appears on the sensor itself.
4) Sensing range: **LS-H91(F)-A** 0.1 to 5 m (U-LG), 0.1 to 3 m (STD), 0.1 to 1 m (FAST / H-SP)
LS-H21(F)(-A) 30 to 500 mm (U-LG), 30 to 250 mm (STD), 30 to 150 mm (FAST / H-SP)

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** series amplifiers can be connected side-by-side with **FX-300** series fiber sensors.

Up to 16 units can be connected side by side in series

Amplifiers

Type		Connector type (Note)	Cable type
Model No.	NPN output	**LS-401**	**LS-401-C2**
	PNP output	**LS-401P**	**LS-401P-C2**
Supply voltage		12 to 24 V DC ± 10 %	
Output (Output 1, Output 2)		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor	
Output operation		Selectable either Light-ON or Dark-ON, with jog switch	
Response time		80 μs or less (H-SP), 150 μs or less (FAST), 500 μs or less (STD), 4 ms or less (U-LG), selectable with jog switch	
Sensitivity setting		Normal mode: 2-level teaching / Limit teaching / Full auto teaching / Manual adjustment Window comparator mode: Teaching (1-level, 2-level, 3-level) / Manual adjustment Hysteresis mode: Teaching (1-level, 2-level, 3-level) / Manual adjustment Differential mode: 5-level settings	
Digital display		4 digit (green) + 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 (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)	
Dimensions		W10 × H30 × D75 mm	

Note: The cable for amplifier connection is not supplied as an accessory with the connector type amplifier. Make sure to use the optional quick-connection cable given below.
Main cable (4-core): **CN-74-C1** (cable length 1 m), **CN-74-C2** (cable length 2 m)
CN-74-C5 (cable length 5 m)
Sub cable (2-core): **CN-72-C1** (cable length 1 m), **CN-72-C2** (cable length 2 m)
CN-72-C5 (cable length 5 m)

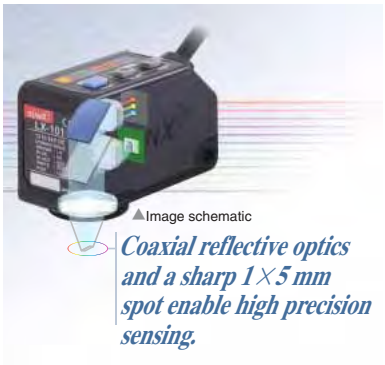
Mark Sensor Photoelectric Sensor

Digital
LX-100 SERIES

Introducing the 3-LED mark sensor!

Equipped with 3 red, green and blue LEDs

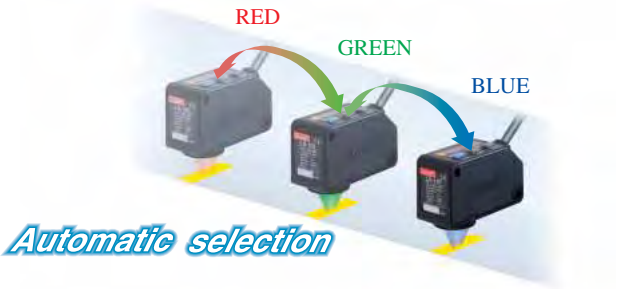
To detect any marking, this sensor is equipped with red, green and blue LED light emitting elements all in one. In addition, it uses a coaxial reflective optics system and realizes high precision sensing when used with a 1/4000 resolution 12-bit A/D converter.



2 selectable sensing modes for any application

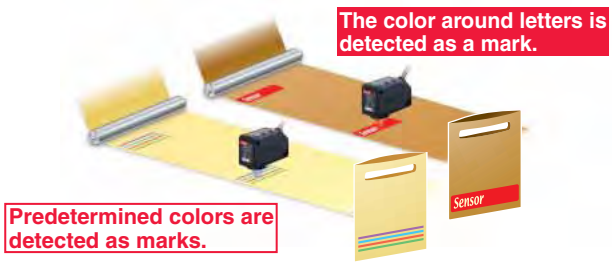
Mark mode

This sensing mode automatically selects a single color from the 3 R•G•B LEDs to realize an ultra quick 45 μs 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 area of the mark.

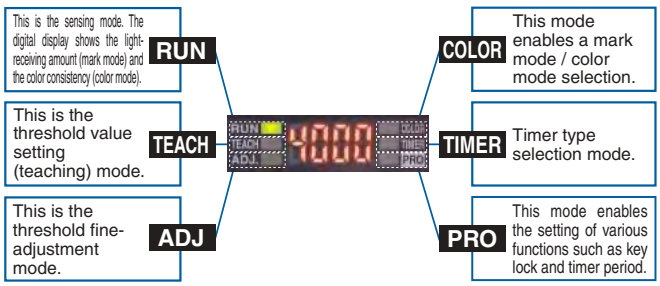


Type		Cable type	Plug-in connector type (Note)
Model No.	NPN output	**LX-101**	**LX-101-Z**
	PNP output	**LX-101-P**	**LX-101-P-Z**
Sensing range		10 ± 3 mm	
Supply voltage		12 to 24 V DC ± 10 %	
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor	
	Output operation	Mark mode: Light-ON / Dark-ON (Auto-setting on teaching) Color mode: Consistent-ON / Inconsistent-ON (Setting on teaching)	
Response time		Mark mode: 45 μs or less, Color mode: 150 μs or less	
Sensitivity setting		Mark mode: 2-level teaching / Full-auto teaching, Color mode: 1-level teaching	
Protection		IP67 (IEC)	
Ambient temperature		− 10 to + 55 °C	
Emitting element		Combined Red / Green / Blue LEDs (Peak emission wave length: 640 nm / 525 nm / 470 nm)	

Note: Mating cable is not supplied with the plug-in connector type. Please order it separately.

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) can be effectuated by a super simple operation 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

High precision sensing and multiple functions provided all in a compact W57 × D24 × H38 mm body. Cable and plug-in connector types are available depending on the equipment used. These sensors can be easily introduced to already existing facilities.

Digital
FX-301 SERIES

Enhanced functions and performance but still easy to use

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

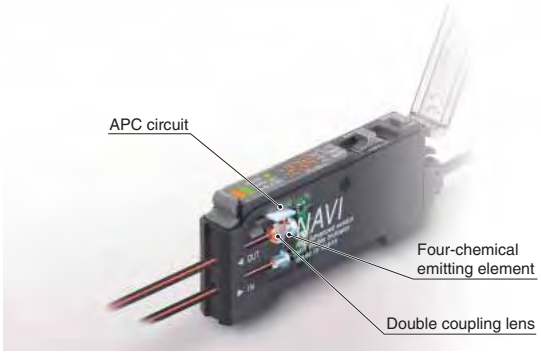
We improved the standard model by enhancing its sensing stability and equipping it with handy functions such as light-emitting amount selection function. This makes using a fiber sensor easier than ever while conserving the superior operationality of the conventional model.

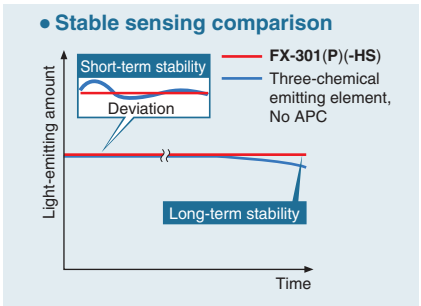
Super high speed response of 35 μs FX-301(P)-HS

The new **FX-301(P)-HS** model is the digital type fiber sensor realizing a super high speed response of 35 μs rendering it capable of sensing minute objects moving at high speeds. At 65 μs, the standard **FX-301(P)** model (H-SP mode) realizes twice the speed of the conventional model.

Stable sensing over long and short periods FX-301(P)(-HS)

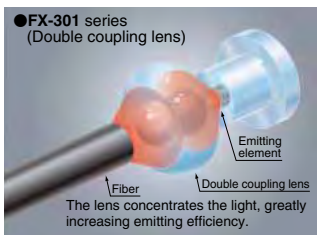
In addition to a 'four-chemical emitting element' which suppresses changes in the light-emitting element over time so that a stable level of light emission can be maintained over long periods, a new 'APC (Auto Power Control) circuit' has also been adopted. Because fluctuations over short periods of time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

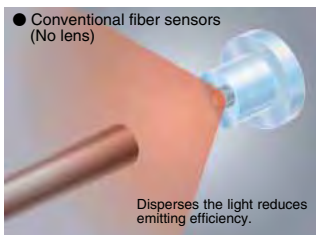




Sensing range has been greatly increased All models

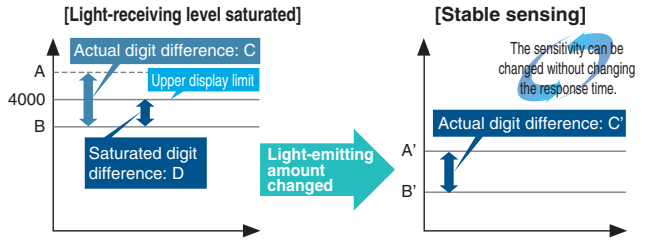
All models use a 'double coupling lens' that enables a much wider sensing range and maximization in the light emission efficiency. Sensing ranges with small diameter fibers and ultra-small diameter fibers, which have become very popular due to the miniaturization of chip components, have been increased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





Light-emitting amount selection function FX-301(P)(-HS)

If the light-receiving level becomes saturated during close-range sensing or when sensing transparent or ultra-small objects, you can adjust the light-emitting amount of the sensor to stabilize sensing without needing to change the response time. Sensing that previously required the response time or fibers to be changed can now be set much more easily using this function.



Type		Standard type (Note 2)	High speed type
Model No.	NPN output	**FX-301□**	**FX-301-HS**
	PNP output	**FX-301□P**	**FX-301P-HS**
Sensing range (Red LED type)		Thru-beam type (**FT-B8**): 1,100 mm (LONG), 530 mm (STD), 400 mm (FAST), 200 mm (H-SP), 180 mm (S-D) Reflective type (**FD-B8**): 480 mm (LONG), 220 mm (STD), 160 mm (FAST), 85 mm (H-SP), 75 mm (S-D)	Thru-beam type (**FT-B8**): 1,100 mm (LONG), 530 mm (STD), 400 mm (FAST), 160 mm (H-SP), 180 mm (S-D) Reflective type (**FD-B8**): 480 mm (LONG), 220 mm (STD), 160 mm (FAST), 60 mm (H-SP), 75 mm (S-D)
Supply voltage		12 to 24 V DC ± 10 %	
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor	
	Output operation	Selectable either Light-ON or Dark-ON, with jog switch	
Response time		65 μs or less [H-SP (Red LED type only)], 150 μs or less (FAST), 250 μs or less [STD / S-D (Red LED type only)], 2 ms or less (LONG) selectable with jog switch	35 μs or less (H-SP), 150 μs or less (FAST), 250 μs or less (STD / S-D), 2 ms or less (LONG) selectable with jog switch
Sensitivity setting		2-level teaching / Limit teaching / Manual adjustment / 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.)]	— (Not equipped with communication function)
Ambient temperature		−10 to +55°C (If 4 to 7 units are connected in cascade: −10 to +50 °C, if 8 to 16 units are connected in cascade: −10 to +45 °C)	
Emitting element (modulated)		**FX-301(P)**: Red LED, **FX-301B(P)**: Blue LED, **FX-301G(P)**: Green LED, **FX-301H(P)**: Infrared LED	Red LED
Dimensions		W10 × H30.5 × D64.5 mm	

Notes: 1) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1 m), **CN-73-C2** (cable length 2 m), **CN-73-C5** (cable length 5 m)
Sub cable (1-core): **CN-71-C1** (cable length 1 m), **CN-71-C2** (cable length 2 m), **CN-71-C5** (cable length 5 m)
2) Red LED type **FX-301(P)** is version upgrade.

Easy operation with MODE NAVI All models

MODE NAVI uses six indicators to display the amplifier's basic operations. The current operating mode can be confirmed at a glance, so even a first time user can easily operate the amplifier without becoming confused.

RUN→
This is the sensing mode. Light-receiving amount is displayed in the digital display.

TEACH→
This mode is for setting the threshold value.

ADJ→
In this mode, the threshold value, once set, may be fine-tuned.

L/D→
This mode allows the selection of output operation as either Light-ON or Dark-ON.

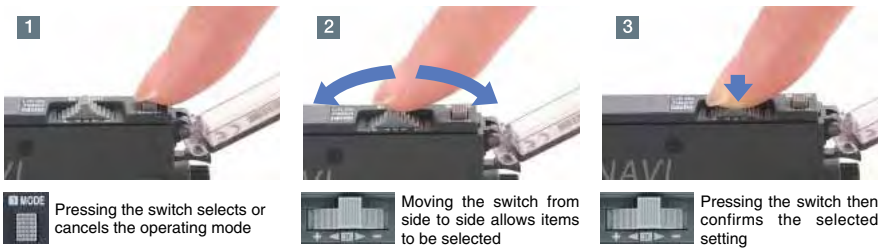
TIMER→
This mode allows timer selection and setting.

PRO→
This mode allows the selection of further advanced functions, such as the copying of individual settings and the memory functions.

The use of only two switches makes for very simple operations All models

Only two switches, the large jog switch and the large MODE key, are required for operation. Depressing the large MODE key sets the 'mode selection' and 'mode cancel' functions. The large jog switch is used to select from the detailed functions available within each mode, as well as to change numerical values after the mode has been chosen.

Large MODE key | **Large jog switch**



Pressing the switch selects or cancels the operating mode

Moving the switch from side to side allows items to be selected

Pressing the switch then confirms the selected setting

Easy threshold value verification FX-301(P)(-HS)

Even in RUN mode, the threshold value can be checked by turning the jog switch to the left.

Key lock function prevents accidental setting changes All models

Equipped with a key lock function that disables the jog switch and MODE key to prevent accidental setting changes by the operator.

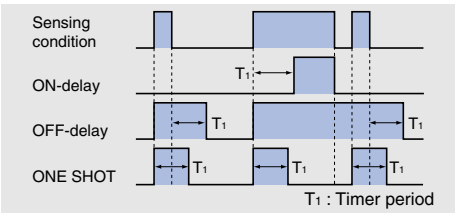
Optical communication function lets multiple sensors be adjusted all at once FX-301□(P)

The optical communication function allows the data that is currently set to be copied and saved all at once for all amplifiers connected together from the right side. This greatly reduces troublesome setup tasks and makes setup much smoother.

※Use the optical communication function for only the same types of sensors. Furthermore, the **FX-301-HS** is not equipped with optical communication function capability.

Equipped with each type of timer All models

These sensors are equipped with 3 types of timers, ON-delay, OFF-delay, and ONE SHOT, for compatibility to variegated environments.



Wiring- and labor-saving design allows side-by-side configuration for up to sixteen units All models

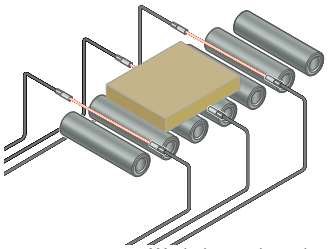
Easy maintenance, as main and sub units are identical. All models

A lineup of four light source type sensors gives a greater range of applications.

In addition to our red LED (four-chemical emitting element) type, the blue, green, and infrared LED types are also provided to correspond to your specific application.

Red LED type FX-301(P)(-HS)

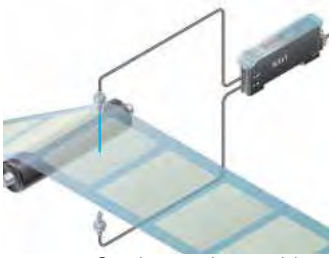
This standard type of **FX-301**(**P**)(**-HS**) using red light has a four-chemical emitting element for stable sensing over long periods.



Workpieces detection

Blue LED type FX-301B(P)

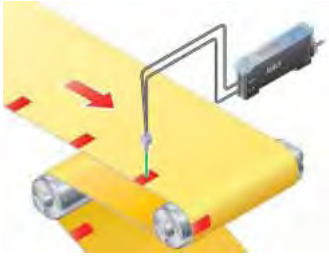
The blue LED type greatly reduces the dampening rate, making it ideal for delicate sensing.



Sensing translucent stickers

Green LED type FX-301G(P)

The green LED type can accurately discriminate between red and yellow, that cannot be easily detected using red LED type.



Sensing register marks

Infrared LED type FX-301H(P)

Infrared LED type is ideal for sensing environments with light restrictions, such as places where light-sensitive film is being handled. (The emission peak wavelength: 940 nm.) It includes full-auto teaching function which allows sensitivity to be set without stopping the workpiece line.

Digital Dual Display

FX-411 SERIES

New

Just 'Look' and 'Turn', Simple, easy-to-use fiber sensor

Incident light intensity and threshold value are displayed simultaneously

The incident light intensity and threshold value can be checked at the same time with no operations needed. In addition, no complex mode settings are needed when the values are adjusted.

Large endless adjuster

New concept

Standard screwdrivers can be used to turn the adjuster as well as precision screwdrivers. In addition, an 'endless' mechanism is used which eliminates the possibility of any damage being caused by turning the adjuster too far.

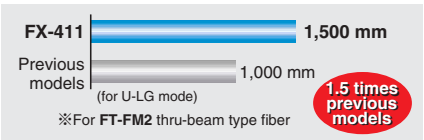
Immediate setting possible using the R.S.S. adjuster

The sensitivity amount changes depending on the rotation speed of the adjuster, so that adjustment can be carried out speedily.

Beam power greatly increased to give strong performance under adverse environments

Red LED type

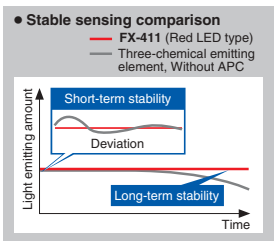
The beam power has been greatly increased. This means a longer sensing distance and less trouble from problems such as dust. These sensors have ample performance for workplace needs.



Improved stability over both long and short terms

Red LED type

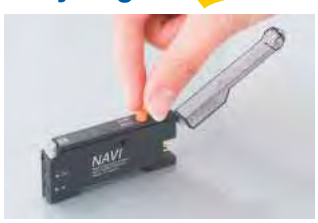
The red LED type sensors have a 'four-chemical emitting element' which maintains stability of light emissions for long-term operation. Furthermore, all models have an 'APC (Auto Power Control) circuit' which improves stability at times such as when the power is turned on. These features improve overall stability compared to previous models.



New FX-412 can be turned by finger!

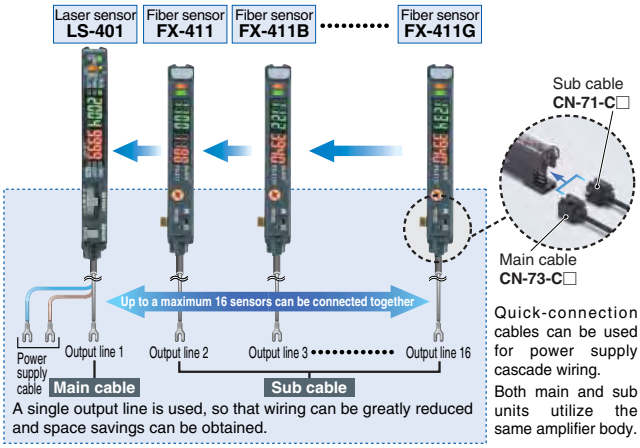
New

The adjuster can be turned directly by finger, without the need for a screwdriver.



