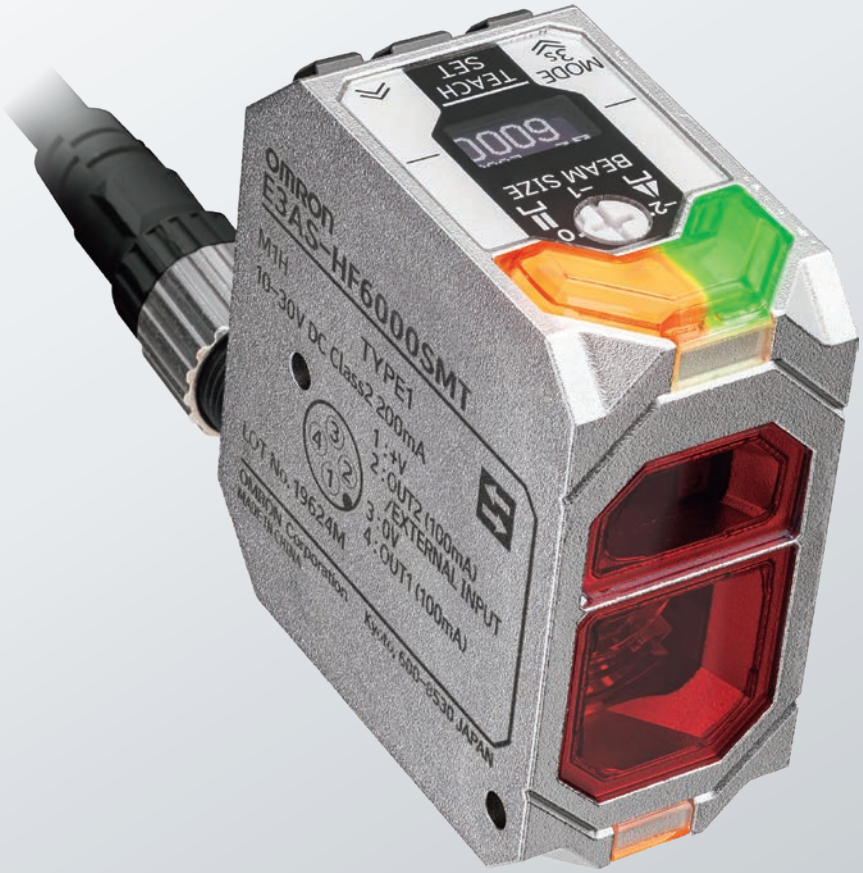
TOF Laser Sensor with Built-in Amplifier
E3AS-HF Series

OMRON

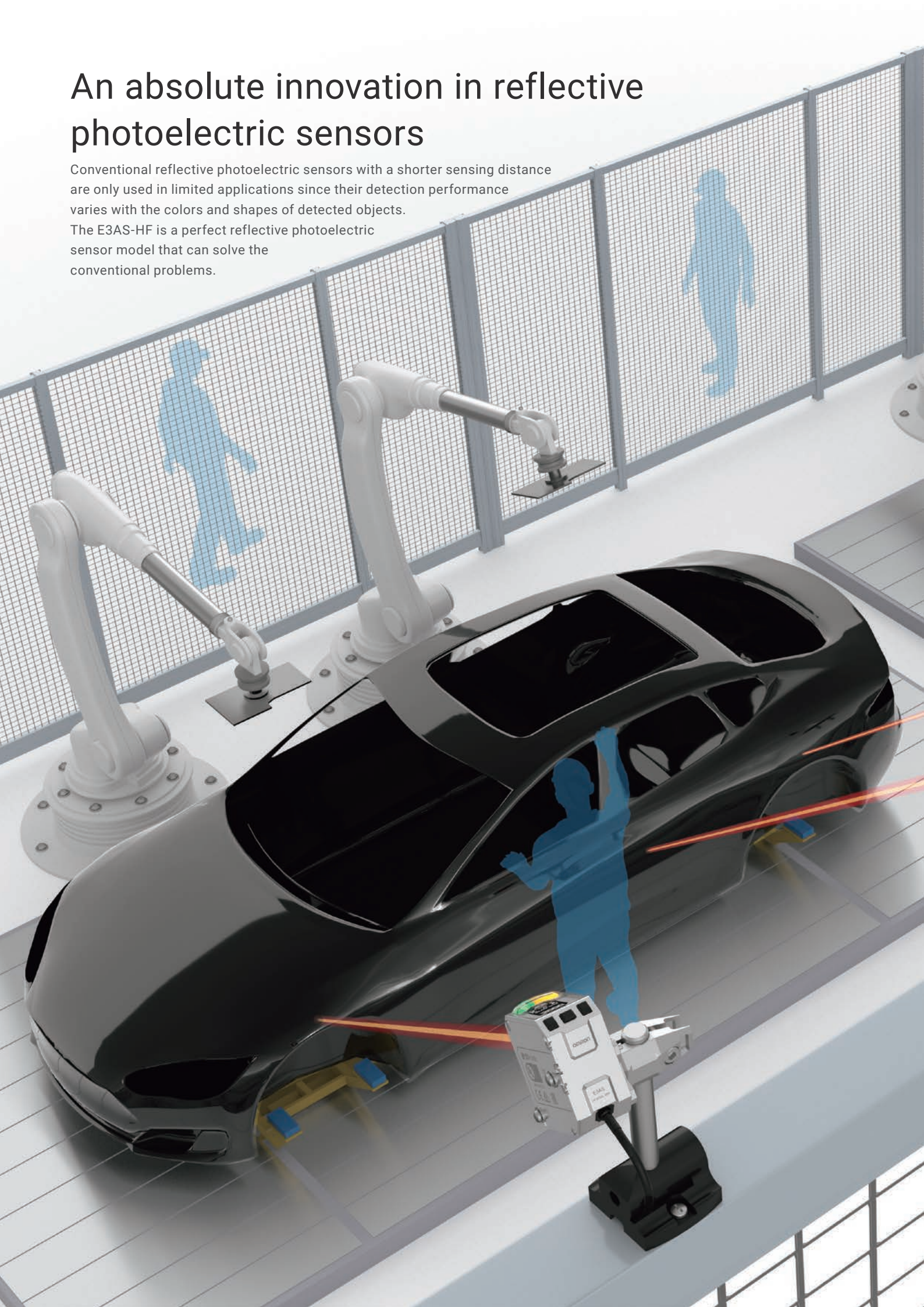
High-sensitivity TOF Laser Sensor to increase equipment design flexibility