Excellent workability and ease of maintenance

The same quick-connection cable that is used for sensors such as the **FX-300** series of digital fiber sensors is used. This means that they can be used together with other types of sensors such as laser sensors, and the number of power supply cables can be reduced.



Quick-connection cables can be used for power supply cascade wiring.
Both main and sub units utilize the same amplifier body.

Type		Red LED		Blue LED		Green LED	
Model No.	NPN output	FX-411	FX-412	FX-411B	FX-412B	FX-411G	FX-412G
	PNP output	FX-411P	——	FX-411BP	——	FX-411GP	——
Sensing range (Red LED type)		Thru-beam type (**FT-B8**): 2,000 mm (U-LG), 530 mm (STD), 400 mm (FAST) Reflective type (**FD-B8**): 650 mm (U-LG), 180 mm (STD), 120 mm (FAST)					
Supply voltage		12 to 24 V DC ± 10 %					
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor					
	Output operation	Switchable either Light-ON or Dark-ON					
Response time		150 μs or less (FAST), 500 μs or less (STD), 4.5 ms or less (U-LG), selectable with setting switch					
Timer function		Incorporated with variable ON-delay / OFF-delay / ONE SHOT timer, switchable either effective or ineffective. (Timer period: 1 ms to 3 sec. approx.)					
Automatic interference prevention function		Incorporated (Up to four sets of fiber heads can be mounted close together. However, U-LG mode is 8 fiber heads.)					
Ambient temperature		− 10 to + 55 °C (If 4 to 7 units are connected in cascade: − 10 to + 50 °C, if 8 to 16 units are connected in cascade: − 10 to + 45 °C)					
Dimensions		W10 × H30.5 × D64.5 mm					

Note: The cable for amplifier connection is not supplied as an accessory with the connector type amplifier. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1 m), **CN-73-C2** (cable length 2 m) **CN-73-C5** (cable length 5 m)
Sub cable (1-core): **CN-71-C1** (cable length 1 m), **CN-71-C2** (cable length 2 m) **CN-71-C5** (cable length 5 m)

Fiber Sensors

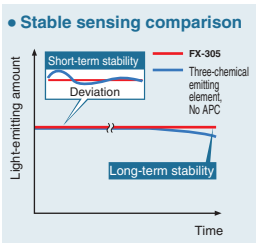
Photoelectric Sensor

Digital
FX-305

High level of stability and sensing performance!

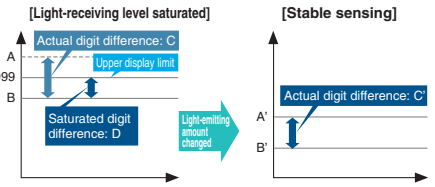
Stable sensing over long and short periods

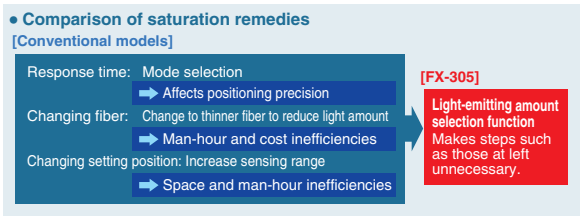
In addition to a 'four-chemical emitting element' which suppresses changes in the light-emitting element over time so that a stable level of light emission can be maintained over long periods, a new 'APC (Auto Power Control) circuit' has also been adopted. Because fluctuations over short periods of time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



Light-emitting amount selection function

If the light-receiving level becomes saturated during close-range sensing or when sensing transparent or ultra-small objects, you can adjust the light-emitting amount of the sensor to stabilize sensing without needing to change the response time. Sensing that previously required the response time or fibers to be changed can now be set much more easily using this function.





Large display 9999

Large display with 4 digits (9999). With a greater difference in digit value than previous models, threshold values can be set in units of 1 digit up to maximum 9999. Threshold setting can now be done more easily and accurately.

(During STDF, LONG and U-LG modes)

2.5 times previous models

High-speed response 65 μs

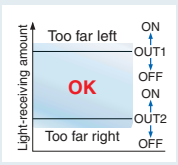
High-speed response that is about twice as fast as before has been achieved. Even small objects moving at high speeds can be sensed. In addition, interference between two units is prevented in high-speed mode (H-SP).

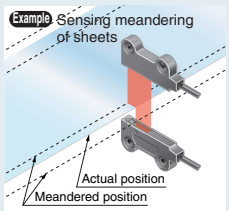
Automatic interference prevention of up to 16 units

Can be used even in places where fibers need to be installed close together.

Independent dual outputs

Two independent output channels are provided, so that one sensor can be used for control tasks that previously required two sensors. In addition, the second output channel can be used for simple self-diagnosis and alarm output, so that ease of maintenance is improved.





[Conventional models] 2 sensors needed

[FX-305] 1 sensor is enough!

Type	NPN output	PNP output
Model No.	**FX-305**	**FX-305P**
Sensing range (mm)	Thru-beam type (**FT-B8**): 1,600 (U-LG), 1,100 (LONG), 700 (STDF), 530 (STD), 400 (FAST), 200 (H-SP) Reflective type (**FD-B8**): 600 (U-LG), 480 (LONG), 280 (STDF), 220 (STD), 160 (FAST), 85 (H-SP)	
Supply voltage	12 to 24 V DC ± 10 %	
Output (Output 1, Output 2)	NPN open-collector transistor	PNP open-collector transistor
Output operation	Selectable either Light-ON or Dark-ON, with jog switch	
Response time	65 μs or less (H-SP), 150 μs or less (FAST), 250 μs or less (STD), 700 μs or less (STDF), 2.5 ms or less (LONG), 4.5 ms or less (U-LG), selectable with jog switch	
Sensitivity setting	Normal mode: 2-level teaching / Limit teaching / Full-auto teaching / Max. sensitivity teaching / Manual adjustment Window comparator mode: Teaching (1-level, 2-level, 3-level) / Manual adjustment	
Automatic interference prevention function	Incorporated [Up to 4 sets of fiber heads can be mounted close together (However, U-LG mode is 8 sets, H-SP mode is 2 sets.)]	
Ambient temperature	− 10 to + 55 °C (If 4 to 7 units are connected in cascade: − 10 to + 50 °C, if 8 to 16 units are connected in cascade: − 10 to + 45 °C)	
Emitting element	Red LED (modulated)	
Dimensions	W10 × H30.5 × D64.5 mm	

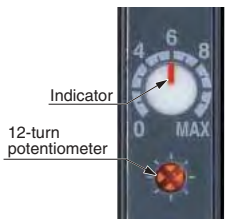
Note: The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (4-core): **CN-74-C1** (cable length 1 m), **CN-74-C2** (cable length 2 m) **CN-74-C5** (cable length 5 m)
Sub cable (2-core): **CN-72-C1** (cable length 1 m), **CN-72-C2** (cable length 2 m) **CN-72-C5** (cable length 5 m)

Manually Set
FX-311 SERIES

FX-311 is remarkably easy to use, yet employs the latest in technology

12-turn potentiometer with visible indicator

12-turn potentiometer has been incorporated for fine adjustments.
It enables very fine differences to be detected.
Moreover, since the pointer of indicator has a red backlight, you can confirm the position at a glance, even in a dark area.



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

Rapid blinking 'assist function' eases adjustment for optimum sensitivity

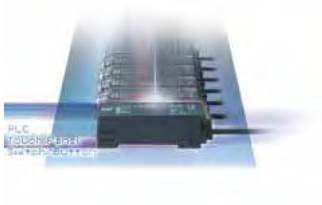
Sensing range (Red LED type):
FT-B8 1,100 mm (LONG), 530 mm (STD), 180 mm (S-D)
FD-B8 480 mm (LONG), 220 mm (STD), 75 mm (S-D)
Supply voltage: 12 to 24 V DC ± 10 %
Output: **FX311**□ NPN open-collector transistor
FX311□**P** PNP open-collector transistor
Dimensions: W10 × H30.5 × D64.5 mm

Note: The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1 m), **CN-73-C2** (cable length 2 m) **CN-73-C5** (cable length 5 m)
Sub cable (1-core): **CN-71-C1** (cable length 1 m), **CN-71-C2** (cable length 2 m) **CN-71-C5** (cable length 5 m)

External Input Unit for Digital Sensor
FX-CH2

Up to 16 sensors can be set / switched all together by an external signal

A maximum of 16 sensors can be set / switched simultaneously



Up to 16 digital fiber sensors can be set / switched simultaneously not by directly operating the sensors but from a PLC, a touch panel, push button or some other external signal generating device.

Simultaneous teaching

■ Teaching possibilities
- Full-auto teaching
- Limit teaching '+'
- Limit teaching '−'
- 2-level teaching

Key lock setting

Even the enable / disable command for the key lock setting, a function designed to prevent operational mistakes, can be effectuated simultaneously from an external signal.

Batch loading and saving of bank settings

The bank settings for 3 previously set channels can be loaded and saved all together using an external signal.

Type	NPN input type	PNP input type
Model No.	**FX-CH2**	**FX-CH2-P**
Applicable sensor	**FX-301(P)**(Version upgrade)(Note), **FX-305(P)**	
Supply voltage	12 to 24 V DC ± 10 %	
Input	Low: 0 to + 2 V DC High: + 5 V to + V DC, or open	Low: + 4 V to + V DC High: 0 to + 0.6 V DC, or open
Power indicator	Green LED	
Transmission operation indicator	Green LED (Lights up when loaded, and 2-level / limit teaching, brinks→lights up when saved, and full-auto teaching)	
Ambient temperature	− 10 to + 55 °C (When 4 to 7 sensors are connected: − 10 to + 50 °C, When 8 to 16 sensors are connected: − 10 to + 45 °C)	
Dimensions	W10 × H27 × D68.5 mm	

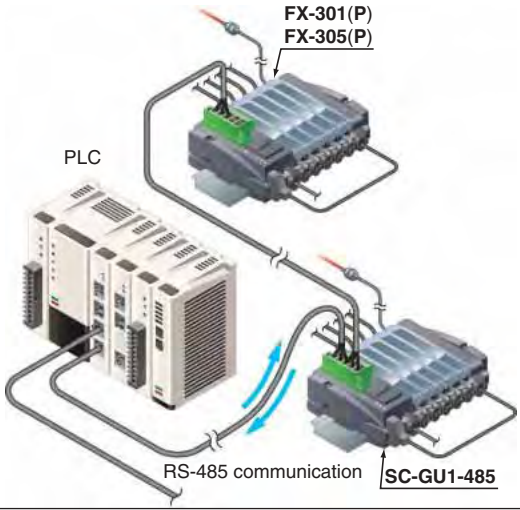
Note: Only the upgraded version of the **FX-301(P)** model can be used. Do not use the conventional **FX-301(P)** model.

Upper Level Communication Unit for Digital Sensors
SC-GU1-485

We now offer remote maintenance for digital sensors!

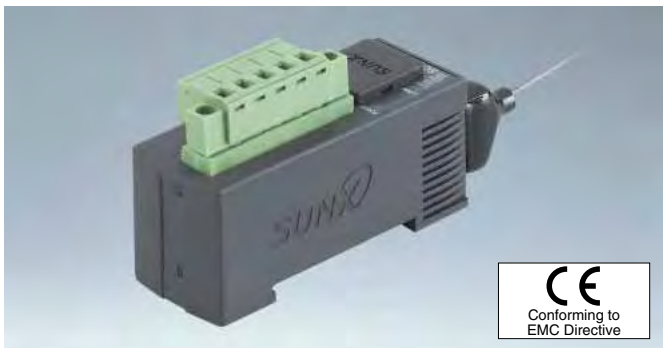
Function handy for startup and maintenance

Using a PLC or PC, this communication unit not only facilitates inputs (teaching, bank switching) to a digital fiber sensor [**FX-301(P)/305(P)**] but also received-light amount and output status verifications greatly enhancing workability during startup and maintenance.

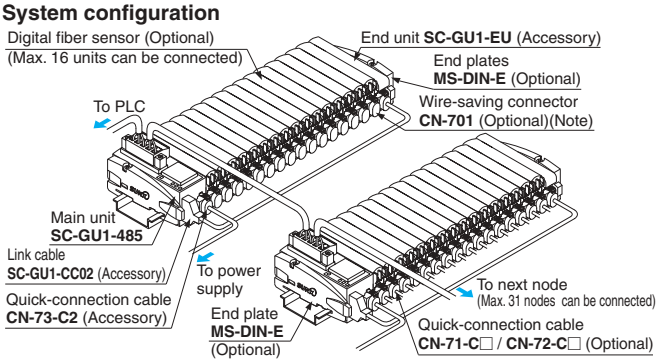


Compatible with other companies' PLCs that contain RS-485-compatible units

[Communicable commands]
- Sensor incident light intensity verification
- Sensor settings verification
- Sensor operation status verification
- Threshold value settings, etc.



System configuration



Note: This is used to control the output signal via signal transmission.

Type	Main Unit
Model No.	**SC-GU1-485**
Applicable sensor	**FX-301(P)**(Version upgrade)(Note), **FX-305(P)**
Supply voltage	24 V DC ± 10 %
Ambient temperature	− 10 to + 55 °C (When 4 to 7 sensors are connected: − 10 to + 50 °C, When 8 to 16 sensors are connected: − 10 to + 45 °C)
Dimensions	W25 × H41.7 × D64.5 mm

Note: Only the upgraded version of the **FX-301(P)** model can be used. Do not use the conventional **FX-301(P)** model.

Optical Fiber Heads

Sharp Bending Fiber
FT/FD-W SERIES

Now, an even greater variety of sharp bending fibers

Compact routing in space way as electrical wires

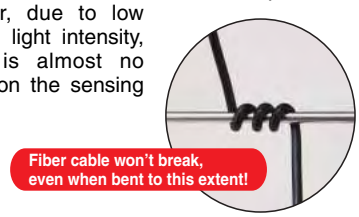
With the smallest bending radius being over R1 mm and the coaxial types capable of highly accurate sensing (**FD-WG4** and **FD-WSG4**) being over R2 mm, it can bend sharply like a cable to reduce wasted space.

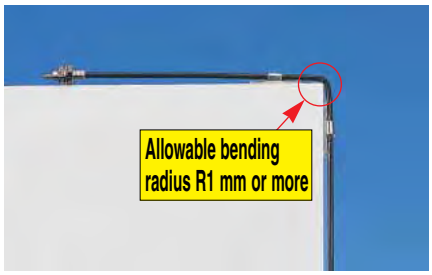
All 24 models! Complete lineup!

13 thru-beam models and 11 reflective models are available for a total of 24 models. You are sure to find the sharp bending fiber that is best for you.

Does not break even at sharp bends

It does not break even at sharp bends. Further, due to low loss in light intensity, there is almost no affect on the sensing range.





Applicable amplifiers: **FX-301/305/311/411** series
Max. sensing range (at LONG mode of red LED type) (Note):
Thru-beam type 3,500 mm (**FT-WA8/WA30**)
Reflective type 480 mm (**FD-WKZ1**)
Allowable bending radius: R1 mm or more (**FD-WG4, FD-WSG4**: R2 mm or more, sleeve part of **FD-W44**: R10 mm or more)

Note: **FX-411** specifications are in U-LG mode.

Wide Beam Fiber
FT-WA30/A30, FT-WA8/A8, FD-A15

Sensing possible with a wide area

Wide range Thru-beam type

It has a wide sensing width of 11 mm for **FT-WA8/A8** and 32 mm for **FT-WA30/A30** enabling long distance sensing of objects as far as 3,500 mm (with **FX-301** in LONG mode). Optimal for detecting unsteady objects or small objects.

Seal slit mask is available Thru-beam type

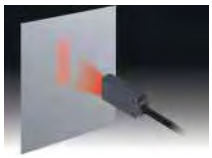
A seal slit mask reduces the width and thereby the intensity of the emitting beam, which enables much smaller objects to be detected.

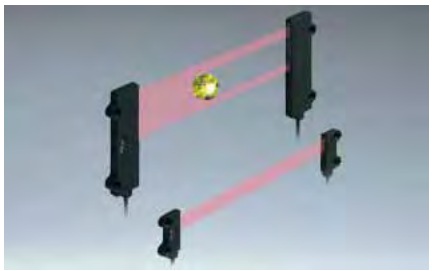
Space saving installation possible Thru-beam type

FT-WA30/A30 and **FT-WA8/A8** depth fibers boast a slim size of 20 mm and 13.5 mm respectively that enables mounting in even the narrowest of lines.

FD-A15 reflective type fiber also available

The 2×15 mm rectangular spot (at distance 15 mm) makes a wide range of sensing possible.





Applicable amplifiers: **FX-301/305/311/411** series
Sensing range (at LONG mode of red LED type) (Note 1):
Thru-beam type 3,500 mm, Reflective type 200 mm (Note 2)
Allowable bending radius: R1 mm or more (**FT-WA30/WA8**)
R10 mm or more (**FT-A30/A8**)
R25 mm or more (**FD-A15**)
Fiber cable length: 2 m (Free-cut)

Notes: 1) **FX-411** specifications are in U-LG mode.
2) 280 mm for the **FX-411** (U-LG mode).

Heat-resistant Fixed-focus Reflective Fiber
FD-H30-L32, FD-H18-L31

Glass substrate detection in high temperature production line

2 types to choose from to match your working environment

300 °C heat-resistant type / FD-H30-L32
Fiber cable length: 2 m (fixed)
Allowable bending radius: R25 mm or more

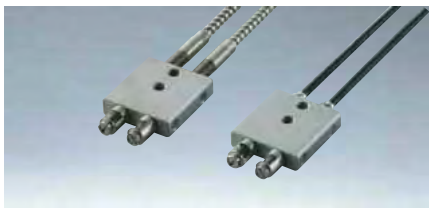
180 °C heat-resistant type / FD-H18-L31
Fiber cable length: 2 m (free-cut)
Allowable bending radius: R25 mm or more

High precision detection

In addition to excellent heat resistance, these fibers have achieved a repeatability of 0.06 mm for transparent glass substrates.

Extended detection range

Now available with full-range detection capabilities containing no dead zones (in both LONG and STD modes). Also, an extended detection distance of 15 mm (in LONG mode) has been achieved, which even allows warping in glass substrates to be detected.



Applicable amplifiers: **FX-301/305/311/411** series red LED type
Sensing range (at LONG mode): 0 to 15 mm (Note)
Allowable bending radius: R25 mm or more
Fiber cable length: 2 m (**FD-H18-L31**: Free-cut)

Note: If using the **FX-411**, the sensing range is 0 to 20 mm for the **FD-H30-L32** (U-LG mode) and 0 to 25 mm for the **FD-H18-L31** (U-LG mode).

Heat-resistant M4 Head Reflective Fiber
FD-H20-21, FD-H35-20S

Heat resistant fiber uses less setting-up space

Heat-resistant fiber saves installation space

The fiber head has M4 screw threads, allowing installation space savings when using many fibers.

High-precision positioning is possible

The 200 °C heat-resistant fiber (**FD-H20-21**) uses a coaxial fiber that makes high-precision positioning possible.

Heat-resistant fiber with sleeve (FD-H35-20S)

The sleeve is useful for cases when the fiber head cannot be installed close to the sensing location.