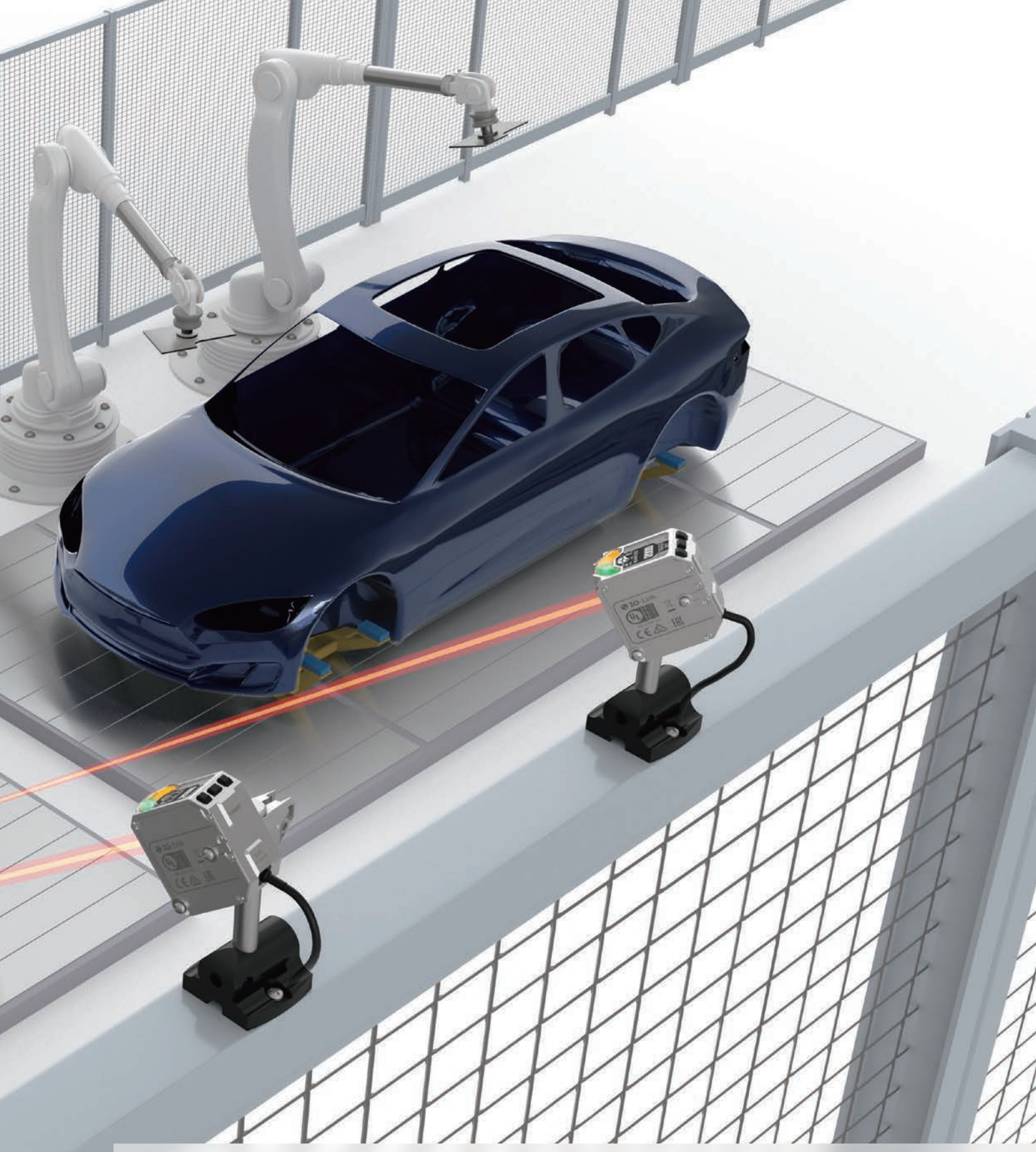


IO-Link ECOLAB CERTIFIED CE

An absolute innovation in reflective photoelectric sensors

Conventional reflective photoelectric sensors with a shorter sensing distance are only used in limited applications since their detection performance varies with the colors and shapes of detected objects.
The E3AS-HF is a perfect reflective photoelectric sensor model that can solve the conventional problems.





Three features to improve all types of production lines

1. **A wide sensing range and excellent angle characteristics supported at the same time**
2. **Equipment free from mutual interference when multiple sensors are used**
3. **An easily visible OLED display**

1. A wide sensing range and excellent angle characteristics supported at the same time

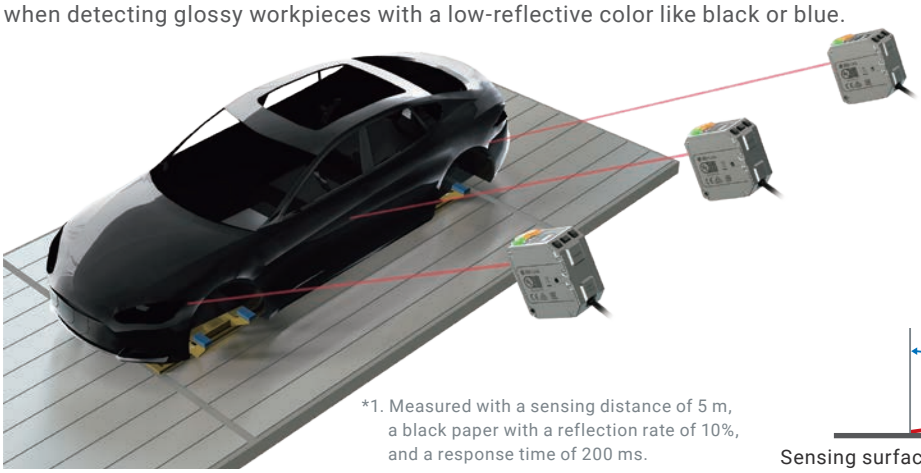
Performance of conventional long-distance reflective photoelectric sensors is not always stable since their detection performance varies with the colors and shapes of detected objects. With its unique sensing algorithm, E3AS-HF has overcome the problem, eliminating the time and effort to select and set up sensors.

A sensing range of 0.05 to 6 m and angle characteristics of ±85° max.

Place the sensors away from the pathways of people and robots so that the sensors do not obstruct their movement. Thus remove failure risks such as optical axis displacement and cable disconnection due to collision with a workpiece, and ensure stable sensing when the target workpiece is changed or added.

Sensing whether a painted vehicle body is positioned in place

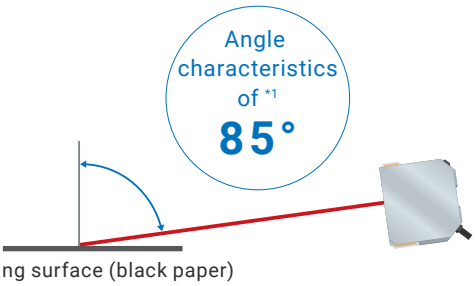
The sensors perform reliable detection even when installed at an angle in a far place or when detecting glossy workpieces with a low-reflective color like black or blue.

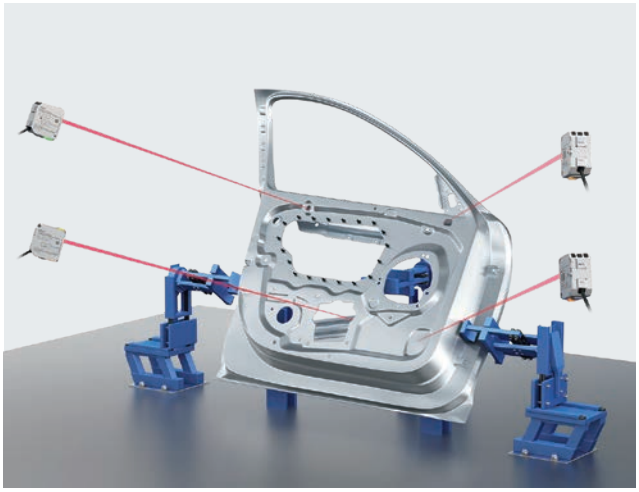


*1. Measured with a sensing distance of 5 m, a black paper with a reflection rate of 10%, and a response time of 200 ms.

Detecting glossy black workpieces at a wide angle

Angle characteristics of 85° max.





Identifying the vehicle model from the body panel

By detecting the holes and pins of the body panel set on the jig, the sensors identify the vehicle model and detect the presence of necessary parts.
The sensors with excellent angle characteristics can be installed away from the pathways of people and robots.

Detecting a small bore with the spot beam type

Sensing workpieces in a palletizing process

Multi-color, low-reflective workpieces can be detected reliably. The setup can reduce installation and wiring work compared with through-beam sensors.

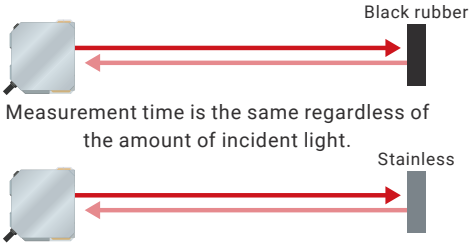
Detecting multi-color, low-reflective workpieces

Three technologies underlying the excellent sensing performance

TOF method to stably detect various workpieces

The TOF (Time of Flight) method measures the distance based on the elapsed time. Therefore, measurement is not easily affected by changes in the color and material of the workpieces. The method needs only a low incident light level to perform sensing, so the sensor can detect low-reflective workpieces such as black rubber from a distance.

Operating principle of TOF



Laser class 1 for safety

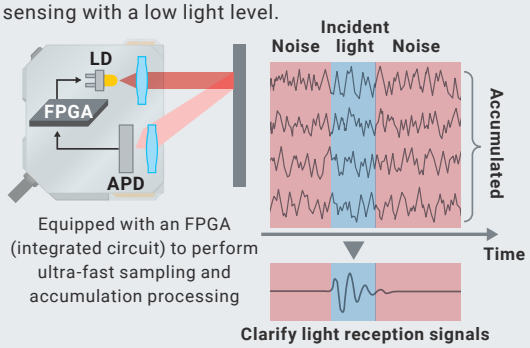
Combining as strong an emission as possible within the class 1 limit with the advanced device and high-frequency circuit design technology, the sensor can perform laser control within an extremely narrow pulse width.
This reduces the need for operator safety measures and equipment protection measures, allowing a compact, low-cost equipment design.

High-sensitivity photo diode controlling algorithm

The sensor has a high-sensitivity APD[*3] that can detect even a slight amount of incident light.
With the built-in temperature element that corrects the temperature in real-time, the sensor reduces characteristics variation and ensures stable sensing.

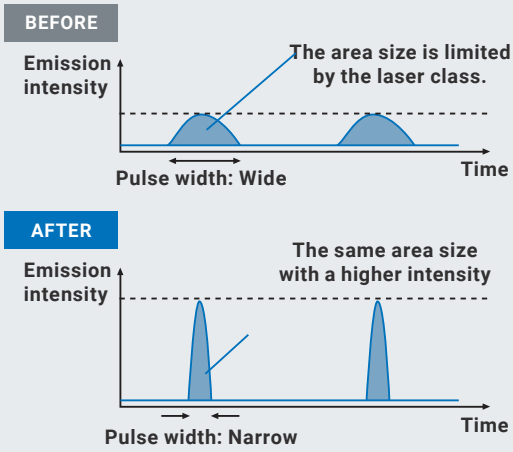
Ultra-fast sampling and unique accumulation processing PATENTED[*2]

By accumulating approximately 10 million data points obtained by ultra-fast sampling at 10 billion times per second, the method obtains a clear incident light waveform and minimizes the noise, enabling stable sensing with a low light level.

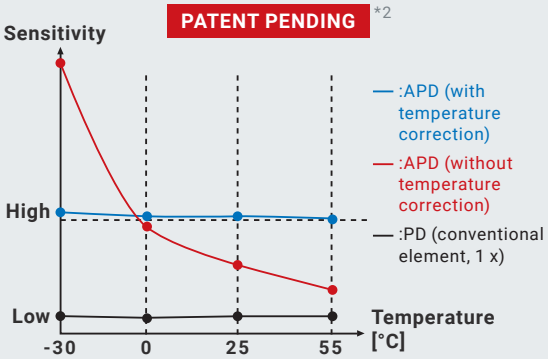


Equipped with an FPGA (integrated circuit) to perform ultra-fast sampling and accumulation processing

High-frequency circuit technology PATENT PENDING[*2]



Real-time temperature correction PATENT PENDING[*2]



The graph shows typical characteristics.

*2. "PATENT PENDING" means that we applied for a patent in Japan, and "PATENTED" means that we obtained a patent in Japan. (As of September 2024)
*3. APD: Avalanche Photo Diode

2. Equipment free from mutual interference when multiple sensors are used

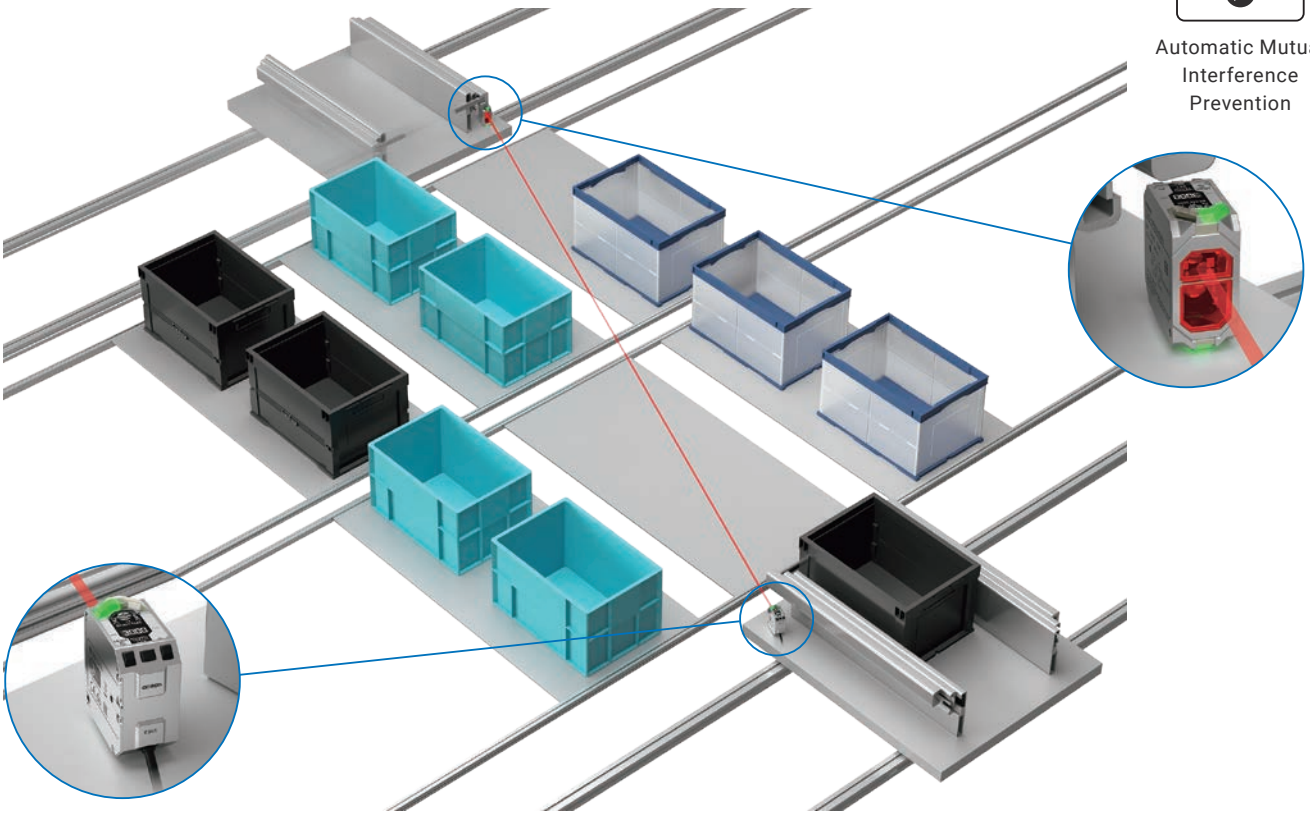
Automatic Mutual Interference Prevention

The technology adopted by E3AS-HF can prevent interference between the sensors without the need for their channel settings. It prevents the sensors placed to face each other from causing mutual interference, reducing equipment disruptions.

Sensing pallets in an automated warehouse

It is difficult to predict when the sensors on shuttles will encounter each other while many shuttles are running sideways in an automated warehouse. In such a warehouse, unexpected mutual interference inevitably occurs causing the lines to stop. E3AS-HF, however, has an Automatic Mutual Interference Prevention function that can prevent malfunction without the need for channel settings.

Automatic Mutual Interference Prevention

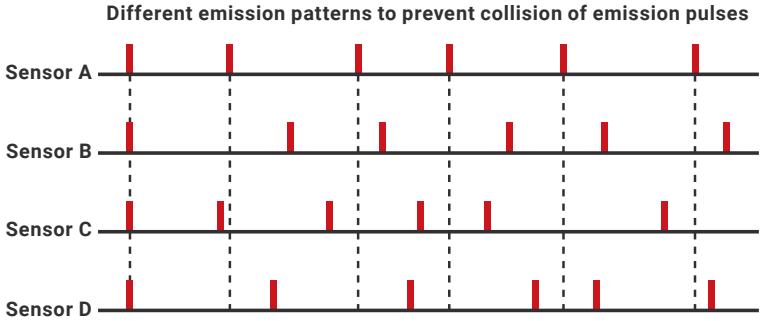


A technology underlying Automatic Mutual Interference Prevention

PATENT PENDING *1

Sensors have different emission patterns to prevent mutual interference. If a malfunction still occurs, you can manually modify their patterns.

Image of emission patterns

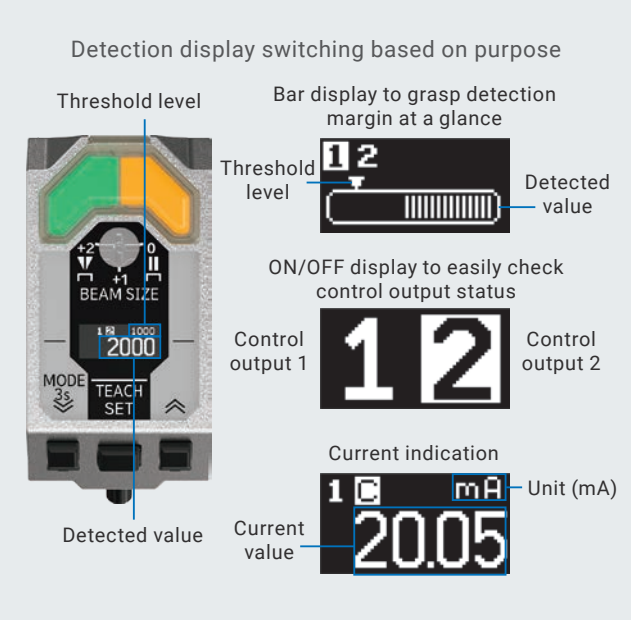


3. An easily visible OLED display

Setup of conventional reflective photoelectric sensors is complicated and requires skills and experience.
However, the enhanced operability of the sensor allows anyone to reliably perform the setup, reducing commissioning hours and ensuring long-term stable operation.