Can be installed in narrow spaces

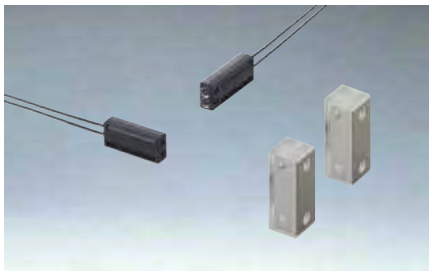
A flexible metal jacket sheath that allows cables to be routed easily has been adopted.

Applicable amplifiers: **FX-301/305/311/411** series
Sensing range (at LONG mode of red LED type):
FD-H20-21 270 mm, **FD-H35-20S** 160 mm (Note)
Allowable bending radius: R25 mm or more (sleeve of **FD-H35-20S**: R10 mm or more)
Ambient temperature: **FD-H20-21** −60 to +200°C
FD-H35-20S −60 to +350°C
Fiber cable length: 1 m

Note: If using the **FX-411**, the sensing range is 350 mm for the **FD-H20-21** (U-LG mode) and 210 mm for the **FD-H35-20S** (U-LG mode).

Optical Fiber Heads

Narrow Beam Retroreflective Type Fiber
FR-KZ21/KZ21E



Applicable amplifiers: **FX-301/305/311/411** series red LED type
Sensing range (at STD mode): 200 mm
Fiber cable length: 2 m (free-cut)
Allowable bending radius: R10 mm or more

Ideal for sensing transparent objects!

Stable sensing of transparent objects is possible

A unique optical system gives excellent performance in sensing transparent objects at close ranges. Uses an exclusive reflector (**RF-003**) for stable sensing of transparent objects such as transparent sheets on transparent mounts and transparent tubes.

Ultra-compact fiber head & compact reflector

The fiber head size is ultra compact at W9.5 × H5.2 × D21 mm (Side sensing type: W9.5 × H25 × D5.2 mm). The reflector is also a compact W10.6 × H28 × D10.1 mm so that it very space efficient.

Two types of fiber head for different installation directions

Two types of fiber head are available: a Top sensing type (**FR-KZ21**) and a Side sensing type (**FR-KZ21E**).
Whichever type best suits the installation conditions can be selected.

Retroreflective with Polarizing Filters Fiber
FR-WKZ11

Applicable amplifiers: **FX-301/305/311/411** series red LED type
Sensing range (at LONG mode) (Note 1):
100 to 800 mm (at attached reflective tape **RF-13**)
100 to 3,200 mm (Note 2) (at optional reflector **RF-230**)
Allowable bending radius: R1 mm or more
Fiber cable length: 2 m (free-cut)

Notes: 1) **FX-411** specifications are in U-LG mode.
2) 100 to 3,500 mm for the **FX-411** (U-LG mode).

Stable sensing of transparent objects

Compact head and long sensing range

This fiber has a compact head of W9.5 × H5.2 × D15 mm. It is a retroreflective type with a polarizing filters that has a long sensing range of 3,200 mm.

Unaffected by surface reflection from transparent objects

FR-WKZ11 has a built-in polarizing filters in its tip, so that it is unaffected by surface reflection from transparent objects and specular objects directly in front of it.

Gives stable detection of transparent objects

Because it's a retroreflective type, light passes through transparent objects twice, so differences in light amount can be easily picked up and glass substrate and transparent films can be detected with good stability.

Coaxial M3 Head Reflective Fiber
FD-G6

Applicable amplifiers: **FX-301/305/311/411** series
Sensing range (at LONG mode of red LED type): 110 mm (Note)
Allowable bending radius: R25 mm or more
Spot diameter (when **FX-MR6** is mounted): approx. ϕ0.4 mm
Fiber cable length: 2 m (free-cut)

Note: 220 mm for the **FX-411** (U-LG mode).

High-precision & space saving

Fiber allows installation space saving

The fiber head has M3 screw threads, allowing installation space savings when using many fibers.

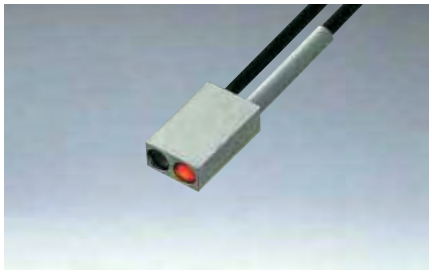
High-precision positioning is possible

This coaxial fiber has the emitting fiber at the center and the receiving fiber around it. This fiber is ideal for high-precision positioning.

Allows sensing of very small objects

FX-MR6 and **FX-MR3** finest spot lenses can be attached, making this fiber ideal for sensing very small objects such as sensing the orientation of chips.

Long Sensing Range Rectangular Head Reflective Fiber
FD-WKZ1



Applicable amplifiers: **FX-301/305/311/411** series red LED type
Sensing range (at LONG mode)(Note 2): 20 to 480 mm
Allowable bending radius: R1 mm or more
Fiber cable length: 2 m (free-cut)

Note: **FX-411** specifications are in U-LG mode.

Narrow field of view / long distance detection!

Compact fiber head

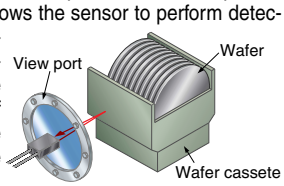
FD-WKZ1 has a compact head with dimensions of W9.2 × H5.2 × D15 mm.

Narrow-view reflective type fiber allows for accurate aiming through narrow aperture obstruction

The beam spread of **FD-WKZ1** has been reduced to approximately 1/5 of that of conventional fiber, enabling detection through narrow apertures.

High power beam and long sensing range

Sensing can now be performed over distances of 480 mm. As well, the implementation of a powerful light beam allows the sensor to perform detection under difficult sensing conditions where high levels of dust and coarse particulates are present.



Sensors for Semiconductor / FPD Industry

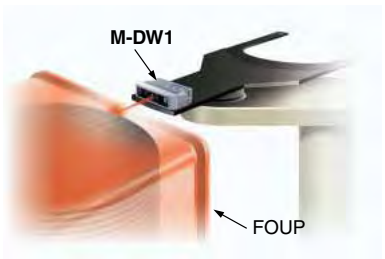
Glass Substrate / Wafer Sensing

LED Beam Reflective Type Wafer Mapping Sensor

Photoelectric sensor

M-DW1

Detectable nitride-coated wafers



Safe LEDs adopted

Laser mapping sensor is dangerous, because when mapping from inside the loading port, the laser beam which misses the FOUP is directed toward the operator. **M-DW1** which uses an LED light source is much safer than the conventional laser beam mapping sensor.

Precise position detection by 2-segment receiving element

Wafer detection by the amount of reflected light may sometimes fail depending on the wafer edge shape. **M-DW1** uses 2-segment receiving element in the beam-receiving part, and detects wafers by the reflected light position instead of the amount of reflected light. Thus, the sensor is less affected by wafer thickness or the amount of reflected light.

Sensing of nitride-coated wafers possible

Nitride-coated wafers absorb light at certain wavelengths depending on the coating thickness. If the sensor uses the laser beam having a single wavelength, the beam may be absorbed completely, resulting in wafer detection error. **M-DW1** uses an LED light source with a wide wavelength band that allows it to detect nitride-coated wafers successfully.

Center sensing distance: 45 mm
Sensing object: 3 inch or larger semiconductor wafer (Note)
Supply voltage: 12 to 24 V DC ± 10 %
Output: NPN open-collector transistor or PNP open-collector transistor, selectable with output selection switch
Dimensions: W80.6 × H18.3 × D50 mm

Note: In case of 8 inch or less wafers, the wafer pitch orientation flat or the surface condition may affect the sensing.

Vacuum Resistant Fiber

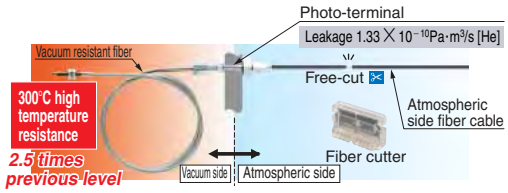
Fiber head

FT/FD-V SERIES

Providing highly reliable sensing in vacuum and high temperature environments

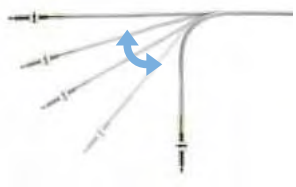
Usable in high-temperatures of 300°C and vacuum

Highly reliable sensing of objects is possible even after the high-temperature processing that is used in FPD manufacturing processes.



Highly resistant to repeated bending

It has a bending durability of over 100,000 times (at R20 mm)



Compact routing in space way

We've realized an allowable bending radius of R18 mm.

Applicable amplifiers: **FX-301/305/311/411** series
Sensing range (at LONG mode of red LED type):
FT-H30-M1V 250 mm (Note 1)
FD-H30-KZ1V 20 to 200 mm (Note 2)
FD-H30-L32V 0 to 8 mm (Note 3)
Allowable bending radius: R18 mm or more
Fiber cable length: 1 m (**FD-H30-L32V**: 3 m)

Notes: 1) 390 mm for the **FX-411** (U-LG mode).
2) 20 to 300 mm for the **FX-411** (U-LG mode).
3) 0 to 11 mm for the **FX-411** (U-LG mode).
4) Model Nos. having the suffix '**-S**' are set model Nos. When ordering, be sure to specify the vacuume resistant fiber, photo-terminals and atmospheric fibers set model No.

Wafer Mapping Fiber

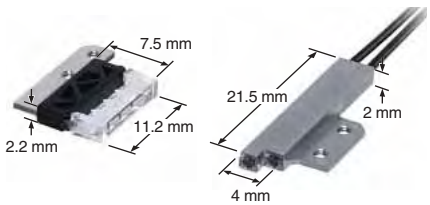
Fiber head

Retroreflective Type **FR-KV1** SERIES Thru-beam Type **FT-KV1** SERIES

NEW Concept ! Retroreflective Type

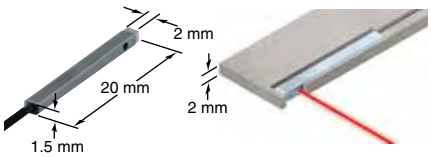
Retrorefelctive type mapping fiber

2.0 mm fiber head and an ultra-thin 2.2 mm reflector allow these to be mounted even in thin robot hands. Furthermore, because they are retroreflective type fibers, the amount of wiring needed can be reduced, and the robot hands require less processing and so can be kept strength. Furthermore, a heat-resistant type that can resist heats of + 105 °C is also available.

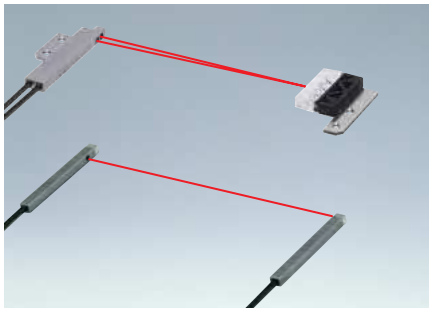


Ultra-compact size Thru-beam Type

The ultra-compact size of W2 × H1.5 × D20 mm means that mounting is possible even in places such as robot hands where space is limited. Furthermore, a heat-resistant type that can resist heats of + 105 °C is also available.



With the **FT-KV1**, the fiber can be embedded into a plate with a thickness of 2 mm.



Applicable amplifiers: **FX-301/305/311/411** series
Sensing range (at LONG mode of red LED type)
Retroreflective type 15 to 330 mm (Note)
Thru-beam type 500 mm
Allowable bending radius: R10 mm or more
Fiber cable length: 2 m (free-cut)

Note: If using the **FX-411**, the sensing range is 15 to 350 mm for the **FR-KV1** and 15 to 320 mm for the **FR-H10-KV1**.

Sensors for Semiconductor / FPD Industry

Glass Substrate / Wafer Sensing

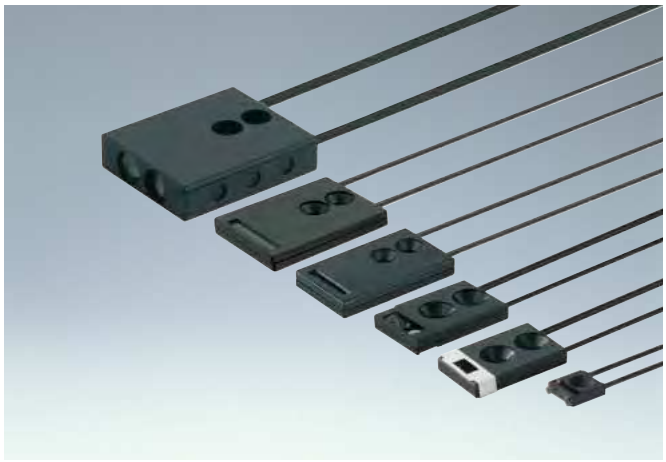
Fibers for Liquid Crystal Display Industry

Fixed-focus Reflective Type

FD-L40 SERIES

Fiber head

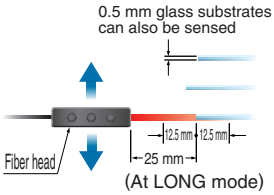
6 types of fiber for glass substrate conveyors



Mapping fiber **FD-L46**

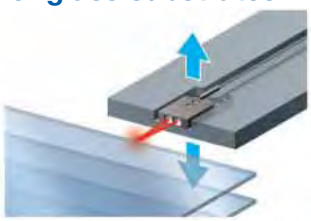
Accurate mapping even for thin glass substrates

The adoption of a unique large lens allows even thin glass substrates to be sensed directly from the side. In addition, because the sensing range is wide (25 ± 12.5 mm), stable mapping is possible even if glass substrates are in irregular positions.



Can be used for a variety of glass substrates

Large light amounts can be obtained for a variety of glass edge shapes such as R surfaces and C surfaces, so that accurate mapping of glass substrates inside cassettes is possible. Glass that has received black or yellow masking can also be sensed in addition to clear glass.

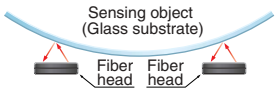


Edges with poor reflectivity can also be sensed

Alignment fiber **FD-L43 / FD-L45**

Stable and greater performance in sensing of glass with ±8° flexure

Increases in sizes of glass substrates mean greater amounts of flexure, but a single fiber can sense glass even if horizontal flexure is within ±8° (**FD-L45**: ±6°).



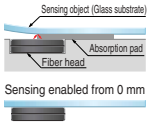
Improved high-precision sensing over wide ranges

A sensing range of 3 to 17 mm (**FD-L45**: 10 to 25 mm) and a positioning error of 0.2 mm or less makes higher precision sensing possible.

Seating confirmation fiber **FD-L44 / FD-L44S / FD-WL48**

Sensing range 0 to 7 mm FD-L44

0 to 7 mm of long sensing range for seating confirmation. Sensing is even possible if absorption pads are presented.



The short range type FD-L44S is also available

Ultra-compact type FD-WL48 saves space

The ultra-compact size of W7.2 × H7.5 × D2 mm holds a fixed-focus reflective optical system. These fiber heads can now be mounted in locations and devices that were previously impossible because of a lack of space. As a result, an even wider range of applications is now available. Can be used for a variety of different applications in addition to glass substrate sensing.

Applicable amplifiers: **FX-301/305/311/411** series red LED type
Sensing range (Note 1): **FD-L46** 12.5 to 37.5 mm (LONG mode)(Note 2), **FD-L43** 0 to 23 mm (STD mode)
FD-L44 0 to 7 mm (LONG mode)(Note 3), **FD-L44S** 0 to 4.5 mm (LONG mode)(Note 4)
FD-L45 0 to 36 mm (LONG mode)(Note 5), **FD-WL48** 0.5 to 7.5 mm (LONG mode)(Note 6)
Allowable bending radius: **FD-L46** R25 mm or more, **FD-L45** / **FD-L43** R4 mm or more
FD-L44(**S**) R10 mm or more, **FD-WL48** R1 mm or more
Fiber cable length: **FD-L46** 4 m (free-cut), **FD-L43/44**(**S**) 2 m (free-cut)
FD-L45 3 m (free-cut), **FD-WL48** 1 m (free-cut)

Notes: 1) The values for the **FD-L46** are for R edge of glass substrate (100 × 100 × t0.7 mm) for LCDs; the values for the **FD-L43**, **FD-L44** and **FD-L45** are for glass substrate (100 × 100 × t0.7 mm) for LCD; the values for the **FD-L44S** are for silicon wafer (polished surfaces) and the values for the **FD-WL48** are for white non-glossy paper (100 × 100 mm).
2) 12 to 50 mm for the **FX-411** (U-LG mode).
3) 0 to 8.2 mm for the **FX-411** (U-LG mode).
4) 0 to 4.4 mm for the **FX-411** (U-LG mode).
5) 0 to 50 mm for the **FX-411** (U-LG mode).
6) **FX-411** specifications are in U-LG mode.

Sensors for Semiconductor / FPD Industry

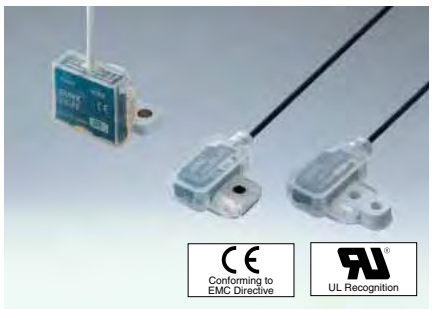
Liquid Leak / Liquid Level Sensing

Amplifier Built-in • Leak Detection Sensor

Photoelectric sensor

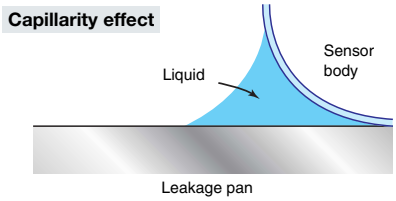
EX-F70/F60 SERIES

High-speed detection even a little liquid leak



Reliable detection

The unique effect of capillarity enables reliable detection of small leaks and viscous liquids.



Safe design

If the sensor is installed incorrectly, or if the cable breaks or a sensor problem occurs, the same output as for a liquid leak occurs.
In addition, this guards against human error in setup that might occur during maintenance.

Compact, space-saving

The **EX-F70** series is slim (10 mm) side mounting sensor. The **EX-F60** series is compact at 26 mm (W) × 19 mm (H) × 9 mm (D), so that it can be used even in narrow spaces.

PFA enclosure gives excellent chemical resistance

Accurate sensing can be obtained even if there are leaks of chemicals such as sulfuric acid, hydrochloric acid or ammonia.

Sensing object: **EX-F7**□ Water, Fluorinert™ (Note 1)
EX-F6□ Agent, such as sulfuric acid, Hydrochloric acid, Phosphoric acid or Ammonia etc.
Supply voltage: 12 to 24 V DC ± 10 %
Output: **EX-F7**□**/F6**□ NPN open-collector transistor
EX-F7□**/F6**□**-PN** PNP open-collector transistor
Response time: 50 ms or less
Emitting element: Infrared LED (non-modulated)

Notes: 1) Flouorinert™ is the world wide TradeMark of 3M.
2) 5 m cable length type (standard: **EX-F7**□ 2 m, **EX-F6**□ 3 m) is also available.