OLED Display with 5 languages supported

A detection display can be selected according to the usage, so you can quickly see the necessary sensor's status. In addition, the sensor supports five languages for local operators to smoothly set up the units outside Japan.



Language setting

Language English	言語 日本語	Idioma Espanol	Lingua Italiano	Sprache Deutsch
English	Japanese	Spanish	Italian	German

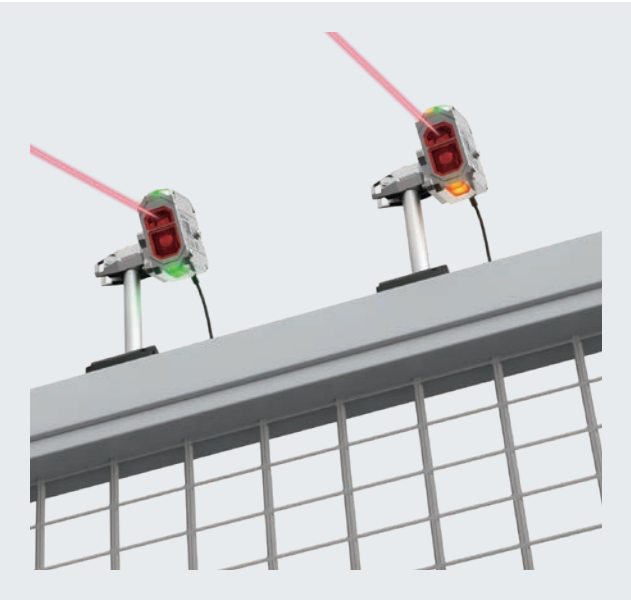
Response time

Response 200ms	応答時間 200ms	Respuesta 200ms	Risposta 200ms	Antwort 200ms
English	Japanese	Spanish	Italian	German

High-brightness indicator at the bottom

PATENT PENDING *1

The sensor has an indicator at the bottom to help check the operation status of the sensor installed in a high place.



Enhanced visibility with an indicator at the bottom

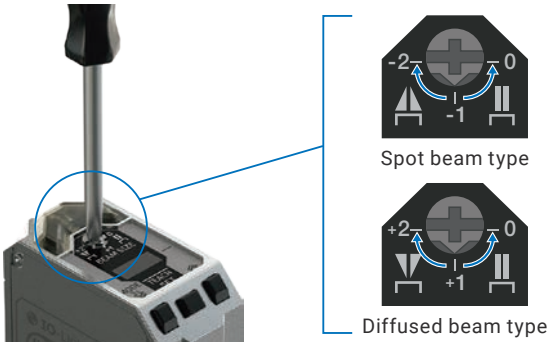
*1. "PATENT PENDING" means that we applied for a patent in Japan, and "PATENTED" means that we obtained a patent in Japan. (As of September 2024)

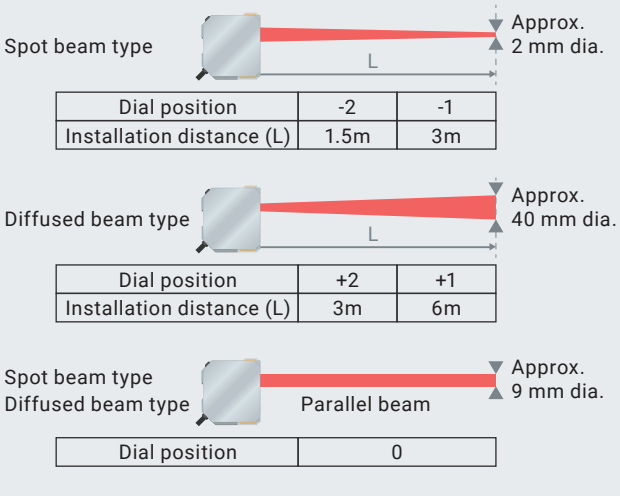
Various functions for easy use

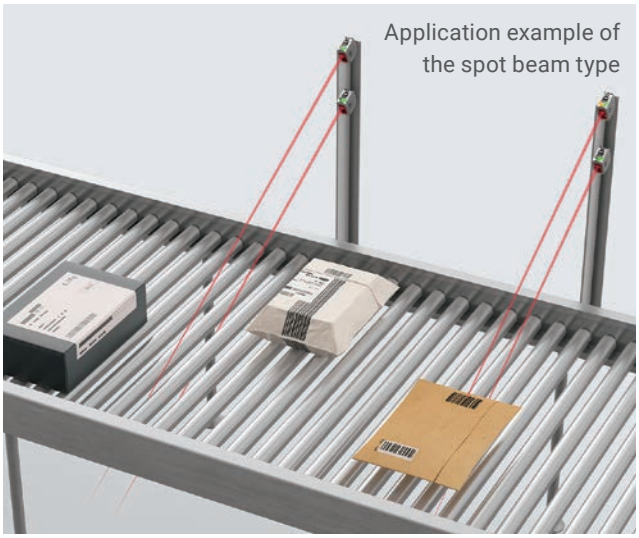
Adjustable spot diameter

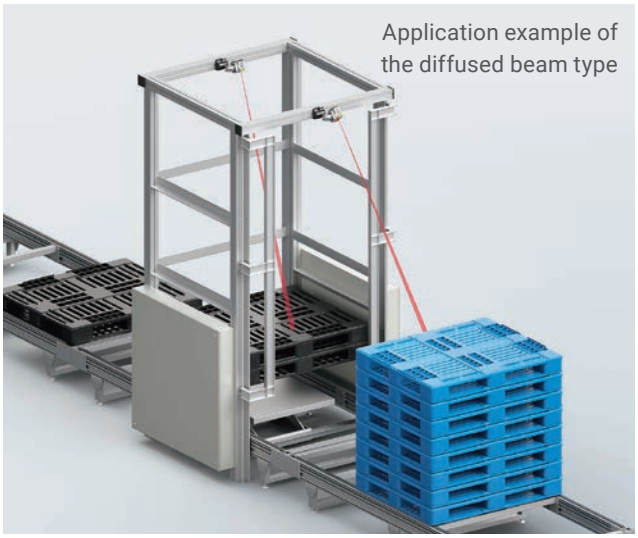
PATENT PENDING *1

The spot diameter adjustable with the dial on the top of the sensor can be selected from three options according to whether you want to detect a spot on a small workpiece such as a pin or an area on a surface such as a hole.









Detecting workpieces on a roller conveyor

The spot diameter can be reduced to approximately 2 mm. Set up the optical axes so that they pass between the rollers to stably detect workpieces only.

Detecting workpieces with the spot beam type

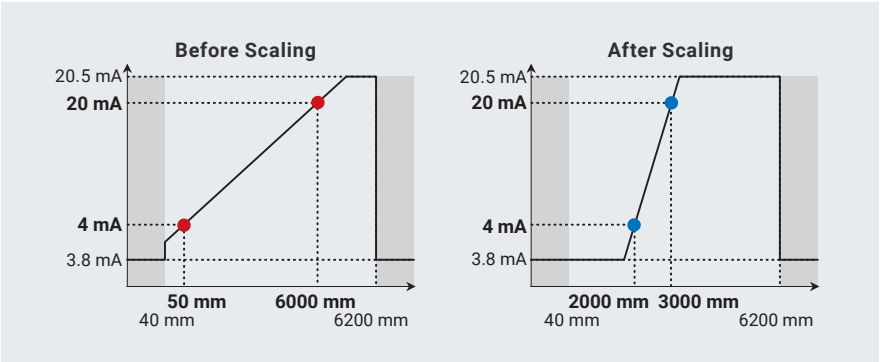
Detecting how many pallets are remaining

The spot diameter can be increased to approximately 40 mm, allowing stable detection regardless of the shape and holes of the pallets.

Sensing pallets with the diffused beam type

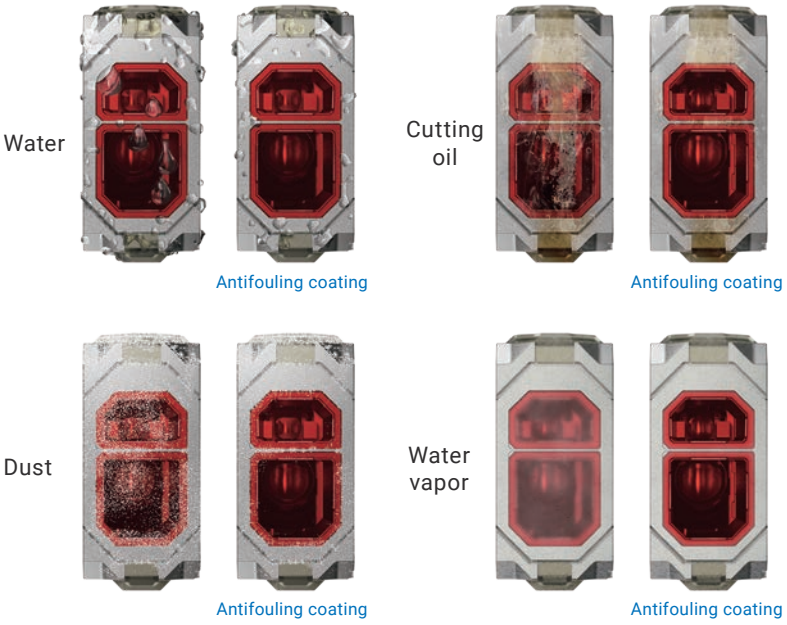
Scaling function

Converts a digital output value (distance) to a given output current value. Use the function when you use a narrow sensing distance range. The scaling function helps you find even small changes.



Antifouling coating PATENTED *1

A dirty sensing surface can cause false detection due to the principle of photoelectric sensors. The antifouling coating on the sensing surface prevents paper dust, etc. from sticking to the sensing surface, and keeps the lens from fogging as well. Adding an air blow unit available as an accessory can help further reduce the frequency of cleaning the sensor.



Air blow unit PATENTED *1

Attaching an air blow unit helps greatly reduce the frequency of false detection since it prevents contamination of the sensing surface of the sensor installed in a high, difficult-to-clean place.

Environmentally-resistant structural design

Highly resistant to water, oil, and high-pressure washing and can be used in a harsh environment.

IP67G
Water resistance / oil resistance

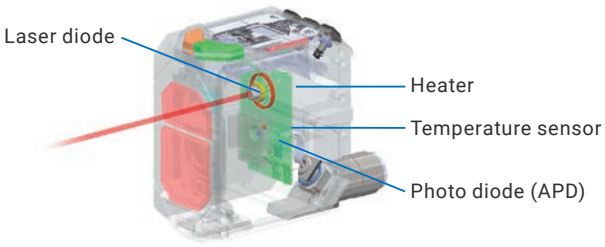
IP69K
High temperatures/ high water pressure

ECOLAB
Detergent resistance

IP69K (high temperatures / high water pressure) testing

Operable at an ambient operating temperature of -30°C

With a combination of a heater and a temperature sensor built in to control operation, the sensor can reliably operate in a low-temperature environment such as a freezer warehouse.



Note: Warm-up of a maximum of 10 minutes is necessary at a temperature of -10°C or below.

*1. "PATENT PENDING" means that we applied for a patent in Japan, and "PATENTED" means that we obtained a patent in Japan. (As of September 2024)

IO-Link supported as standard to visualize a manufacturing environment

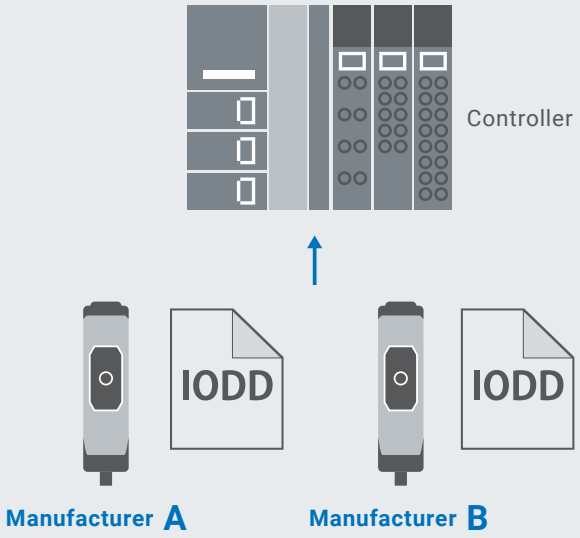
In addition to ON/OFF signals, IO-Link can send and receive the sensor information to and from an upper-level controller. This allows real-time status monitoring of the sensors, reduction of the configuration hours during setup and replacement, and reduction of unexpected equipment disruptions due to accidental problems.

Open international standard

IO-Link is an open information technology (interface) used between a sensor/actuator and an I/O terminal, as defined in IEC61131-9, an international standard.

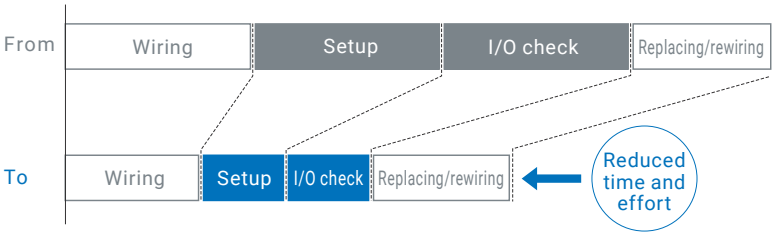
Globally deployable

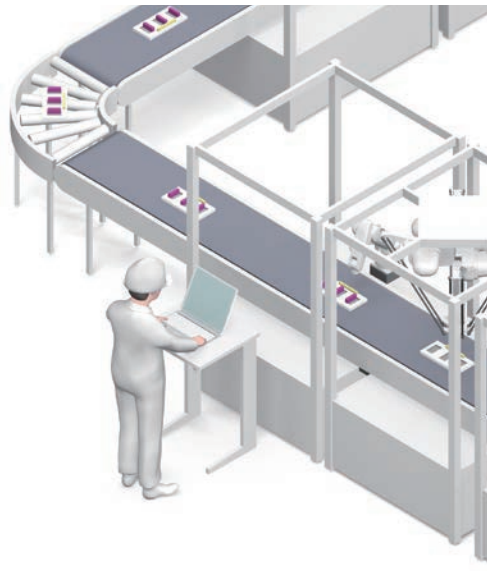
Every IO-Link sensor has an IODD (IO Data Description) file containing information about what kind of equipment it is and what parameter settings it needs. The specification of IODD file is globally common and shareable by all IO-Link sensors regardless of their manufacturers.



Line commissioning and maintenance with less people in less time with IO-Link

With IO-Link, reduce commissioning time by batch-setting the sensors and cut troubleshooting time during mass production by utilizing field data.