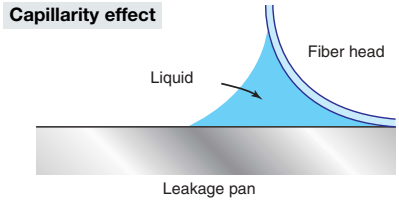
Leak Detection Fiber Fiber head

FD-F705

A new slim fiber sensor ideal for sensing chemical leaks

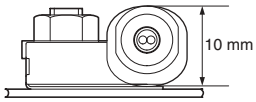
Reliable detection

The unique effect of capillarity enables reliable detection of small leaks and viscous liquids.



Compact, space-saving

This slim (10 mm) side-mounting sensor is especially good for use in confined spaces.



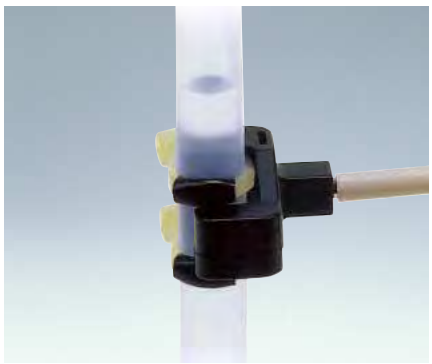
Ideal for chemicals and volatile materials

This fiber type sensor is safer to use with volatile materials (SEMI S2 compliant). The PFA (fluorine resin) fiber head makes it ideal for use with chemicals.

Applicable amplifiers: **FX-301-F**, **FX-301P-F**
Sensing object: Liquid
Fiber cable length: 5 m (free-cut)
Protective tube length: 3 m
Dimensions: W20 × H30 × D10 mm

Liquid Detection Fiber Fiber head

FT-F902



Reliably detect liquid in pipe

Safer fiber type sensor

Because it is a fiber sensor, it is safe to use in dangerous areas where there is a risk of fires or explosions. It meets the stringent demands for higher safety levels placed by international standards including SEMI S2.

Easy to use and reliable detection

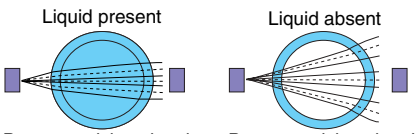
Even when the shape and thickness of the pipe vary, this sensor uses a method where the beam axis follows the diameter of the pipe, and so when compared to conventional methods, the shape and thickness of the pipe have no influence over the performance of this sensor.

Reliable detection not affected by bubbles or droplets

Problems encountered by conventional pipe-mountable sensors, such as bubbles, droplets, or liquid leakage, have been solved using the latest optical fiber techniques.

Worry-free design that doesn't overlook liquid-absent condition and sensor malfunction

When liquid is present in the pipe, the lens effect of the liquid condenses the beam, so the sensor become to be in beam received condition.



Applicable amplifiers: **FX-301-F**, **FX-301P-F**
Sensing object: Liquid
Applicable pipe diameter: Outer dia. ϕ3.0 to ϕ10.0 mm
Fiber cable length: 2 m (free-cut)
Protective tube length: 1 m
Dimensions: W23 × H17 × D20 mm

Digital Fiber Sensor for Leak Detection / Liquid Detection Fibers Only Photoelectric sensor

FX-301-F

Easy operation even for beginners!
Optimum settings can be realized with simple operations

For use with leak detection or liquid detection fiber only

FX-301-F is designed specifically for use with the leak detection fiber (**FD-F705**) or the liquid detection fiber (**FT-F902**). You can easily set the optimum conditions.

Flashing function incorporated

When the leak detection fiber is connected (F7 mode), if a leak is detected, you will recognize which fiber detects the leak at a single glance because the emitter will start flashing.

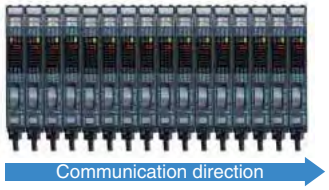
Easy to operate with individual / collective teaching mode

Individual teaching mode (TEACH)

After you select **FD-F705** or **FT-F902** with the jog switch, the optimum threshold level is automatically set by just pressing the jog switch.

Collective teaching mode (ALL)

You can set the optimum sensitivity for all cascaded units in one step by the optical communications function. Moreover, since the settings are also copied to all units, the time involved is considerably reduced.



Collective teaching mode is possible for 16 units max.

Applicable fibers: **FD-F705**, **FT-F902**
Supply voltage: 12 to 24 V DC ± 10 %
Output: **FX-301-F** NPN open-collector transistor
FX-301P-F PNP open-collector transistor
Response time: 250 μs or less
Emitting element: Red LED (modulated)
Dimensions: W10 × H30.5 × D64.5 mm

Note: The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1 m)
CN-73-C2 (cable length 2 m)
CN-73-C5 (cable length 5 m)
Sub cable (1-core): **CN-71-C1** (cable length 1 m)
CN-71-C2 (cable length 2 m)
CN-71-C5 (cable length 5 m)

Photoelectric Sensors

Amplifier Built-in• Compact
CX-400 SERIES

We have a full lineup of world standard photo-electric sensors!

Great lineup of 116 models

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

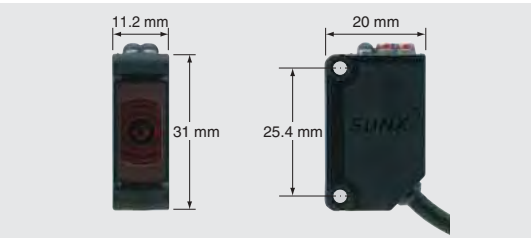
Type	Sensing range
Thru-beam (long sensing range)	15 m
Thru-beam	10 m
Retroreflective (long sensing range)	5 m
Retroreflective (with polarizing filters)	3 m
Retroreflective (transparent object sensing)	0.1 to 2 m
Retroreflective (transparent object sensing)	50 to 500 mm
Diffuse reflective (800 mm type)	800 mm
Diffuse reflective (300 mm type)	300 mm
Diffuse reflective (100 mm type)	100 mm
Diffuse reflective (narrow-view)	70 to 200 mm
Adjustable range reflective	20 to 300 mm
Adjustable range reflective	15 to 100 mm
Adjustable range reflective	2 to 50 mm
Adjustable range reflective (small spot)	2 to 50 mm

Output	NPN, PNP
Connecting method (Note 1)	Cable type, M8 plug-in connector type, M12 pigtailed type
Cable length of cable type (Note 2)	0.5 m, 2 m, 5 m

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

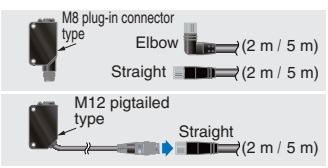
Compact size

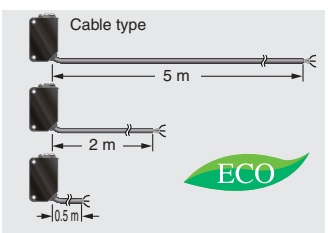
The sensors are compact in size at W11.2 × H31 × D20 mm.
The mounting pitch is also at the world standard size of 25.4 mm (1 in).

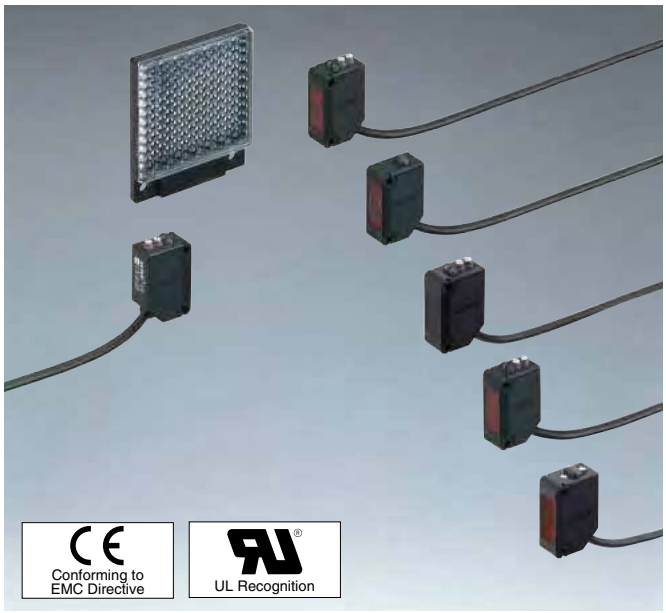


Less processing

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

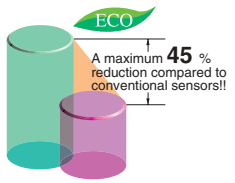






Less power consumed

The **CX-400** series sensors achieve a maximum of approx. 55 % the power consumption of conventional sensors.
Contributes to preserving the environment.



Less resources used

Based on environmental considerations, simplified packaging is used in order to reduce waste.
In addition, the bag is made from polyethylene which produces no toxic gases even when burned.

Strong against oil and coolant liquids CX-41□/42□/49□

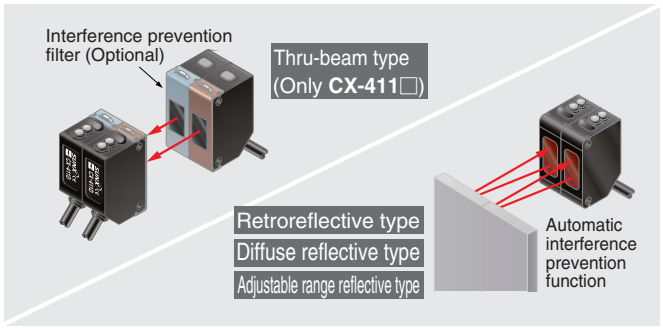
The lens material for the thru-beam type, retroreflective type (excluding the **CX-48**□) and the diffuse reflective type are made of a strong acrylic that resists the harmful effects of coolants. These sensors can be used with confidence even around metal processing machinery that disperses oil mists.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

Strong against ethanol CX-44□/48□

A strong, ethanol resistant polycarbonate was 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 lets two sensors to be mounted close together precisely.



Strong against noise

Significantly stronger against inverter light and other extraneous light as well as high frequency and electromagnetic noise generated by high-pressure inverter motors and other devices.

Thru-beam type

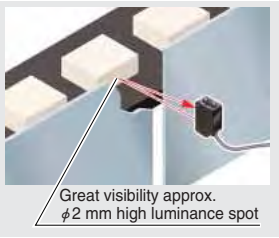
Strong infrared beam CX-412□

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

Diffuse reflective type

Beam axis alignment made easy with a high luminance spot beam CX-423□

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. ϕ2 mm, even the minutest object can be accurately detected.



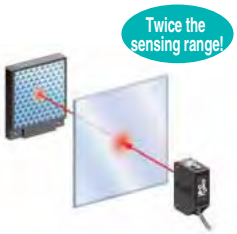
Retroreflective type

Strongest sensing range in its class CX-493□

A long 5 m 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.

Introducing the transparent object sensing type sensor CX-481□/482□

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



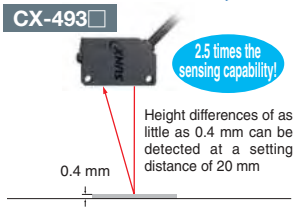
Type		Thru-beam		Retroreflective				Diffuse reflective			Narrow-view
			Long sensing range	With polarizing filters	Long sensing range	For transparent object sensing					
Model No.	NPN output	CX-411	CX-412	CX-491	CX-493	CX-481	CX-482	CX-424	CX-421	CX-422	CX-423
	PNP output	CX-411-P	CX-412-P	CX-491-P	CX-493-P	CX-481-P	CX-482-P	CX-424-P	CX-421-P	CX-422-P	CX-423-P
Sensing range		10 m	15 m	3 m	5 m	50 to 500 mm	0.1 to 2 m	100 mm	300 mm	800 mm	70 to 200 mm
Supply voltage		12 to 24 V DC ± 10 %									
Output		NPN output type: NPN open-collector transistor, PNP output type: PNP open-collector transistor									
	Output operation	Switchable either Light-ON or Dark-ON									
Response time		1 ms or less									
Automatic interference prevention function		Two units of sensors can be mounted close together with interference prevention filters. (Sensing range: 5 m)	—	Incorporated (Two units of sensors can be mounted close together.)							
Protection		IP67 (IEC)									
Ambient temperature		− 25 to + 55 °C									
Emitting element (modulated)		Red LED	Infrared LED	Red LED		Infrared LED					Red LED

Note: 0.5 m / 5 m cable length type (standard: 2 m), M8 plug-in connector type, and M12 pigtailed type are available.

Adjustable range reflective type

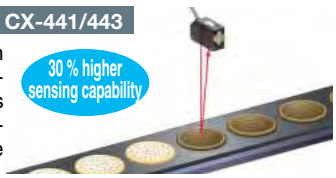
Can sense differences as small as 0.4 mm, with hysteresis of 2 % or less CX-493□

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



Not affected by color CX-441/443

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.



[Sensing range difference is 1 % or less between white non-glossy paper and non-glossy paper (gray) with lightness: 5 at a setting distance of 50 mm.]

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

BGS

Background not present

When object and background are separated

FGS

Background present

- When object and background are close together
- When the object is glossy or uneven

Type		Small spot	Adjustable range reflective		
Model No.	NPN output	CX-441	CX-443	CX-444	CX-442
	PNP output	CX-441-P	CX-443-P	CX-444-P	CX-442-P
Adjustable range (Note 1)		20 to 50 mm		20 to 100 mm	40 to 300 mm
Sensing range (with white non-glossy paper)		2 to 50 mm		15 to 100 mm	20 to 300 mm
Supply voltage		12 to 24 V DC ± 10 %			
Output		NPN output type: NPN open-collector transistor, PNP output type: PNP open-collector transistor			
	Output operation	Switchable either Detection-ON or Detection-OFF			
Response time		1 ms or less			
Sensing mode		BGS / FGS functions Switchable with wiring of sensing mode selection input			
Protection		IP67 (IEC)			
Ambient temperature		− 25 to + 55 °C			
Emitting element		Red LED (modulated)			

Notes: 1) The adjustable range stands for the maximum sensing range which can be set with the distance adjuster. The sensor can detect an object 2 mm [**CX-444(-P)**: 15 mm, **CX-442(-P)**: 20 mm], or more away.
2) M8 plug-in connector type is also available.

Photoelectric Sensors

Amplifier Built-in • Ultra-slim
EX-10 SERIES

The smallest: 3.5 mm thick

Freely mountable fingertip size

Freely mountable W10 × H14.5 × D3.5 mm size (thru-beam, front sensing type). Moreover, easy alignment is possible with the visible red LED beam source.

Six types of mounting brackets, fixable with M3 screws, are available.

Long sensing range 1 m: EX-19□

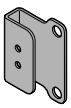
Operation mode switch type: EX-15□/17□

Ten times durable: EX-□-R

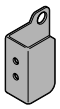
Flexible cable on **EX-□-R** is 10 times as durable as conventional model. It is most suitable for moving parts, such as robot arm, etc.

Slit mask available for EX-13□/17□/19□

• **OS-EX10-12** / **OS-EX10-15**



• **OS-EX10E-12**



Type		Thru-beam						Thru-beam • with operation mode switch on bifurcation		Convergent reflective	
Model No. (Note 1)		EX-11A(-R)	EX-11B(-R)	EX-13A(-R)	EX-13B(-R)	EX-19A(-R)	EX-19B(-R)	EX-15	EX-17	EX-14A(-R)	EX-14B(-R)
Sensing range		150 mm		500 mm		1 m		150 mm	500 mm	2 to 25 mm (Conv. point: 10 mm)	
Min. sensing object		ϕ1 mm opaque object		ϕ2 mm opaque object				ϕ1 mm opaque object	ϕ2 mm opaque object	ϕ0.1 mm copper wire (Setting distance: 10 mm)	
Supply voltage		12 to 24 V DC ± 10 %									
Output		NPN open-collector transistor (Note 2)									
	Output operation	Light-ON	Dark-ON	Light-ON	Dark-ON	Light-ON	Dark-ON	Switchable either Light-ON or Dark-ON		Light-ON	Dark-ON
Response time		0.5 ms or less									
Protection		IP67 (IEC)									
Ambient temperature		− 25 to + 55 °C									
Dimensions		W10 × H14.5 × D3.5 mm						W10 × H14.5 × D3.5 mm (sensor head)		W13 × H14.5 × D3.5 mm	

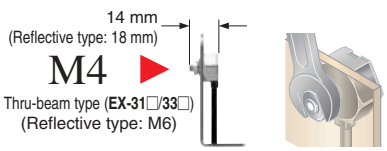
Notes: 1) **EX-□-R** is flexible cable type.
2) PNP output type is also available. (Excluding flexible cable type, **EX-15** and **EX-17**)
3) Side sensing type (excluding **EX-19**□ and **EX-14**□) is also available.
4) 5 m cable length type (standard: 2m) is also available.

Amplifier Built-in • Threaded Miniature Type
EX-30 SERIES

A new alternative to fiber sensors

Can be installed in the same way as standard fibers

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

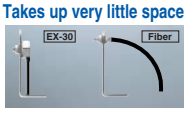


New design solves all weak points of fiber sensors

The **EX-30** series solves all of the difficulties associated with fiber sensors, such as 'Difficulty finding a suitable place for the amplifier', 'Fragility of the fiber', 'Extra space needed because of difficulty in bending the fiber', 'The nuisance of having to use a protective tube to prevent fiber breakages'.

Unbreakable

Takes up very little space



No protective tube needed

800 mm thru-beam type available EX-33□ New

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.

Low price

The recommended price is much lower than the price for fiber sensor sets.

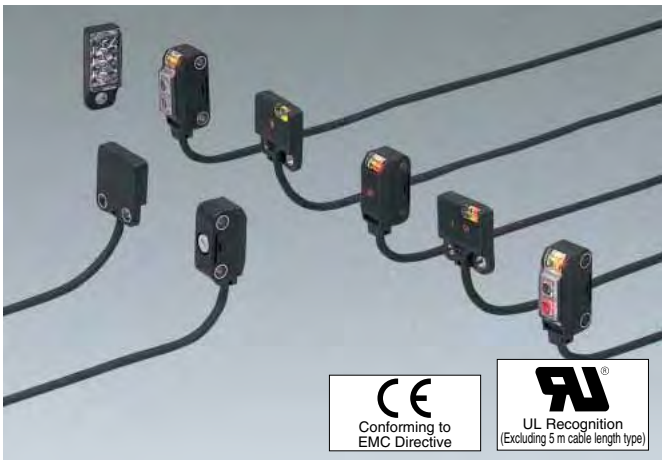
Type		Thru-beam			Diffuse reflective	
Model No.	NPN output	EX-31A	EX-31B	EX-33	EX-32A	EX-32B
	PNP output	EX-31A-PN	EX-31B-PN	EX-33-PN	EX-32A-PN	EX-32B-PN
Sensing range		500 mm		800 mm	50 mm	
Sensing object		ϕ2 mm or more opaque object			Opaque, translucent or transparent object	
Supply voltage		12 to 24 V DC ± 10 %				
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor				
	Output operation	Light-ON	Dark-ON	Variable (Switching method)	Light-ON	Dark-ON
Response time		0.5 ms or less				
Protection		IP67 (IEC)				
Ambient temperature		− 25 to + 55 °C				

Note: 5 m cable length type (standard: 2 m) is also available.
[excluding **EX-33(-PN)**]

Amplifier Built-in • Ultra-compact

EX-20 SERIES

Miniature-sized and still mountable with M3 screws



Mountable with M3 screws in spite of miniature size

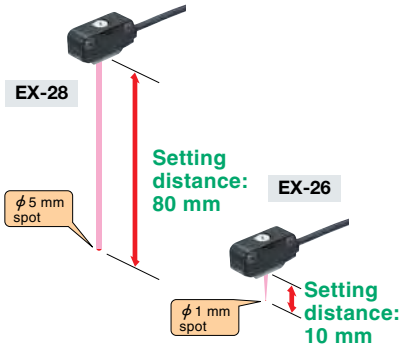
Mountable with M3 screws. Moreover, ultra-compact size is realized. It is mountable in a tight space.

Long sensing range

The **EX-20** series achieves long distance sensing [thru-beam type: 2 m, retroreflective type: 200 mm (when using the attached reflector), diffuse reflective type: 160 mm], 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, and it is possible to design a high power, narrow beam. Since a red LED dot light source is used, the red beam spot is clear even at a far place, so that alignment and confirmation of sensing position is easy.



Type		Thru-beam		Retroreflective	Diffuse reflective	Convergent reflective		Narrow-view reflective
						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. (Note 1)	Light-ON	**EX-21A(-PN)**	**EX-23(-PN)**	**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		1 m	2 m	30 to 200 mm	5 to 160 mm	2 to 25 mm (Conv. point: 10 mm)	6 to 14 mm (Conv. point: 10 mm)	45 to 115 mm
Sensing object		Min. ϕ2.6 mm opaque object	Min. ϕ3 mm opaque object	ϕ15 mm or more opaque or translucent object	Opaque, translucent or transparent object	Min. ϕ0.1 mm copper wire (Setting distance: 10 mm)		Opaque, translucent or transparent object
Supply voltage		12 to 24 V DC ± 10 %						
Output		NPN output type: NPN open-collector transistor, PNP output type: PNP open-collector transistor						
Response time		0.5 ms or less						
Protection		IP67 (IEC)						
Ambient temperature		− 25 to + 55 °C						
Dimensions (mm)		W16 × H18 × D4.5	W8.2 × H19 × D10.5	W8.2 × H22 × D12.3		W16 × H18 × D4.5	W8.2 × H22 × D12.3	

Notes: 1) **EX-□-PN** is PNP output type.
2) 5 m cable length type (standard: 2 m) is also available.

Adjustable Range Reflective Type

EQ-30 SERIES

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

Not affected by object color or background

Long sensing range 2 m

Compact size

It saves space, since a miniaturized housing of W20 × H68 × D40 mm has been designed for the fixed-focus sensing sensor.

Two setting distances are possible: EQ-34W

With **EQ-34W**, two sensing distances, Far (Main) and Near (Sub), can be set.
Hence, one sensor can suffice where, earlier, two were required.

Plug-in connector type (excluding EQ-34W)

Plug-in connector type of the **EQ-30** series can be easily disconnected for replacement. Should a trouble occur, anyone can replace the sensor in a minute.

Adjustable range: **EQ-34(-PN)** 0.2 to 2 m
EQ-34W Far 0.2 to 2 m, Near 1 to 2 m
Sensing range: **EQ-34(-PN)** 0.1 to 2 m
EQ-34W Far 0.1 to 2 m, Near 0.2 to 2 m
Supply voltage: 10 to 30 V DC
Output: **EQ-34(W)** NPN open-collector transistor
EQ-34-PN PNP open-collector transistor
Dimensions: W20 × H68 × D40 mm

Note: Plug-in connector type (**EQ-34-J**, **EQ-34-PN-J**) and 5 m cable length type (**EQ-34-C5**, **EQ-34W-C5**)(standard: 2 m) are also available.

Photoelectric Sensors

Multi-voltage / Amplifier Built-in Adjustable Range Reflective Type EQ-500 SERIES

Long range sensing capability to 2.5 m.
Stable sensing unaffected by color or gloss.

Long sensing range!

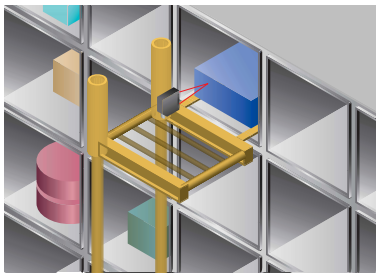
An adjustable to 2.5 m allows plenty of space for installation.

Introducing the 1 m sensing range type!

EQ-502(T)/512(T)

Impervious to variations color or angle

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



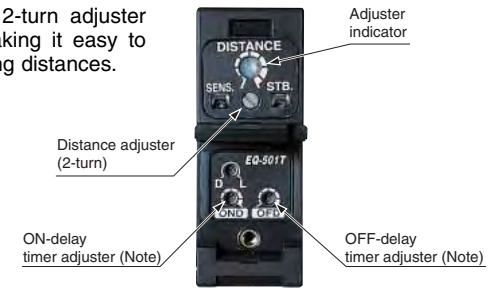
Note: Sensing range difference is 5 % or less between white non-glossy paper and non-glossy paper (gray) with lightness: 5 at a setting distance of 2 m. [**EQ-5□1(T)**]

Not affected by background objects

Because the sensor doesn't detect objects outside the preset sensing field by using the 2-segment photodiode adjustable range system, 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.



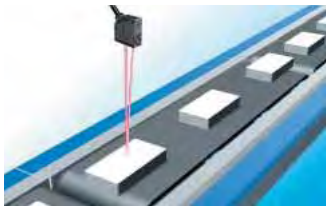
Note: For **EQ-5□T** only.

Multi-voltage EQ-501(T)/502(T)

Because it can function with 24 to 240 V AC and 12 to 240 V DC, almost any power supply anywhere in the world will do.

Introducing the new DC-voltage type equipped with BGS / FGS function EQ-511(T)/512(T)

We've 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**)
OFF-delay, e.g. useful when the response of the connected device is slow, ON-delay, e.g. useful to detect objects that take a long time to move.

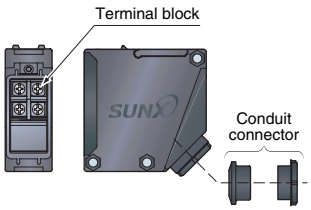
- Operation: ON-delay
  OFF-delay
- Timer period: 0.1 to 5 sec. (individual setting is possible)

Little affected by contamination on lens

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

Convenient terminal block type

Cabling enabled by way of a terminal block that eliminates waste.

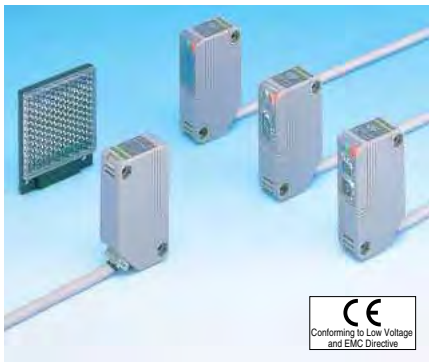


Type	Multi-voltage				DC-voltage			
		With timer		With timer		With timer		With timer
Model No.	**EQ-501**	**EQ-501T**	**EQ-502**	**EQ-502T**	**EQ-511**	**EQ-511T**	**EQ-512**	**EQ-512T**
Adjustable range (Note)	0.2 to 2.5 m		0.2 to 1.0 m		0.2 to 2.5 m		0.2 to 1.0 m	
Sensing range (at maximum setting distance)	0.1 to 2.5 m		0.1 to 1.0 m		0.1 to 2.5 m		0.1 to 1.0 m	
Supply voltage	24 to 240 V AC ±10 % or 12 to 240 V DC ±10 %				12 to 24 V DC ±10 %			
Output	Relay contact 1a				NPN open-collector transistor and PNP open-collector transistor 2 outputs			
Output operation	Switchable either Detection-ON or Detection-OFF							
Response time	20 ms or less (For **EQ-50□T** depends on the setting timer period)				2 ms or less (For **EQ-51□T** depends on the setting timer period)			
Timer function	———	Incorporated with variable (0.1 to 5 sec.) ON-delay / OFF-delay timer	———	Incorporated with variable (0.1 to 5 sec.) ON-delay / OFF-delay timer	———	Incorporated with variable (0.1 to 5 sec.) ON-delay / OFF-delay timer	———	Incorporated with variable (0.1 to 5 sec.) ON-delay / OFF-delay timer
Protection	IP67 (IEC)							
Ambient temperature	−20 to +55 °C							
Emitting element	Infrared LED (modulated)							
Dimensions	W26 × H68 × D68 mm							

Note: The adjustable range stands for the maximum sensing range which can be set with the distance adjuster.
The sensor can also detect an object 0.1 m, or more, away.

Compact Size • Multi-voltage
NX5 SERIES

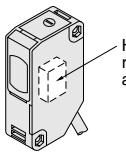
World-wide usable sensor



Supply voltage: 24 to 240 V AC ± 10 % or
12 to 240 V DC ± 10 %
Output: Relay contact 1c
Response time: 10 ms or less
Protection: IP66 (IEC)
Ambient temperature: − 20 to + 55 °C
Dimensions: W18 × H62 × D35 mm

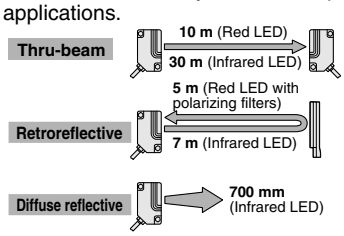
Multi-voltage
24 to 240 V AC and 12 to 240 V DC, suitable for supply voltages all over the world.

High reliability
It has IP66 protection. Moderate dust or water splashes do not affect it.
The new hermetically sealed output relay significantly increases its reliability.



Interference prevention
Two sensors operate quite normally even if mounted close together.
(Excluding the 30 m thru-beam type sensor)

Long sensing range
Most suitable for conveyor lines and parking lot applications.



Terminal Connection Type • Multi-voltage
VF SERIES

Easy to use terminal connection type

Supply voltage: 24 to 240 V AC ± 10 % or
12 to 240 V DC ± 10 %
Output: Relay contact 1a
Response time: 20 ms or less
Protection: IP66 (IEC)
Ambient temperature: − 10 to + 60 °C
Dimensions: W26 × H55 × D75 mm

Note: **VF-□T** is equipped with timer function.

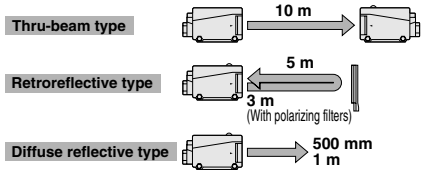
New convenient construction
The slanting step-wise terminal enables quick and easy connection.

Multi-voltage
The **VF** series can operate at 24 to 240 V AC or 12 to 240 V DC, which makes it suitable for supply voltages all over the world.

Timer function models
The sensing signal can be easily converted into a signal suitable for your control process. It is also suitable for PLC input.

- Timer period: 0.1 to 5 sec. (Variable)
- Operation: ON-delay
  OFF-delay
  ONE SHOT
  (Normal)

Long sensing range
The **VF** series ensures stable detection with its long sensing range.



Amplifier / Power Supply Built-in • Cylindrical
CY SERIES

Simple mounting with M18 thread

Supply voltage: AC supply type 24 to 240 V AC ± 10 %
DC supply type 10 to 30 V DC
Response time: AC supply type 20 ms or less
DC supply type 2 ms or less
Test input (emission halt) function:
Incorporated in DC supply type only
Protection: IP67 (IEC)
Ambient temperature: − 25 to + 55°C

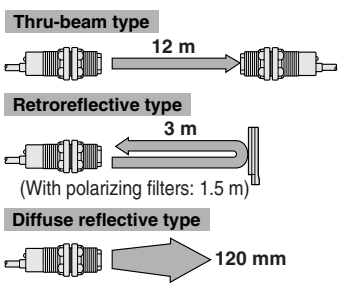
M18 thread
This sensor has an M18 thread on the enclosure, which is convenient for mounting.

Wide product range
Supply voltage
① AC supply type (24 to 240 V AC)
② DC supply type (10 to 30 V DC)
Output
① NPN open-collector transistor
② PNP open-collector transistor
③ AC non-contact (thyristor) output
Connection
① Cable type
② Pigtailed type

A total of 32 models are available.

Easy to replace
A pigtailed type sensor with connector (**CY-□-J**) is easy to replace.

Long sensing range



Micro Photoelectric Sensors

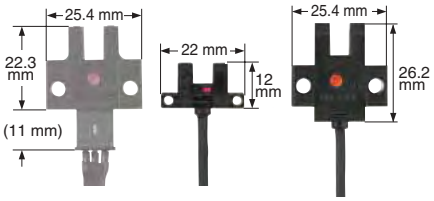
Amplifier Built-in • U-shaped
PM SERIES

Enables equipment miniaturization and quick construction

Extremely compact

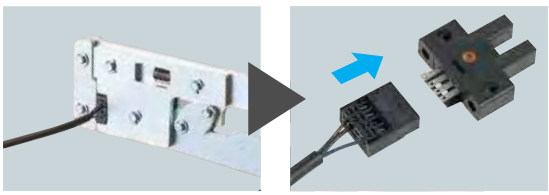
Conventional model | Ultra-small type PM-K24(-R) | Small cable type PM-K44

Ultra-small type **PM-□24(-R)** achieves an extremely compact size.
It contributes to the miniaturization of your equipment.



Quick fitting hook-up connector

Easy to maintain connector type models are available. Its exclusive connector is the hook-up connector.
Since only crimping with exclusive pliers is to be done, cumbersome soldering or insulation is absolutely not required.
Further, connector attached cable (**CN-14H-C1/C3**) is also available.



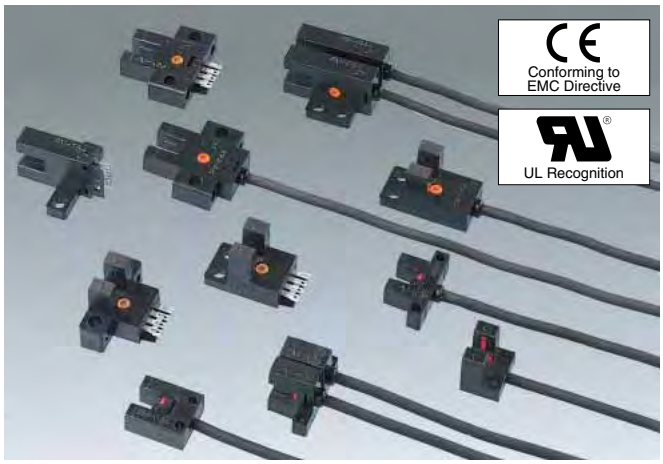
Crimp the connector on the cable. Quick connection to the sensor

Equipped with two independent outputs

All models are equipped with two independent outputs – Light-ON and Dark-ON. Hence, one model suffices even if the output is to be used differently, depending upon the location of use.

Flexible cable type

Flexible cable is used, which allows bending repeatedly. It is suited to use in moving part of a robot arm.



Quick-connector connections with commercially-available connectors

PM-□64; Built-in connector type **New**

The connector is built-in, allowing greater space savings.
Commercially-available general-purpose connectors can be used with some types for improved reliability.

Type		Ultra-small type	Small type		
		With cable	With cable	With connector	Built-in connector
Model No.	NPN output	PM-□24(-R) (Note)	PM-□44	PM-□54	PM-□64
	PNP output	———	PM-□44P	PM-□54P	———
Sensing range		5 mm (fixed)			
Min. sensing object		0.8 × 1.8 mm opaque object			
Repeatability		0.03 mm or less			0.01 mm or less
Supply voltage		5 to 24 V DC ± 10 %			
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor			
Output operation		Incorporated with 2 outputs: Light-ON / Dark-ON			
Response time		Under light incident condition: 20 μs or less Under light interrupted condition: 100 μs or less (Response frequency: 1 kHz or more)			
Emitting element		Infrared LED (non-modulated)			

Notes 1): **PM-□24-R** is flexible cable type.
2): 3 m cable length type (standard: 1 m) is also available [excluding flexible cable type and **PM-□54(P)**].

Convergent Reflective
PM2 SERIES

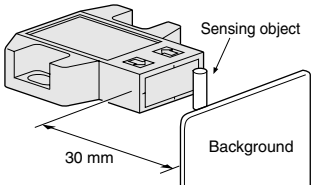
Convergent reflection sensing ensures stable detection

Stable detection by convergent reflective mode

Stable detection characteristics are obtained since it is convergent reflective type and senses a limited area.

Not affected by background

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

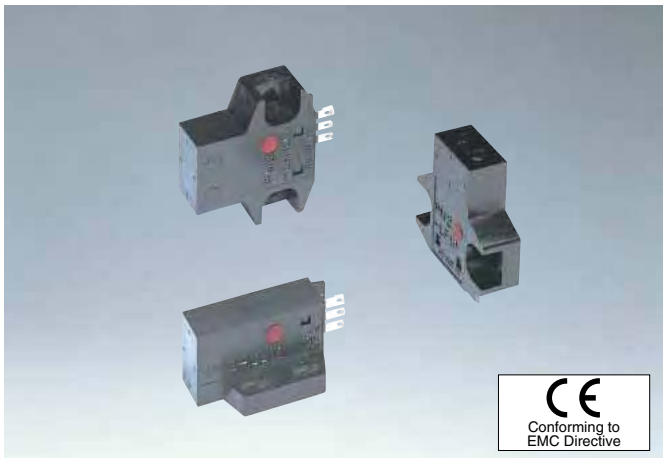


Dark object detectable

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

Minute object detectable

A ϕ0.05 mm copper wire can be detected at a distance of 5 mm.



Type		Connector type			Cable type		
		Top sensing	Front sensing	L type (Top sensing)	Top sensing	Front sensing	L type (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 8 mm (Conv. point: 5 mm) with white non-glossy paper (15 × 15 mm)					
Min. sensing object		ϕ0.05 mm copper wire (Setting distance: 5 mm)					
Repeatability (perpendicular to sensing axis)		0.08 mm					
Supply voltage		5 to 24 V DC ± 10 %					
Output		NPN open-collector transistor					
Response time		0.8 ms or less					
Emitting element		Infrared LED (modulated)					

Area Sensors

Slim Body
NA2-N SERIES

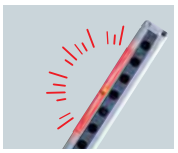
Slim style for all your needs

Slim body, just 13 mm thick

The slim body **NA2-N** series aesthetically fits in your equipment, since it is just 13 mm thick and 30 mm wide. It never disturbs your access to the machine.

Clearly visible wide job indicator

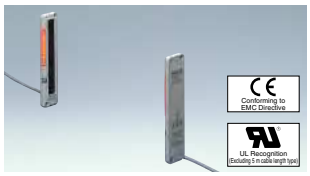
Both the receiver and the emitter feature job indicators, 102 mm wide, which use red bright LEDs. When the sensing output and the job indicator input are connected, the job indicator can be used as a large size operation indicator.



Information

Other available models are the ultra-slim **NA1-5** area sensor that is ideal for picking applications on packaging lines, the **NA1-PK5** with more easily visible job indicators, and the compact **NA1-PK3** picking sensor that can be installed almost anywhere.