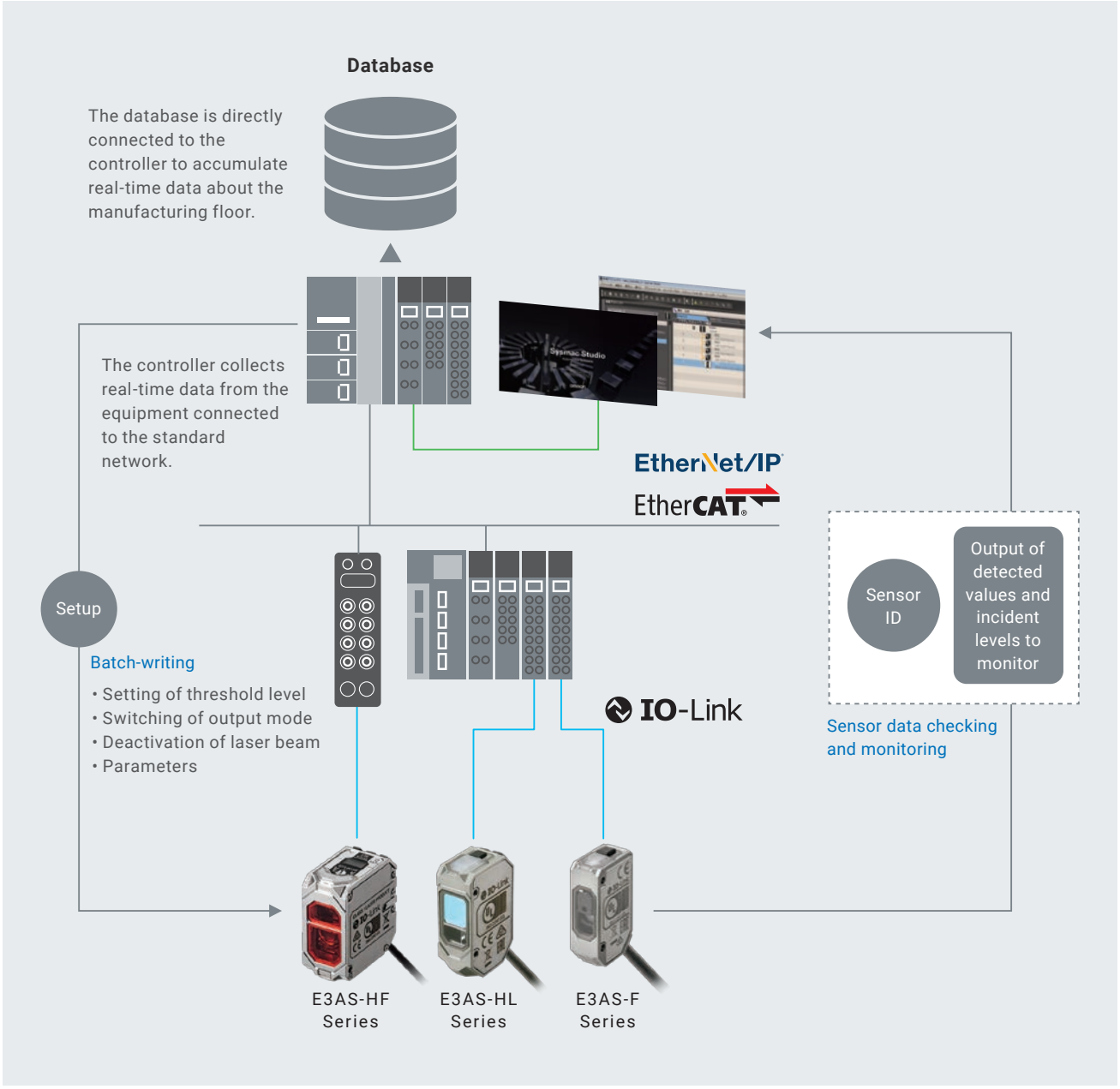
Reduce commissioning time by batch-writing settings from IO-Link device configuration tool

Setting information can be batch-written to thousands of sensors on a line, effectively reducing commissioning time and inconsistent settings.

Predictive monitoring and quick recovery by checking and monitoring sensor data

The monitor shows light intensity decrease due to sensing surface contamination or other reason, allowing users to take proactive actions to prevent potential false detections. This reduces the frequency of unexpected failures.

Converting the equipment information into meaningful data with IO-Link



Accessories enhance sensor usability

180º/360º Mounting Bracket

Allows flexible optical axis adjustment.

E39-L245

E39-L255

How to use a mounting bracket

Flexible Mounting Bracket

The optical axis can be adjusted in three directions: vertical, horizontal, and angular.

E39-L264

PATENTED *1

Air Blow Unit

Blows paper dust, etc. off the sensing surface.

E39-E17

PATENTED *1

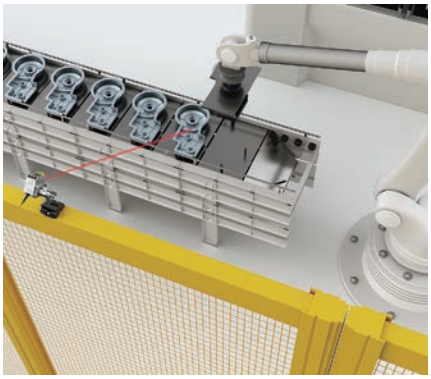
Front Protection Cover

Protects the sensing surface from spatter and collisions with tools.

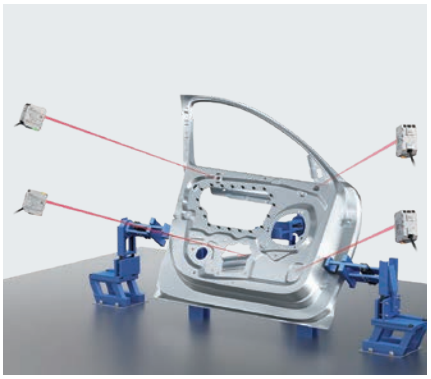
E39-E20

*1. “PATENT PENDING” means that we applied for a patent in Japan, and “PATENTED” means that we obtained a patent in Japan. (As of September 2024)

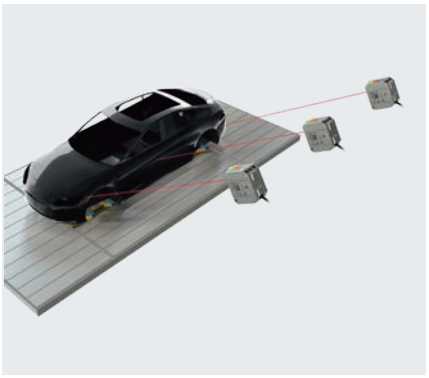
Applications and target workpieces



Sensing eAxle gearboxes

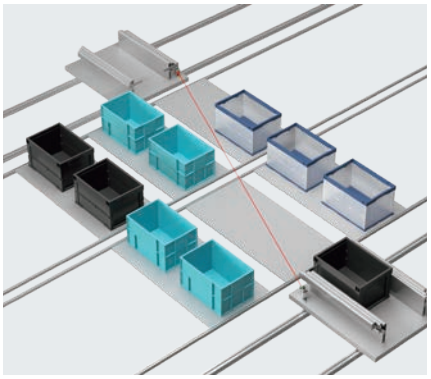


Identifying the vehicle model from the body panel

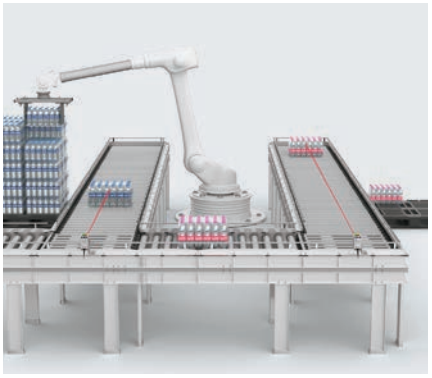


Sensing whether a black-painted body is positioned in place

Sensing an obstacle in the path of an AGV

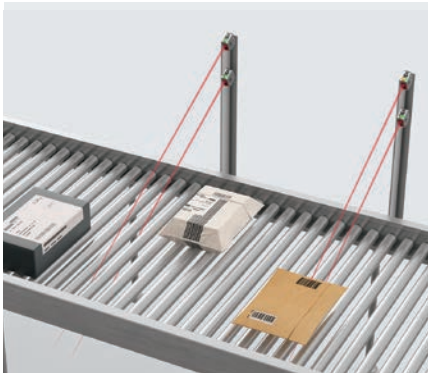


Sensing pallets in an automated warehouse



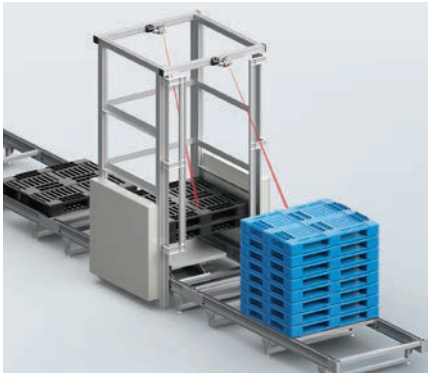
Detecting an accumulated shrink-wrapped pack of bottles

Sensing shrink wrappings



Detecting workpieces on a roller conveyor

Sensing workpieces in a palletizing process



Detecting how many pallets are remaining

MEMO

TOF Laser Sensor with Built-in Amplifier

E3AS-HF Series

CSM_E3AS-HF_DS_E_1_1

High-sensitivity TOF Laser Sensor to increase equipment design flexibility

- A sensing range of 0.05 to 6 m and angle characteristics of ±85° max.
- TOF method to stably detect various workpieces
- Laser class 1 for safety
- Automatic Mutual Interference Prevention to reduce equipment disruptions
- OLED Display with 5 languages supported
- Antifouling coating to prevent contamination of the sensing surface
- IP67, IP69K rated, and ECOLAB approved
- All models with IO-Link connectivity (NPN type excluded)

Refer to *Safety Precautions* on page 27.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Table of Contents

Ordering Information

Spot beam type [Refer to *Dimensions* on page 30]