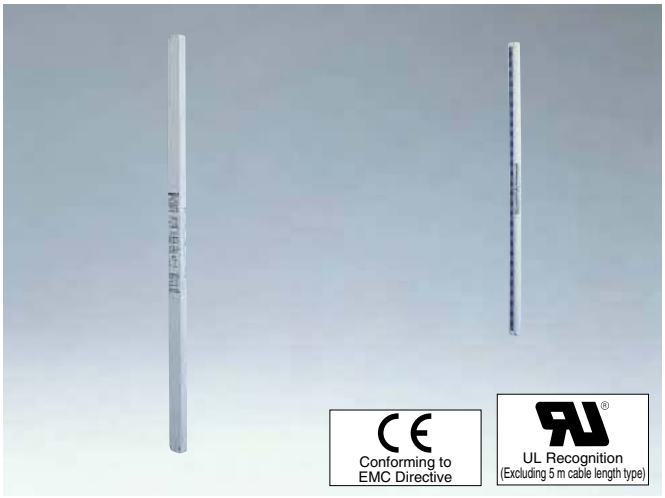
NA1-5 / NA1-PK5



NA1-5 (5 beam channels, 25 mm beam pitch)
Dimensions: W30 × H140 × D10 mm
NA1-PK5 (5 beam channels, 25 mm beam pitch)
Dimensions: W30 × H140 × D10 mm

NA1-PK3

NA1-PK3 (3 beam channels, 24.6 mm beam pitch)
Dimensions: W24 × H70 × D8 mm



Interference prevention for parallel installation

Convenient test input (emission halt) function

Beam output can be stopped via the input of an external signal. This is a useful test input (emission halt) function when beginning operation.

Selectable lighting pattern

The operation of the job indicator can be selected lighting pattern either lighting or blinking using the operation mode selection switch.

Model No.	NA2-N8	NA2-N12	NA2-N16	NA2-N20	NA2-N24	NA2-N28
Number of beam channels	8	12	16	20	24	28
Sensing height	140 mm	220 mm	300 mm	380 mm	460 mm	540 mm
Sensing range	5 m					
Beam pitch	20 mm					
Sensing object	ϕ30 mm or more opaque object					
Supply voltage	12 to 24 V DC ± 10 %					
Output	NPN open-collector transistor					
Output operation	ON when all beam channels are received (OFF when one or more beam channels are interrupted)					
Response time	10 ms or less (12 ms or less when the interference prevention function is used)					
Ambient temperature	− 10 to + 55 °C					
Dimensions (mm)	W30 × H190 × D13	W30 × H270 × D13	W30 × H350 × D13	W30 × H430 × D13	W30 × H510 × D13	W30 × H590 × D13

Note: PNP output type and 5 m cable length type (standard: 3 m) are also available.

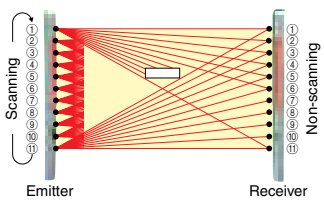
Small / Slim Object Detection
NA1-11

Cross-beam scanning system to detect slim objects

Letter or visiting card detectable!

Slim objects can be detected by using the cross-beam scanning system.

Cross-beam scanning system



Emitting and receiving element pitch: 10 mm

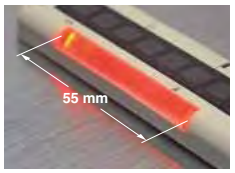
A minimum sensing object size of ϕ13.5 mm is realized by using an emitting and receiving element pitch of 10 mm.

Wide area

Though being very slim, it realizes a wide sensing area of 1 m length and 100 mm width. 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 55 mm width, is incorporated on both the emitter and the receiver.



Model No.	NA1-11	NA1-11-PN
Sensing height / Sensing range	100 mm / 0.17 to 1 m (Note 1)	
Element pitch	10 mm	
Number of emitting / receiving elements	11 Nos. each on the emitter and the receiver, respectively	
Sensing object	ϕ13.5 mm or more opaque object (Note 2)	
Supply voltage	12 to 24 V DC ± 10 %	
Output	NPN open-collector transistor	PNP open-collector transistor
Ambient temperature	− 10 to + 55 °C	
Dimensions	W30 × H140 × D10 mm	

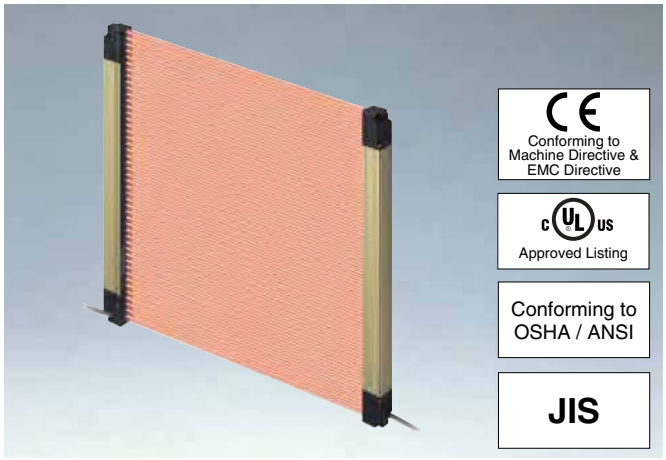
Notes: 1) The sensing range is the possible setting distance between the emitter and the receiver. The sensor can detect an object less than 0.17 m away.
2) Although this product can detect slim objects by using the cross-beam scanning system, the size of the slim object which can be stably detected differs with the setting distance. When this sensor is used to detect slim objects, make sure to confirm stable detection using the actual objects.
3) 5 m cable length type (standard: 2 m) is also available.

Light Curtains for safeguard

High-function • Type 4

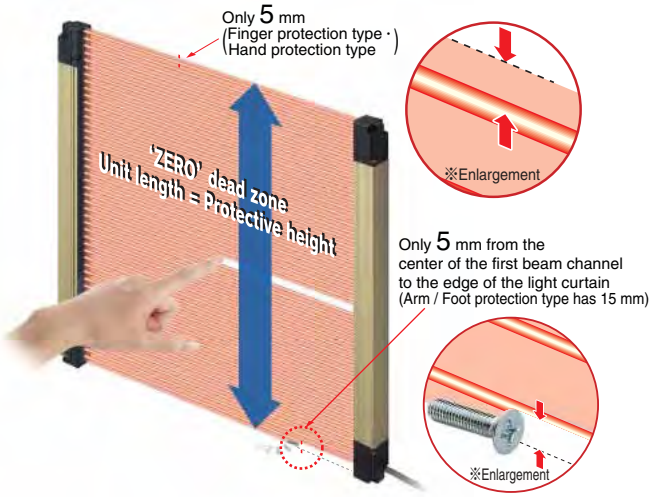
SF4B SERIES

New concepts combining greater safety and higher productivity !

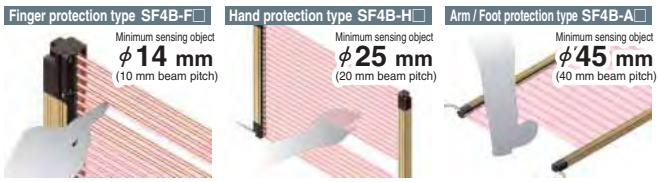


'ZERO' dead zone

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



3 types available for different workplace conditions

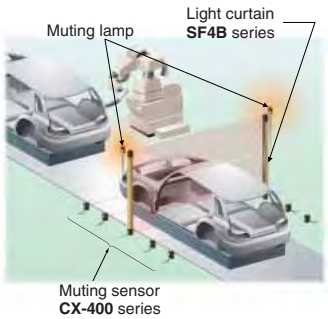


Same response time of 14 ms and constant safety distance!

A fast response time of 14 ms 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 human body passes through the light curtain, and does not stop the line when a workpiece passes through.



The safety relay unit capability is built into the light curtain, so component costs can be reduced

The light curtain has a built-in external device monitoring function (such as for fused relay monitoring) 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, which both help contribute to lower costs.

Reduces malfunction due to mutual interference and extraneous light

The advanced ELCA function used in the **SF4-A** that has been widely acclaimed by the marketplace has also been adopted into the **SF4B** in order to suppress mutual interference. In addition, the unique double scanning method and retry processing developed by SUNX greatly reduce malfunctions due to extraneous light.

Equipped with a 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.

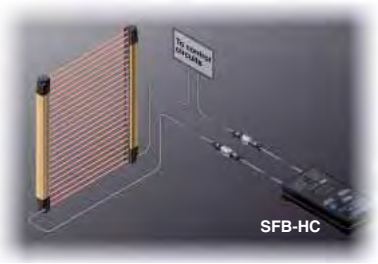
The image shows the display with all indicators lit

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.

Handy-controller SFB-HC that enables the user to select a variety of settings

Functions such as a separate muting control function and blanking function for each beam channel make setup easier.



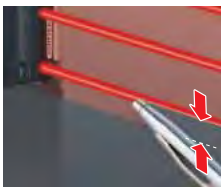
Type	Finger protection type	Hand protection type	Arm / Foot protection type
Beam pitch	10 mm	20 mm	40 mm
Operating range	0.3 to 7 m	0.3 to 9 m (72 beam channels or more: 0.3 to 7 m)	0.3 to 9 m (36 beam channels or more: 0.3 to 7 m)
Protective height	230 to 1,270 mm	230 to 1,910 mm	230 to 1,910 mm
Min. sensing object	ϕ14 mm or more in opaque object	ϕ25 mm or more in opaque object	ϕ45 mm or more in opaque object
Supply voltage	24 V DC ± 10 %		
Control output	PNP open collector transistor / NPN open collector transistor (selectable using wiring)		
Response time	OFF response: 14 ms or less, ON response: 80 to 90 ms		
Dimensions	W28 × H protective height × D30 mm		

Type 2
SF2B SERIES

New

International-standard safety compliance can be achieved with excellent basic functions at a reasonable price

Unit length = Protective height, 'ZERO' dead zone

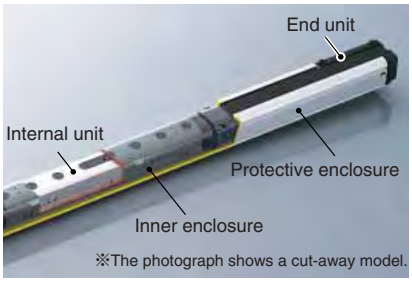


Non-wasteful installation is possible, with no dead corners in the sensing width.

Only 6 mm
(Bottom edge for arm / foot type is 26 mm)

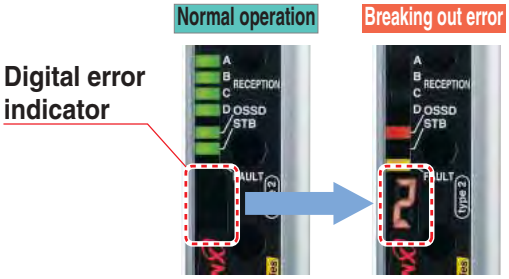
Seamless structure using an inner enclosure

The internal unit fits into an inner enclosure, so that seams (joints) can be completely eliminated inside the product.



Supports resolution of electrical problems when starting up lines

Equipped with a digital error indicator so that error details can be understood at a glance!



Also suppresses mutual interference and effects of extraneous light

The tried and proven ELCA function suppresses operating errors resulting from mutual interference and the effects of extraneous light, and prevents drops in line efficiency rates from occurring.

Type	Hand protection type		Arm / Foot protection type	
	NPN output	PNP output	NPN output	PNP output
Model No.	**SF2B-H□-N**	**SF2B-H□-P**	**SF2B-A□-N**	**SF2B-A□-P**
Beam pitch	20 mm		40 mm	
Operating range	0.2 to 13 m			
Protective height	168 to 1,912 mm		168 to 1,912 mm	
Min. sensing object	ϕ27 mm opaque object		ϕ47 mm opaque object	
Supply voltage	24 V DC ± 10 %			
Control output	NPN output type: NPN open collector transistor PNP output type: PNP open collector transistor			
Response time	OFF response: 15 ms or less, ON response: 40 to 60 ms			
Ambient temperature	− 10 to + 55 °C			
Dimensions	W28 × H protective height × D24 mm			

Light curtain Exclusive Control Unit
SF-C10 SERIES

Less setup time for safety circuits

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 SF-C11, SF-C14EX(-01)

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

Metal enclosure with a IP65 protective structure SF-C12

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.

Slim design SF-C13

22.5 mm thickness, so can be inserted even into narrow spaces inside panels.

Three safety circuit systems packaged into a single unit! SF-C14EX(-01)

Three safety circuit systems ① Light curtain output circuit, ② Muting control circuit, and ③ Emergency stop circuit are packaged into a single unit. This allows safety to be maintained for different sections of the equipment.

Supply voltage: 24 V DC ± 10 %
Enabling path: NO contact × 3
(**SF-C12**: NO contact × 2)
Dimensions: **SF-C11** W46 × H130 × D100 mm
SF-C12 W127 × H67.5 × D130 mm
SF-C13 W22.5 × H130 × D80.8 mm
SF-C14EX(-01) W46 × H130 × D99 mm

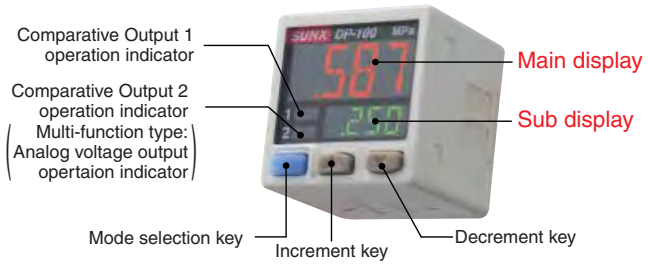
Pressure Sensors

Dual Digital Display
DP-100 SERIES

New

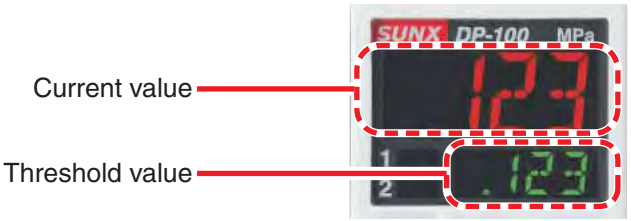
A new global standard, dual display

'Current value' and 'threshold value' can be checked at the same time!



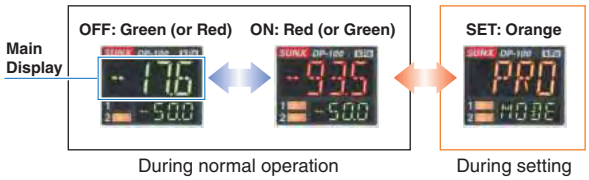
Dual display allows direct setting of threshold value

Equipped with a 30 mm square compact-sized dual display. Because the current value and the 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 changes color in line with changes in the status of output ON / OFF operation, and it also changes color while setting is in progress. The sensor status can therefore be understood easily, and operating errors can be reduced.



Readable digital display!

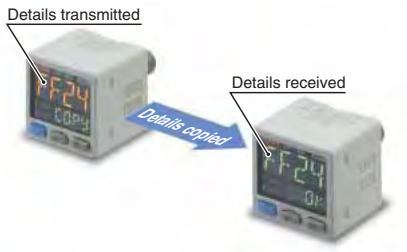
12 segments are used and an alphanumeric display has been adopted. This improves visual checking of letters and numbers.

Realizes high performance Low pressure type

The low pressure type displays measurements in 0.1 kPa at a resolution of 1/2,000 and has a response time of 2.5 ms (variable up to 5,000 ms), ±0.5 % F.S. temperature characteristics and ±0.1 % F.S. repeatability, giving it high performance.

Copy function reduces man-hours and human error

Sensors can be connected to a master sensor one by one, and a copy of the setting details for the master sensor can be transmitted as data to the other sensors. If making the same settings for multiple sensors, this prevents setting errors from occurring with the other sensors and also reduces the number of changes required to instruction manuals when equipment designs are changed.



Equipped with auto-reference / remote zero-adjustment functions
More precise pressure management is possible with a minimum of effort Multi-function type

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

Type		Compound pressure			
				Multi-function	
		For low pressure	For high pressure	For low pressure	For high pressure
Model No.	Asian	**DP-101**	**DP-102**	**DP-101A**	**DP-102A**
	European	**DP-101-E-P**	**DP-102-E-P**	**DP-101A-E-P**	**DP-102A-E-P**
	North American	**DP-101-N(-P)**	**DP-102-N(-P)**	**DP-101A-N(-P)**	**DP-102A-N(-P)**
Rated pressure range		−100.0 to +100.0 kPa	−0.100 to +1.000 kPa	−100.0 to +100.0 kPa	−0.100 to +1.000 kPa
Applicable fluid		Non-corrosive gas			
Supply voltage		12 to 24 V DC ±10 %			
Output		NPN output type: NPN open-collector transistor PNP output type: PNP open-collector transistor			
Response time		2.5 ms, 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1,000 ms, 5,000 ms, selectable by key operation			
Display		4 digits + 4 digits 3-color LCD display			
Pressure port		Asian: M5 female thread + R (PT) 1/8 male thread, European: M5 female thread + G 1/8 male thread, North American: M5 female thread + NPT 1/8 male thread			
Connecting method		Connector			
Accessories		**CN-14A-C2** (Connector attached cable 2 m): 1pc.			
Dimensions		W30 × H30 × D42.5 mm			

Note: Types without connector attached cable are also available.

Compact Size • 2-color Digital Display

DP4 SERIES

New shape makes it most suitable for panel installation

Light-weight, compact design

A compact form specifically designed for mounting on an equipment panel.
It only uses half the space of our conventional product and provides the lightest weight of just 30 g (cable excluded).

Bright, easy to view two-color digital display

The digital display is a large, easy-to-view, and two-color digital display. It is also functions as an output indicator as it changes from green to red color when the output turns ON, enabling you confirm the output status at a glance.

Supplied with a simple-to-mount panel mounting bracket

A panel mounting bracket (**MS-DP-1**) is enclosed to enable simple mounting of the sensor onto the panel surface, thus contributing to the total cost reduction.

Rated pressure range: **DP4-50/50P** 0 to −101.3 kPa
DP4-52/52P 0 to 1.000 MPa
DP4-57/57P −100.0 to 100.0 kPa
Applicable fluid: Non-corrosive gas
Supply voltage: 12 to 24 V DC $^{+10}_{-15}$ %
Output: **DP4-5**□ NPN open-collector transistor
DP4-5□**P** PNP open-collector transistor
Pressure port: M5 female thread
Dimensions: W40 × H20 × D49 mm

Head-separated Type • 2-color Digital Display

DP5 SERIES Controller DPH SERIES Sensor head

1/1,000 second high-speed response!

Response time 1 ms

Mounting the detachable head close to the detecting section minimizes piping and enables response time of 1 ms, as well as greatly decreasing tact time delay. In addition, the ultra-small and light-weight design of the head means it can easily be mounted on moving sections.

Sensor head with operation indicator

The sensor head is also equipped with operation indicator. Output ON / OFF can be checked on the sensor head, so that it is suitable for checking operation at the suction head.

Independent use of sensor head possible

Light-weight, compact design

The controller inherits its lightweight, compact design from the popular **DP4** series of digital pressure sensors. Control panel setup is low cost and requires minimal space.

Convenient intermediate cable with connector

Intermediate cable with connectors for connecting the sensor head and the controller makes operation and maintenance easier.

Note: An intermediate cable is required to connect the controller and the sensor head. Please order the intermediate cable with connector separately.

Pressure sensor heads

Rated pressure range: **DPH-A**□**0** 0 to −101.3 kPa
DPH-A□**2** 0 to 1.000 MPa
DPH-A□**7** −100.0 to 100.0 kPa
Applicable fluid: Non-corrosive gas
Supply voltage: 12 to 24 V DC $^{+10}_{-15}$ %
Analog voltage output: 1 to 5 V (over rated pressure range)
Pressure port: **DPH-A0**□ M5 male thread,
DPH-A1□ R (PT) 1/8 male thread / M5 female thread
DPH-A2□ NPT 1/8 male thread / 10-32UNF female thread
DPH-A30 10-32UNF male thread
Dimensions: **DPH-A0**□**/A30** 12.5 × 25 × 20 mm
DPH-A1□**/A2**□ 12.5 × 25 × 25 mm

Pressure sensor controllers

Applicable pressure sensor head: **DPH-A**□
Rated pressure range: Vacuum pressure 0 to −101.3 kPa
Positive pressure 0 to 1.000 MPa
Compound pressure −100.0 to 100.0 kPa
Supply voltage: 12 to 24V DC $^{+10}_{-15}$ %
Comparative Output (Comparative output 1, Comparative output 2):
DP5-C NPN open-collector transistor
DP5-C-P PNP open-collector transistor
Analog voltage output: 1 to 5 V DC (over rated pressure range)
Dimensions: W40 × H20 × D43 mm

Micro-differential • LED Digital Display

DP-M SERIES

Precisely detects minute differences in pressure levels

High accuracy and resolution

Due to differential pressure sensing, the pressure can be set with a high resolution of 0.01 kPa.D {1 mmH2O.D} over a pressure range of 0 to 2.00 kPa.D {0 to 204 mmH2O.D} and, moreover, the detection accuracy is within ±1 % F.S.

Bright digital display

Three bright red 7-segment LEDs, 12 mm high, are incorporated in the compact body.

Simple key setting

Initialization or pressure settings can be easily done with key operation while looking at the display.

Analog current output (4 to 20 mA) incorporated DP-M2A is also available

Rated pressure range: 0 to 2.00 kPa.D
Applicable fluid: Non-corrosive gas
Supply voltage: 12 to 24 V DC $^{+10}_{-15}$ %
Comparative output: NPN open-collector transistor
Pressure port: φ4.8 mm resin pipe
Dimensions: W40 × H40 × D42.3 mm

Inductive Proximity Sensors

Amplifier-separated
GA-311 / GH SERIES

High-speed response and one-touch connectors

Suitable for high-speed applications

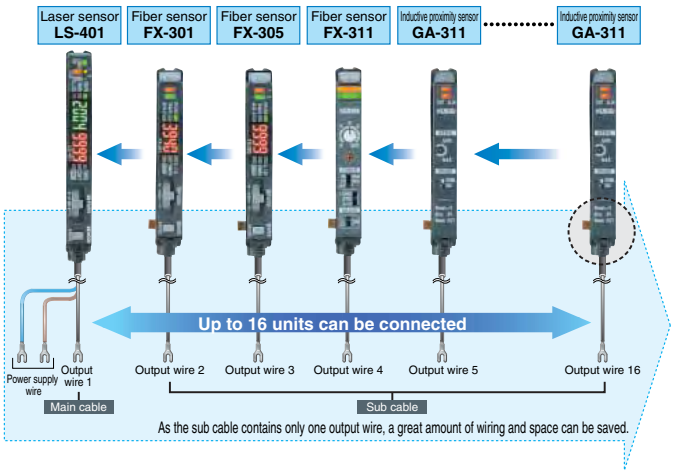
Performance matches the 3.3 kHz response frequency. These sensors are ideal for sensing objects moving at high speeds.

IP67g (JEM) sensor head variations

The lineup includes 5 different models, from an ultra-compact 2.8 mm diameter type to a spatter-resistant type. Furthermore, all except for the **GH-2SE** are IP67g (JEM) oil-resistant models so that they can be used with confidence even in adverse environments.

Excellent workability and ease of maintenance

The all have the same form as the **FX-300** series of fiber sensors. The one-touch cables are also of the same shape, so that fiber sensors and laser sensors can all be used together and less power supply wiring is required.



One-touch connections

The connection between the sensor head and the amplifier is made using a one-touch connector. Past troublesome wiring connections using a screwdriver are no longer necessary.

Model No.	Sensor head	GH-2SE	GH-3SE	GH-5SE	GH-8SE	GH-F8SE
	Amplifier	GA-311				
Stable sensing range (Note 1)		0 to 0.6 mm	0 to 0.8 mm	0 to 1.0 mm	0 to 2.0 mm	
Max. operation distance (Note 1)		1.2 mm	1.8 mm	2.4 mm	4.0 mm	
Supply voltage		12 to 24 V DC ± 10 %				
Repeatability		Along sensing axis, perpendicular to sensing axis: 1 μm or less (Note 2)				
Output		NPN open-collector transistor				
Protection (Sensor head)		IP50 (IEC)	IP67 (IEC), IP67g (JEM)			
Dimensions	Sensor head	ϕ2.8 × 12 mm	ϕ3.8 × 15 mm	ϕ5.4 × 15 mm	ϕ8 × 15 mm	
	Amplifier	W10 × H30.5 × D64.5 mm				

Notes 1): The stable sensing range represents the sensing range for which the sensor can satisfy all the given specifications with the standard sensing object. The maximum operation distance represents the maximum distance for which the sensor can detect the standard sensing object at + 20 °C constant ambient temperature. Usage within the stable sensing range is recommended for accurate sensing applications.
2): Value is given for the stable sensing range.
3): The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1 m), **CN-73-C2** (cable length 2 m), **CN-73-C5** (cable length 5 m)
Sub cable (1-core): **CN-71-C1** (cable length 1 m), **CN-71-C2** (cable length 2 m), **CN-71-C5** (cable length 5 m)

Amplifier Built-in • Low Price
GL SERIES

High performance at a low price

Low price

The **GL** series satisfy the need for a low price inductive proximity sensor. It is recommended to large volume users for cost reduction.

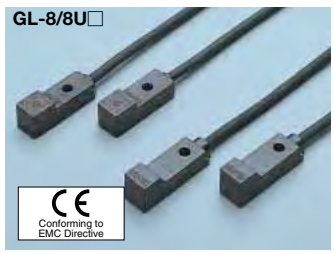
Note: The **GL-8/8U**□ and **GL-N12**□ are available in units of ten sensors.

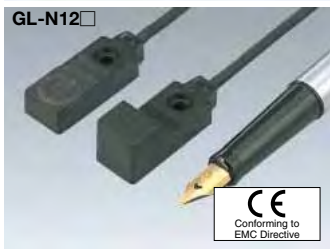
Extremely small GL-6□

Mountable in a tight space as the sensor is just 6 × 6 × 19 mm in size. It is suitable for being mounted in an equipment.

Wide variety

DC 3-wire type (NPN, PNP) / DC 2-wire type, front sensing type / top sensing type, normally open type / normally closed type, as well as, different frequency type which allows close mounting of sensors, etc., is available.





Maximum operation distance: **GL-6**□ 1.6 mm ± 15 %, **GL-8/8U**□ 2.5 mm ± 20 %
GL-N12□ 4 ± 0.5 mm, **GL-18H**□ 5 mm ± 10 %, **GL-18HL**□ 12 mm ± 10 %
Supply voltage: 12 to 24 V DC (**GL-18H**□**/18HL**□ 10 to 30 V DC)
Output (Note 2): NPN open-collector transistor (**GL-8U**□ Non-contact DC 2-wire type)
Protection: IP67 (IEC), IP67g (JEM) (except **GL-8/8U**□ and **GL-N12**□)
Dimensions: **GL-6**□ □6 × 19 mm
GL-8/8U□ Front sensing type W8 × H24 × D7.4 mm
Top sensing type □8 × D26 mm
GL-N12□ Front sensing type W12 × H27.4 × D7.1 mm
Top sensing type W12 × H13 × D27.4 mm
GL-18/18HL□ □18 × D28 mm

Notes 1): 5 m cable length type (standard: 1 m) is also available. (except **GL-8H/18HL**□)
2): PNP output type is also available for **GL-N12**□.

Measurement Sensors

Magnetic Displacement

High Speed • High Accuracy Eddy Current Type Digital Displacement Sensor

GP-X SERIES

High-speed sampling 25 μs and high resolution 0.02 %F.S.

We've realized a 25 μs (40,000 times/sec.) ultra high sampling speed

These devices boast a 0.07 %F.S./°C temperature characteristics

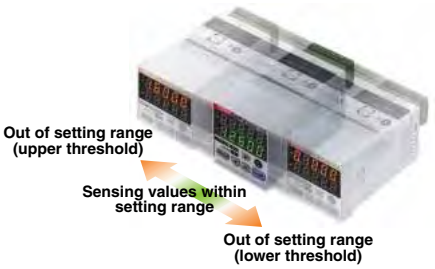
They perform with a ±0.3 %F.S. linearity for stainless steel and iron

Because they perform with a ±0.3 %F.S. linearity, they can be used for sensing stainless steel and iron enabling precise measurements not affected by the workpiece's material.

Intelligent monitor GP-XAiM (Optional) optimal for collecting and analyzing measurement data

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 range (HI, LO), they will be displayed in the upper digital display in orange. The display position and color change allows for accurate visibility even for momentary changes.



Sensor heads
Sensing range: **GP-X3SE** 0 to 0.8 mm, **GP-X5SE** 0 to 1 mm
GP-X8S 0 to 2 mm, **GP-X10M** 0 to 2 mm
GP-X12ML 0 to 5 mm, **GP-X22KL** 0 to 10 mm
Standard sensing object: Stainless steel (SUS304) / Iron sheet 60 × 60 × t 1 mm
Protection: IP67 (IEC), IP67g (JEM)
Ambient temperature: −10 to +55 °C
Dimensions (mm): **GP-X3SE** ϕ3.8 × 17, **GP-X5SE** ϕ5.4 × 17
GP-X8S ϕ8 × 17, **GP-X10M** M10 × 17
GP-X12ML M12 × 21, **GP-X22KL** ϕ22 × 35

Controller
Set model No.: NPN output type **GP-XC**□, PNP output type **GP-XC**□**-P**
Supply voltage: 24 V DC ±10 %
Resolution (64 times average processing):
GP-XC3SE/XC5SE 0.04 % F.S.
GP-XC8S/XC10M/XC12ML/XC22KL 0.02 % F.S.
Analog voltage output: Output voltage −5 to +5 V
Comparative outputs (HI, GO, LO):
GP-XC□ NPN open-collector transistor
GP-XC□**-P** PNP open-collector transistor
Dimensions: W48 × H48 × D83 mm

High Accuracy Eddy Current Type Displacement Sensor

GP-A SERIES

High accuracy analog sensing of minute displacement

Accurate measurement of minute displacements

Minute displacement of metallic objects can be accurately measured with a resolution of 0.04 % F.S.
[**GP-A5S** (For 1 mm sensing type) Resolution: 0.4 μm]

Linearity ±0.5 % F.S.

Displacement is accurately output since it incorporates a high accuracy linearity correction circuit.

Equipped with a zero-adjustment function

By pressing the zero-adjustment button, you can reset the output voltage to 0 V with one touch. (Resets the current output to 4 mA)
This function comes in handy when performing tolerance diagnosis of a masterwork to be used as the standard. Easy adjustment for product changes.
(Remote operation is also possible by way of an external input.)

Sensing range: **GP-A5S(I)** 0 to 1 mm
GP-A8S(I)/A10M(I) 0 to 2 mm
GP-A12ML(I) 0 to 5 mm
GP-A14F(I) 0 to 3 mm
Supply voltage: 24 V DC ±10 %
Analog outputs: Analog voltage 0 to 5 V
Analog current 4 to 20 mA
Dimensions (mm):
Sensor head **GP-A5S(I)** ϕ5.4 × 17, **GP-A8S(I)** ϕ8 × 17
GP-A10M(I) M10 × 17, **GP-A12ML(I)** M12 × 21
GP-A14F(I) W15 × H34 × D5.4
Amplifier W53 × H67 × D90

Note: **GP-A**□**I** is different frequency type.

Particular Use Sensor

Metal-sheet Double-feed Detector

GD SERIES

From ultra-thin lead frames to iron sheets...
Double feed detection of various metal sheets

Easy set-up with object sheets initialization by teaching GD

All you have to do is nothing but depressing keys with sample objects. To complete differentiating among non-existence, one sheet, and two sheets, the controller chooses the optimal sensing method automatically.

Visible seven LEDs indicate the sensing level

Feasible to find out the optimal sensing position on the traveling path of objects such as lead frames because seven LEDs show you the sensing level.

External initialization

Teaching is possible by external devices, such as, PLC, etc. This enhances productivity by machine automation.

Self-diagnosis (alarm)

The **GD** series diagnoses itself. The error code appears on the channel display according to the cause if an error occurs.

Suitable for flexible manufacturing

Since sensitivities of eight channels can be stored, product changeover is smooth and easy.

Sensing range (Between sensor heads):
GD-3 10 mm or less
GD-10 30 mm or less
GD-20 70 mm or less
Supply voltage: 12 to 24 V DC ±10 %
Output: NPN open-collector transistor
Dimensions: **GD-3** ϕ3.8 × 15 mm
GD-10 W12 × H32.2 × D7.1 mm
GD-20 W37 × H32 × D30 mm
GD-C1/C2/C3 W110 × H90 × D67 mm

Ultra High-Speed Laser Displacement Sensor **CCD Style**

HL-C1 SERIES

Ultra high-speed & stable measurement for a variety of measurement objects

100 μs of sampling rate is now available

The most amazing, ultra high-speed sampling in the industry has now been achieved for displacement sensors utilizing linear image sensors, thus enabling ultra high-speed measurement of rotating, vibrating and moving objects.

Resolution of 1 μm, linearity of ±0.1 % F.S.

Now available with ultra-precise 1 μm resolution measurement capability (**HL-C105B-BK**, **HL-C105F-BK**, **HL-C105B**, **HL-C105F**) and a linearity of ±0.1 % F.S. (for all models).

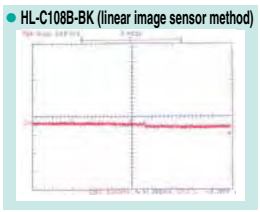
Touch panel operation, easy and compact

A variety of setting and measurement data can be displayed easily. (Option)

Compact console
HL-C1DP-E

High accuracy measurement is now possible, unaffected by the surface condition of the detected object

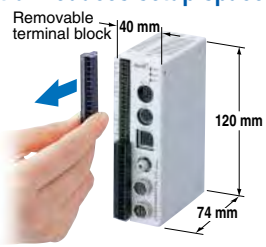
All deficiencies inherent in the conventional PSD sensing method have now been completely solved. Whereas the PSD method measures position information from the center of gravity of the total light quantity distribution of the light spots connected along each light element, the linear image sensing method measures the peak position values for the light spots themselves. This advance now makes high-precision measurement possible, regardless of the surface condition of the object whether for metal hairline surface cracks or for non-reflective surfaces, e.g. black rubber.



Change in measurement data due to color difference (White ceramic / Black rubber)

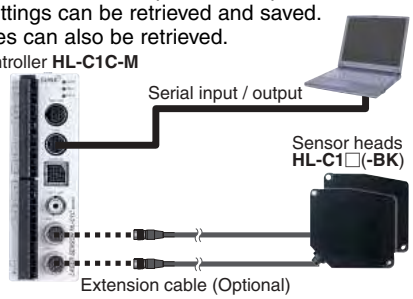
Controller compact and front connection reduces setup space

The ultra-compact controller with dimensions of W40×H120×D74 mm requires extremely little space for installation. Adhesive installation is also possible. Furthermore, the cables can be connected directly or to a removable terminal board, so that all connections come from the same direction in order to further save space.



Equipped with serial input / output

An RS-232C interface for serial input and output is provided so that settings can be retrieved and saved. Measurement values can also be retrieved.



Two sensor heads can be connected ! Reduces costs and saves space

Sensor heads

Type	Diffuse reflective		Specular reflective	
	General propose	High accuracy	General propose	High accuracy
Model No. (Note 1)	**HL-C108B(F)-BK**	**HL-C105B(F)-BK**	**HL-C108B(F)**	**HL-C105B(F)**
Measurement center distance	85 mm	50 mm	81.4 mm	46 mm
Measuring range	±20 mm	±5 mm	±16 mm	±4 mm
Resolution (Note 2)	2 μm	1 μm	2 μm	1 μm
Linearity	±0.1 %F.S.			
Emitting element	Red semiconductor laser, Class 2 (class II for FDA standards conforming type)(IEC/JIS standards conforming type: IEC / JIS, FDA standards conforming type: JIS / IEC / FDA)(Max. output: 1 mW, Peak emission wavelength: 685 nm)			
Beam diameter	100×140 μm approx.	70×120 μm approx.	100×140 μm approx.	70×120 μm approx.
Protection	IP67 (excluding connector)			
Ambient temperature	0 to +45 °C			
Dimensions	W26.6×H82×D87 mm			

Notes: 1) **HL-C10□B(-BK)** is IEC / JIS standards conforming type.
HL-C10□F(-BK) is FDA standards conforming type.
2) Where measurement conditions have not been specified precisely, the conditions used were as follows: supply voltage 24 V DC, ambient temperature +20 °C , sampling rate 100 μs, average number of samples: 256, measurement center distance, object measured is made of white ceramic (an aluminum vapor deposition surface reflection mirror was used with specular reflective type). Linearity also depends upon the characteristics of the object being measured.
3) These values were obtained with an average number of samples: 256, when using an object made of our company's standard white ceramic for measurement (an aluminum vapor deposition surface reflection mirror was used with specular reflective types).

FDA standards conforming types are available

Special version for measurement of raw and completed rubber tire

HL-C105C-BK5
HL-C108C-BK5

The **HL-C1** series has added a new line up of tire measuring specialized version for tire making processes.
High-powered 5 mW type enabled high accuracy and stable measurement of raw tire and completed tire which were previously considered as difficult to measure.

Controller

Model No.		**HL-C1C-M**
Connectable sensor head		Max. 2 sensor heads
Supply voltage		24V DC±10 %
Sampling rate		Selectable from 100 μs / 144 μs / 200 μs / 255 μs / 332 μs / 498 μs / 1,000 μs
Analog output	Voltage	Output voltage: ±5 V/F.S., Output current: Max. 2 mA Output impedance: 50 Ω
	Current	Output current: 4 to 20 mA/F.S., Load resistance: 250 Ω or less
	Output range	Voltage: −10.9 to +10.9 V, Current: 0 to 29.5 mA
Judgment outputs (O1, O2)		Photo-MOS relay
Average number of samples		OFF, 2 to 32,768 cycles (switching in 16 steps)
Ambient temperature		0 to +50 °C
Dimensions		W40×H120×D74 mm

Wide Range · Ultra High-Speed Laser Displacement Sensor CCD Style

HL-C135C-BK10 Sensor head HL-C1C-WL Controller

Superlative wide-range measurement with the small head

Measures wide changes over long ranges

The long-and wide-range capabilities over 350 mm ±200 mm allow large changes to be measured. Even if the object position changes, there is no need to change the sensor head settings or position.

High speed and high precision even over long and wide ranges

High-speed and high-precision measure-ment is possible with high-speed sampling of 100 μs at a resolution of 10 μm an a linearity of ±0.1 % F.S.