Red light

Connection method	Sensing distance	Output	Model	
			NPN output	PNP output
		IO-Link baud rate	---	COM3 (230.4 kbps)
Pre-wired (2 m) *1			E3AS-HF6000SMN 2M	E3AS-HF6000SMT 2M
M12 Connector (horizontal)			E3AS-HF6000SMN M1H	E3AS-HF6000SMT M1H
M12 Connector (vertical)			E3AS-HF6000SMN M1V	E3AS-HF6000SMT M1V
M12 Pre-wired Smartclick Connector (0.3 m)			E3AS-HF6000SMN-M1TJ 0.3M	E3AS-HF6000SMT-M1TJ 0.3M

Diffused beam type

Connection method	Sensing distance	Output	Model	
			NPN output	PNP output
		IO-Link baud rate	---	COM3 (230.4 kbps)
Pre-wired (2 m) *1			E3AS-HF6000DMN 2M	E3AS-HF6000DMT 2M
M12 Connector (horizontal)			E3AS-HF6000DMN M1H	E3AS-HF6000DMT M1H
M12 Connector (vertical)			E3AS-HF6000DMN M1V	E3AS-HF6000DMT M1V
M12 Pre-wired Smartclick Connector (0.3 m)			E3AS-HF6000DMN-M1TJ 0.3M	E3AS-HF6000DMT-M1TJ 0.3M

***1.** Models with 5-m cable length are also available with “5M” suffix. (Example: E3AS-HF6000SMN 5M)

Accessories (Sold Separately)

Sensor I/O Connectors (Sockets on One Cable End)

(Models for Connectors / Pre-wired Connectors)

A Sensor I/O Connector is not provided with the Sensor. It must be ordered separately as required.

Round Water-resistant Connectors XS5 serie

Appearance	Cable specification	Cable diameter (mm)	Cable connection direction	Cable length (m)	Sensor I/O Connector model number
M12 Smartclick Connector Straight type  Right-angle type 	PVC robot cable	6 dia.	Straight	2	**XS5F-D421-D80-F**
				5	**XS5F-D421-G80-F**
			Right-angle	2	**XS5F-D422-D80-F**
				5	**XS5F-D422-G80-F**

Round Water-resistant Connectors XS2 serie

Appearance	Cable specification	Cable diameter (mm)	Cable connection direction	Cable length (m)	Sensor I/O Connector model number
M12 Screw Connector Straight type  Right-angle type 	PVC robot cable	6 dia.	Straight	2	**XS2F-D421-D80-F**
				5	**XS2F-D421-G80-F**
			Right-angle	2	**XS2F-D422-D80-F**
				5	**XS2F-D422-G80-F**

Note: 1. The XS5W/XS2W (Socket and Plug on Cable Ends) are also available. Refer to XS5/XS2 on your OMRON website for details.
2. The connectors will not rotate after they are connected.
3. The cable is fixed at an angle of 180° from the sensor emitter/receiver surface.

Mounting Brackets

For E3AS-HF series **[Refer to *Dimensions* on page 33]**

A Mounting Bracket is not enclosed with the Sensor. Order a Mounting Bracket separately if required.

Appearance	Model	Pre-wired	M12 Pre-wired Smartclick Connector	M12 Connector (horizontal)	M12 Connector (vertical)
L-shaped Mounting Bracket (180°) 	**E39-L245**	Yes	Yes	Yes	---
L-shaped Mounting Bracket (360°) 	**E39-L255**	Yes	Yes	Yes	---
Flexible Mounting Bracket *1 	**E39-L264**	Yes	Yes	Yes	Yes
Post 50 mm 	**E39-L262**	Yes	Yes	Yes	---
Post 100 mm 	**E39-L263**	Yes	Yes	Yes	Yes
Air Blow Unit *2, *3 	**E39-E17**	Yes	Yes	Yes	Yes
Front Protection Cover 	**E39-E20**	Yes	Yes	Yes	Yes

⁎1. The Flexible Mounting Bracket is not provided with a Post (E39-L262/E39-L263). It must be ordered separately.
⁎2. When using the Air Blow Unit (E39-E17), use the L-shaped Mounting Bracket (E39-L245).
⁎3. The tube for air is not included.

Ratings and Specifications

Item		Sensing method	TOF (Time of flight)	
		Type	Spot beam type	Diffused beam type
Model		NPN Output	E3AS-HF6000SMN□	E3AS-HF6000DMN□
		PNP Output	E3AS-HF6000SMT□	E3AS-HF6000DMT□
Sensing distance			50 to 6,000 mm	
Beam size			Variable (Parallel / Spot)	Variable (Parallel / Diffusion, used with 40 dia. or less)
Light source (wavelength)			Red laser (660 nm)	
Power supply voltage			10 to 30 VDC, (including ripple (p-p) 10%), Class2	
Consumption current *1			65 mA max. (when power voltage is 24 V), 155 mA max. (when power voltage is 10 V). Note: 125 max. at environment below the freezing point (when power voltage is 24 V)	
Control output			Load power supply voltage 10 to 30 VDC (Class2), Load current 100 mA max. each output (total of 2 outputs is 200 mA max.) Residual voltage (Load current 10 mA max.: 1 VDC max., Load current 10 to 100 mA: 2 VDC max.) Open collector output type (Depends on the NPN/PNP output type) NO/ NC selectable	
Current output			4 to 20 mA, maximum load resistance 500 Ω	
External input			Laser OFF / Teaching / Zero reset selectable NPN ON time: 0 V short-circuit or 1.5 V or less (Outflow current: 1 mA or less) OFF time: Power supply voltage short-circuit or open PNP ON time: Power supply voltage short-circuit or within power supply voltage - 1.5 V (Sink current: 1 mA or less) OFF time: 0 V short-circuit or open	
Protection circuits			Reversed power polarity protection, Output short-circuit protection and Output reverse polarity protection	
Indicator			OLED Display (White), Power/Communication indicator (Green), Operation indicator (Orange), and Bottom indicator (Green, Orange)	
Response time			2 ms / 10 ms / 50 ms / 200 ms selectable	
Mutual interference prevention			Auto setting (Manual setting is also possible: up to 4 units)	
Ambient illumination			Incandescent lamp / Sunlight: 100,000 lx max.	
Ambient temperature			Operating: -30 to 55°C (with no icing or condensation) *2, Storage: -30 to 70°C (with no icing or condensation)	
Ambient humidity			Operating: 35 to 85%, Storage: 35 to 95%RH (with no condensation)	
Insulation resistance			20 MΩ min. at 500 VDC	
Dielectric strength			1,000 VAC at 50 / 60 Hz for 1 min	
Vibration resistance			10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions	
Shock resistance			500 m/s^2 for 3 times each in X, Y, and Z directions	
Enclosure ratings			IP67 (IEC60529), IP69K (ISO20653), IP67G (JIS C 0920 Annex 1) *3	
Weight (packed state/Sensor only)	Pre-wired (2 m)		Approx. 280 g/approx. 167 g	
	M12 Connector (horizontal/vertical)		Approx. 223 g/approx. 114 g	
	M12 Pre-wired Smartclick Connector (0.3 m)		Approx. 237 g/approx. 128 g	
Material	Case		Aluminum die cast (Chrome plating)	
	Cover		SUS304	
	Indicator		Polyethersulfone (PES)	
	Lens cover and Display		Methacrylic resin (PMMA), Antifouling coating (Lens cover)	
IO-Link Communication specifications	IO-Link specification		Ver. 1.1	
	Baud rate		COM3: 230.4 kbps	
	Data length		PD size: 4 bytes, OD size: 2 byte (M-sequence type: TYPE_2_V)	
	Minimum cycle time		COM3: 1.2 ms	
	Device profile		Smart Sensor Profile (SSP4.1.1) Identification and Diagnosis (I&D)	
Conformity standards			UL/CSA Certification, CE Marking, RCM, UKCA, Various laser standards *4, Ecolab, RoHs2, WEEE2	
MTTFd			340 year	
Accessories			Instruction manual, compliance sheet, index list (attached for IO-Link type only), FDA certification label Note: Mounting Brackets must be ordered separately.	

Note: 1. Altitude: Up to 2000 m, Pollution degree: 3, Enclosure type: Type1.

∗1. Excluding load current.

∗2. When the product is used in an environment with a temperature of -10°C or less, a warm-up time (10 min maximum) is required.