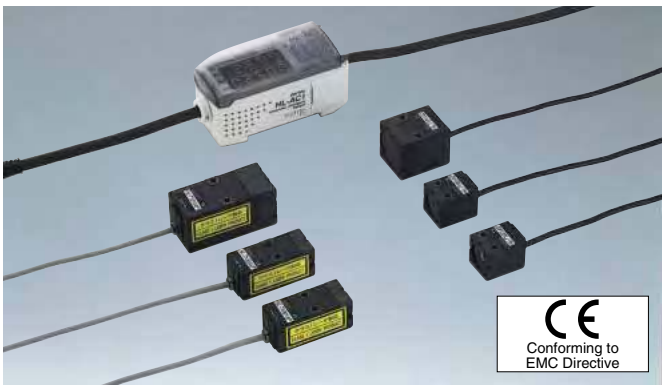
Sensor heads
Measurement center distance: 350 mm
(Measuring range: ±200 mm)
Emitting element: Red semiconductor laser, Class 3B (IEC / JIS)
Beam diameter: 400 × 200 μm approx.
Dimensions: W26.6 × H82 × D87 mm
Controller
Specifications are the same as for the **HL-C1C-M** controller on the previous page.

Measurement Sensors Light / Thru-beam Type

Ultra-compact Laser Collimated Beam Sensor Class 1

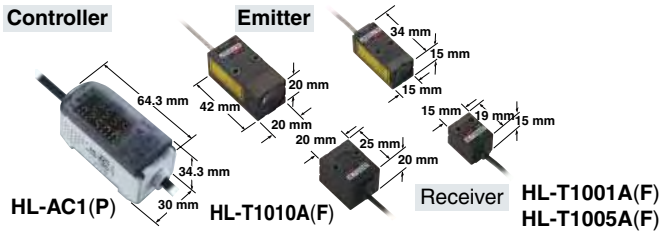
HL-T1 SERIES

The small sensor head
A high-functionality intelligent controller



The small sensor head

The most compact size and yet the highest level of performance in their class. These sensors save space.

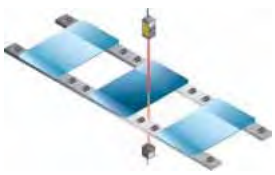


Resolution of 4 μm

A high resolution of 4 μm (at an average 64 cycles) allows high-precision positioning and size judgment.

High-precision judgment even from minute differences in light intensity

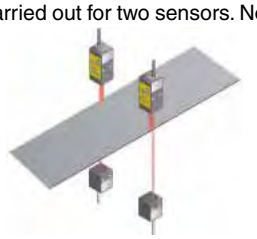
The sensors are sensitive to minute differences in light intensity, so that they can judge even the opacity of glass and turbidity of liquids. In addition, the amount of light received can be displayed as a percentage to allow you to determine permeation rates.



Distinguishing opacity of glass

Calculations for 2 sensors are possible

The calculation unit (optional) just needs to be connected between the two controllers to enable calculations (addition and subtraction) to be carried out for two sensors. No digital panel controller is needed either.



Sheet width measurement

FDA standards conforming types are available

FDA standards conforming types, most suitable for equipment used in the USA, are now available.
[FDA : classII, IEC / JIS : class1]

Sensor heads

Type		Beam diameter ϕ1 mm type		Sensing width 5 mm type	Sensing width 10 mm type
Model No. (Note 1)		HL-T1001A(F)		HL-T1005A(F)	HL-T1010A(F)
Sensing range		0 to 500 mm	500 to 2,000 mm	500 mm	
Sensing width		ϕ1 mm	ϕ1 to ϕ2.5 mm	5 mm	10 mm
Min. sensing object		ϕ8 μm opaque object	ϕ50 μm opaque object	ϕ0.05 mm opaque object	ϕ0.1 mm opaque object
Repeatability (During the state in which light is half blocked)		4 μm (Note 2)	———	4 μm (Note 2)	
Linear output resolution		4 μm (Note 2)	———	4 μm (Note 2)	
Ambient temperature		0 to +50 °C			
Emitting element	IEC / JIS standards conforming type	Red semiconductor laser, Class 1 (IEC / JIS) [modulated, max. output 0.35 mW (HL-T1001A(F): 0.2 mW), emission peak wavelength: 650 nm]			
	FDA standards conforming type	Red semiconductor laser, Class II (FDA) [modulated, max. output 0.35 mW (HL-T1001A(F): 0.2 mW), emission peak wavelength: 650 nm] (IEC / JIS: class 1)			

Notes: 1) **HL-T10□A** is IEC / JIS standards conforming type.
HL-T10□F is FDA standards conforming type.
2) In case of an average sampling rate of 64 times.

Controllers

Type	NPN output	PNP output
Model No.	HL-AC1	HL-AC1P
Supply voltage	12 to 24 V DC ±10 %	
Measuring cycle	150 μs	
Linear output	Current / voltage output switchable • During current output: 4 to 20 mA/F.S., Max. load resistance 300 Ω • During voltage output: ±4 V/F.S., output impedance 100 Ω (In the monitor focus function, it can also be set at ±5 V, 0 to 5 V, etc.)	
Temperature characteristics	±0.2 % F.S./°C	
Settable average sampling rate	1 / 2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1,024 / 2,048 / 4,096	
Judgment output (HIGH, PASS, LOW)	NPN open-collector transistor	PNP open-collector transistor
Ambient temperature	0 to +50 °C	
Dimensions	W30 × H34.3 × D64.3 mm	

Static Remover

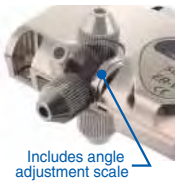
Ultra-Thin Type Ionizer **High-frequency AC Method**

ER-VW

Nozzle angle adjustment and joint layout can be selected as desired

Nozzle angle adjustment mechanism

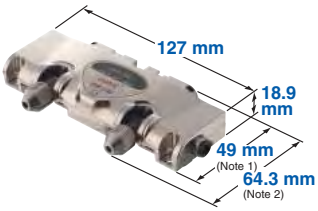
The angles of the two nozzles can be adjusted within a range of approximately 190° by screwing down the ends of the nozzles. After adjusting the angle, turn the ends of the nozzles to tighten them and secure them at that angle. This allows the nozzle angles of the **ER-VW** to be adjusted easily after installation.



Installation examples

Compact and ultra-thin design

The thickness of the unit is 18.9 mm. Even so, the nozzle angles can be adjusted, so that they can still be installed in places where there are space restrictions, such as inside other equipment or along several adjacent production lines.

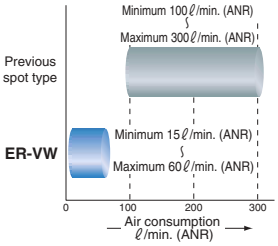


Notes: 1) Minimum width dimensions after nozzle angle adjustment.
2) Maximum width dimensions after nozzle angle adjustment.

Minimum air consumption 15 ℓ/min. (ANR)

ER-VW 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 and costly clean air can be used much more economically.

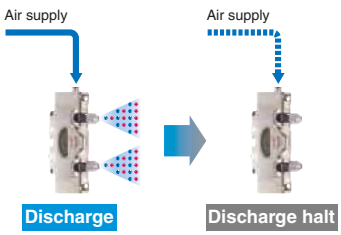
Comparison of air consumption



Air supply monitoring function

New concept

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 and the discharge output (DSC) turns off. This prevents objects which are not charged from being overlooked when the air supply has been stopped.

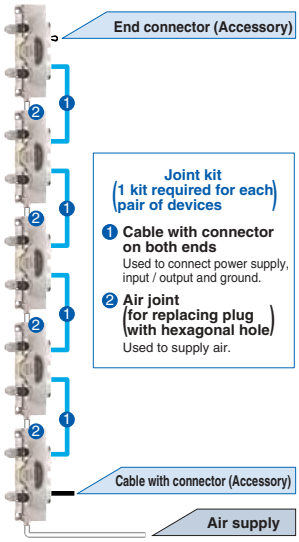


Easy connection possible

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.

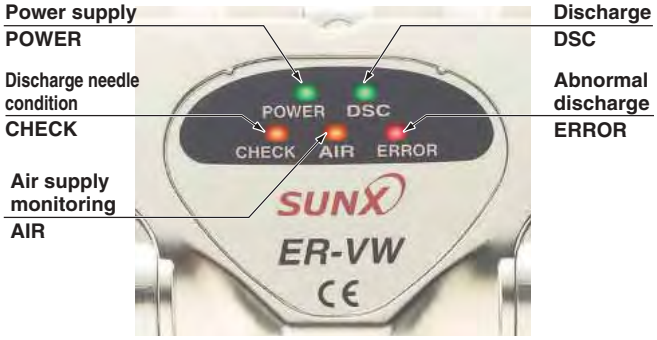
Multiple **ER-VW** units can be connected together to provide charge removal layouts that suit the target equipment.

Connection application example



The functions 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.



Type	Spot type
Model No.	**ER-VW**
Charge removal time (±1,000 V→±100 V)	1 sec. or less (Note 1)
Ion balance	Within ±15 V (Note 1)
Supply voltage	24 V DC ±10 %
Output Check (CHECK) Error (ERROR) Discharge (DSC)(Note 2)	NPN open-collector transistor
Ambient temperature	0 to +55 °C

Notes: 1) A typical sample applied with a supply voltage of 24 V, a distance of 100 mm from the front surface of the air flow outlet and a pressure of 0.25 MPa. (Measured on a sample left in the atmosphere at a relative humidity of 65 % RH or less for 24 hours or more.)
2) 'DSC' is the abbreviated symbol for 'DISCHARGE'.

Discharge halt function: Uses external input to forcibly stop discharge.

Check function : Uses the CHECK indicator and output to notify the operator when it is time to clean or replace the discharge needle.

Abnormal discharge monitoring function : Uses the ERROR indicator and output to notify the operator when a problem with discharge occurs, and stops discharge. It can be canceled by means of reset input.

Discharge output : Output is ON during discharging. This lets you check when discharging is being carried out.

Check output : Output turns ON when the discharge needle is dirty.

Error output : Output turns OFF when there is a problem with discharging (normally it is ON). It also allows you to check the power supply to the ionizer.

Ultra-Compact Ionizer **High-frequency AC Method**

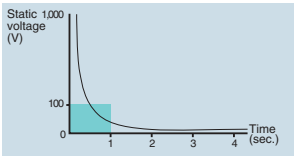
ER-V SERIES

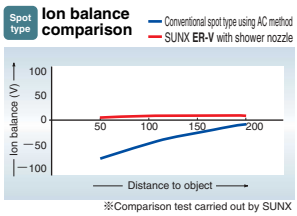
New ultra-compact, high-performance ionizer!

Produces excellent ion balance

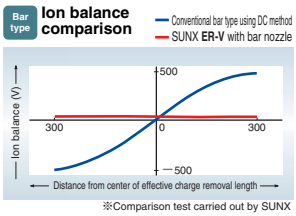
The adoption of high-frequency AC method allows extremely stable ion balance to be achieved. Because the ion balance is not affected by the pressure of air supplied or by the setup distance, no troublesome adjustments are required after setup.

Charge removal time (typical)





※Comparison test carried out by SUNX



※Comparison test carried out by SUNX

High performance with 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.

Discharge halt input
A signal from an external device can be used to turn discharge ON and OFF. Sensors can be used to detect the objects so that the ion air is generated only when required.

Discharge indicator
The discharge ON / OFF status can be checked using an LED display. This lets you avoid problems such as when the power is

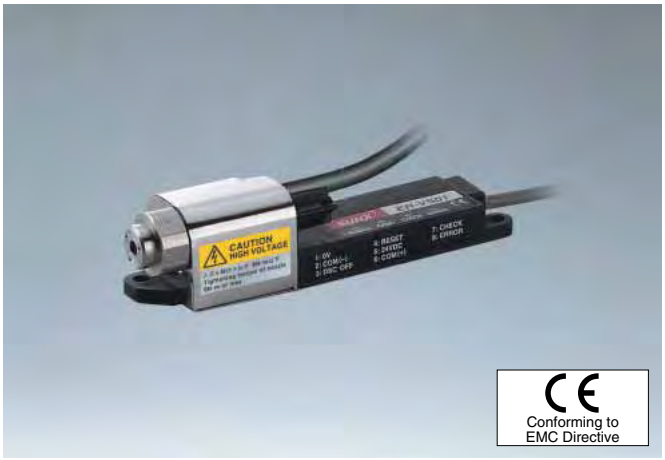
Nozzle variations can be selected to suit the application

Shower nozzle

Straight bar nozzle

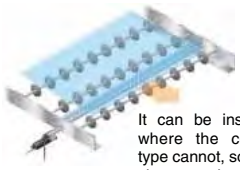
Shape-preserving tube

Conductive tube



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

The main unit is merely 109 × 27 × 28 mm, 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.

Type	Spot type
Model No.	**ER-VS01**
Charge removal time (±1,000 V→±100 V)	1 sec. or less (Note 1)
Ion balance	Within ±15 V (Note 1)
Supply voltage	24 V DC ±10 %
Output [Check (CHECK)] [Error (ERROR)]	NPN open-collector transistor
Ambient temperature	0 to +55 °C

Note: A typical sample applied with a supply voltage of 24 V, a distance of 100 mm from the front surface of the air flow outlet and a pressure of 0.25 MPa while the shower nozzle is in use. (Measured on a sample left in the atmosphere at a relative humidity of 65 % RH or less for 24 hours or more.)

Electrostatic Sensor

EF-S1

Constantly checks static electricity in process lines

Maintains and regulates product quality by eliminating static electric damage

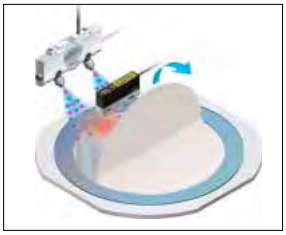
The static electricity that can build up in various places in a process line can be monitored constantly, so that abnormalities can be prevented before they occur. This makes it possible to determine if damage or malfunctions are being caused by static electricity, so that stable product quality can be maintained.

Reduces man-hours for ionizer inspections

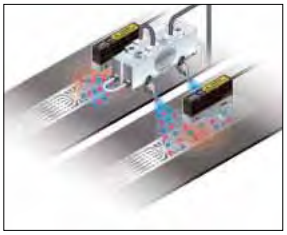
The de-ionizing effectiveness of ionizers can be understood in real-time, so that things such as ionizer damage and the replacement period for worn components can be checked objectively, reducing the number of man-hours required for inspection and testing.

A variety of functions for a wide range of applications

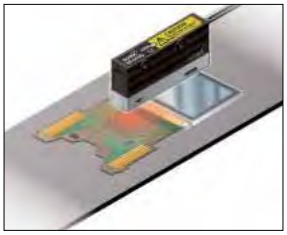
Measuring surface potential when removing BG sheets



Measuring static electric charges in lead frames



Measuring frictional electrification of LCD modules



Sensor head
Model No.: **EF-S1HS**
Sensing range: 8.0 to 20.5 mm (±1 kV range)
21.0 to 40.5 mm (±2 kV range)

Controller
Model No.: **EF-S1C**
Supply voltage: 24 V DC ±10 %
Display range (Measurement range):
−1,000 to 1,000 (±1 kV range)
−2,000 to 2,000 (±2 kV range)
Judgment output: NPN open-collector transistor
Analog output: Output voltage 1 to 5 V
Output impedance 100 Ω approx.

Laser Makers

This product is introduced to only limited countries.
Please contact our office for details.

FAYb Laser Marker
LP-V SERIES

FAYb broadens the world of marking

Equipped with the newly-developed FAYb short-pulse laser

This series realizes a high-speed marking function capable of 700 characters or more per second and a high-powered average output of 12 W. It can provide any desired marking for such applications as ultra-small workpieces and complex shapes.

Compatible with high-speed lines

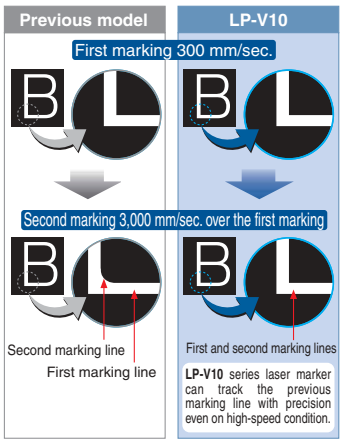
Lead frame-shaped plastic molded packages and metallic packages that are placed into trays can also be marked at high speeds. Step and repeat, rank / offset and serial data marking, and optimization of marking order are among the full range of available functions to shorten marking time. This also contributes to faster speeds for semiconductor and electronic component production lines where a short takt of even 0.1 seconds is required.

Various applications

- IC package
- Button cell

Realized high accurate marking

A newly-designed galvanometer driver extracts the highest limits of performance from the newly-developed super-high-speed galvanometer. Realized high accurate marking under the order of high-speed marking.



Model No.: General purpose type **LP-V10**
Wide area type **LP-V15**
Work distance: **LP-V10** 190 mm, **LP-V15** 350 mm
Scanning method: Galvano-scanning method
Marking laser: Fiber-laser Class 4 (Output: average 12 W· max. 15 W, peak emission wavelength: 1.06 μm)
Range to be marked: **LP-V10** 90 × 90 mm
LP-V15 160 × 160 mm
Basic dimensions of characters:
LP-V10 Height and width 0 to 90 mm (settable at 0.001 mm interval)
LP-V15 Height and width 0. to 160 mm (settable at 0.001 mm interval)
Types of characters: English capital and small characters, figures, symbols, user-defined characters (up to 50 types)
Supply voltage: 90 to 132 V AC or 180 to 264 V AC (auto-changing) 50 / 60 Hz
Ambient temperature: 0 to +40 °C

CO_2 Laser Marker
LP-400 SERIES

High functionality, high-grade model

Super-high-speed marking

Super-high-speed marking is possible, with 700 characters taking 0.99 sec.

High power and high stability

A 30W CO_2 laser is equipped, so that stable marking is possible from low power to high power.

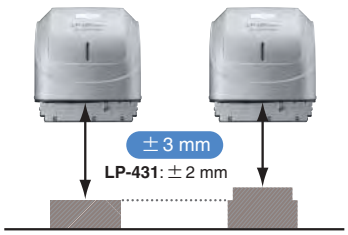
Compatible with high-speed lines

Compatible with high-speed 240 m/min. lines. Inline marking can be carried out for articles such as packing boxes, PET bottles and cables.

Excellent ease of setup

Unique head rotation mechanism allows free angle setting to make setup easy. Equipped focus adjustment function. Equipped with a dual pointer.

- **Focus adjustment function**



- **Head rotation mechanism**

Model No.: **LP-430-A**, **LP-431-A**
Work distance: **LP-430-A** 185 mm, **LP-431-A** 111 mm
Scanning method: Galvano-scanning method
Marking laser: CO_2 laser Class 4 (Output: average 30 W· max. 75 W, peak emission wavelength: 10.6 μm)
Range to be marked: **LP-430-A** 110 × 110 mm
LP-431-A 55 × 55 mm
Basic dimensions of characters:
Height and width **LP-430-A** 0.2 to 110 mm
LP-431-A 0.2 to 55 mm
(settable at 0.001 mm interval)
Types of characters: English capital and small characters, figures, symbols, user-defined characters (up to 50 types)
Supply voltage: 90 to 132 V AC or 180 to 264 V AC (auto-changing) 50 / 60 Hz
Ambient temperature: 0 to +40 °C

SUNX
Sensing the Future