∗3. JIS C 0920 Annex 1 describes the IP67G rating oil and the oil resistance of the product has been assessed by the document. Please visit the website of the Japanese Industrial Standards for more informarion. (https://www.jisc.go.jp/index.html)

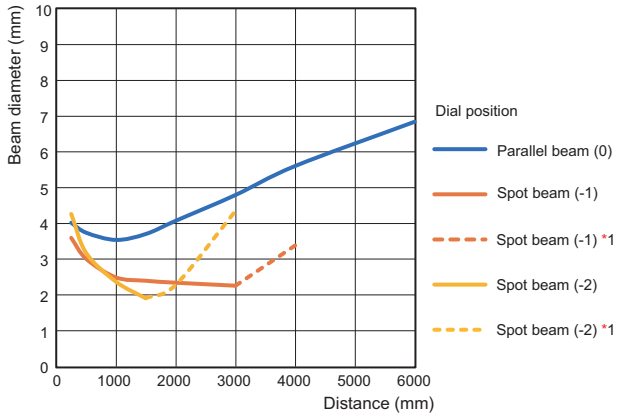
∗4. For details, refer to the *To safely use laser products* on page 28.

Engineering Data (Reference Value)

Beam Diameter vs. Sensing Distance

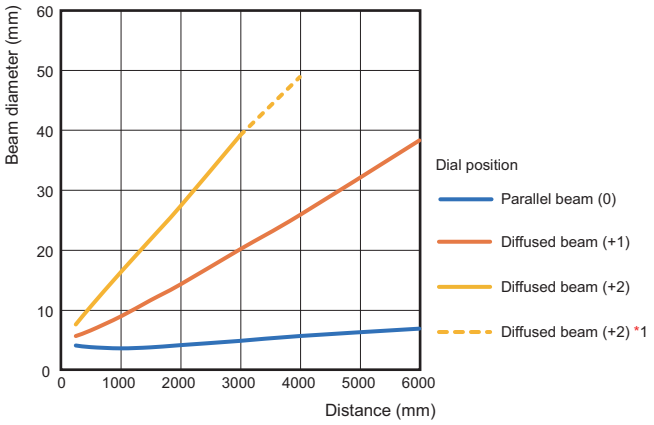
Spot beam type

E3AS-HF6000S□□



Diffused beam type

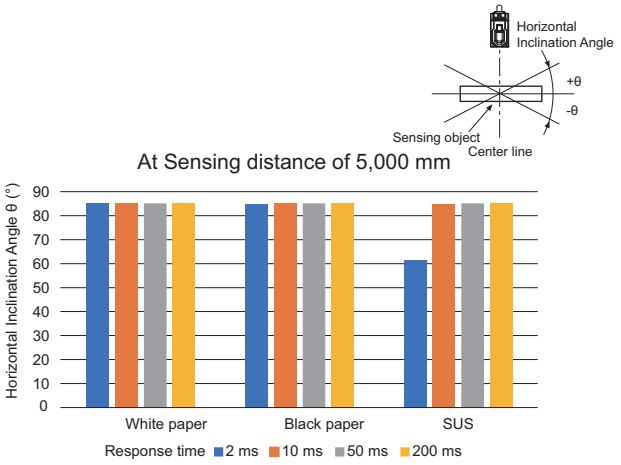
E3AS-HF6000D□□

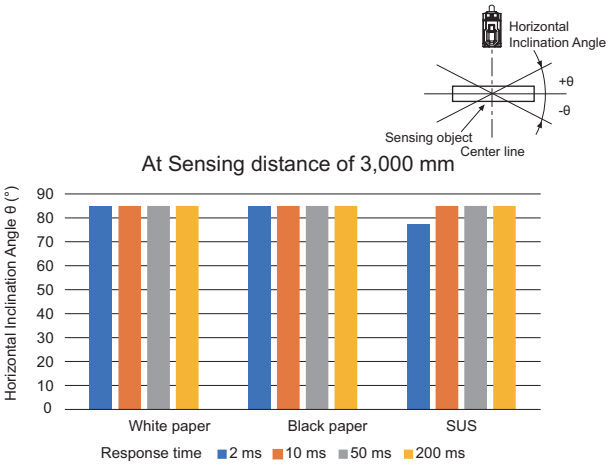


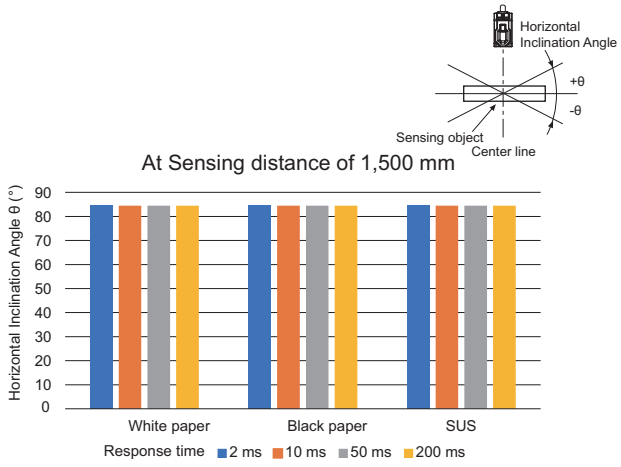
∗1. Please refrain from using the product within the dotted line area.

Sensing Object Angle Characteristics

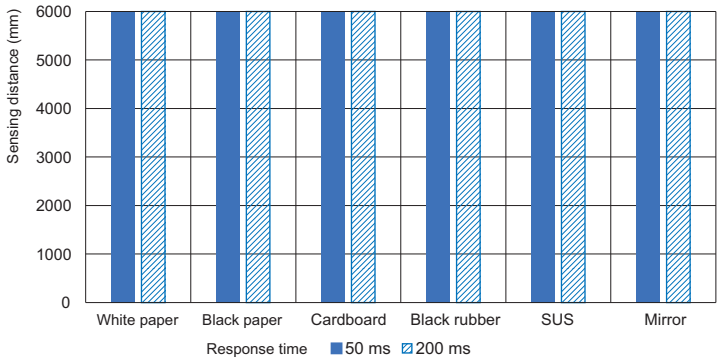
Reflectance: 90% (White paper)/10% (Black paper)







Sensing Distance vs. Sensing Object Material

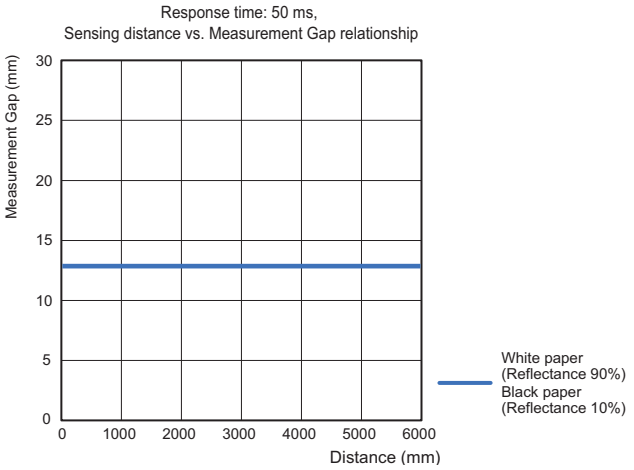


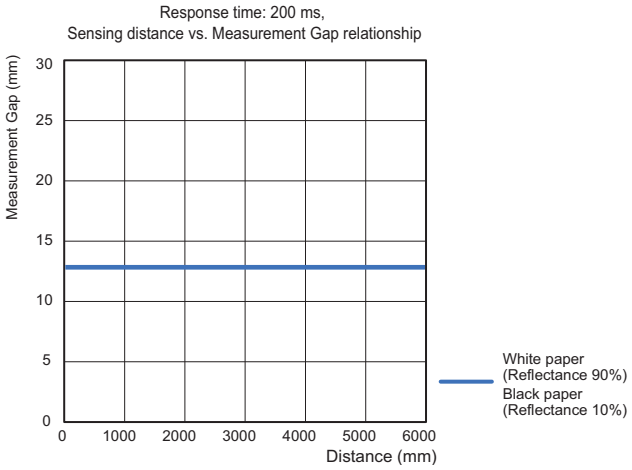
Repeat accuracy

		White paper (Reflectance 90%)				Gray paper (Reflectance 18%)				Black paper (Reflectance 10%)			
		Response time (ms)				Response time (ms)				Response time (ms)			
		2	10	50	200	2	10	50	200	2	10	50	200
Sensing distance (mm)	60	±4	±3	±1	±1	±5	±2	±1	±1	±7	±3	±1	±1
	200	±4	±1	±1	±1	±5	±2	±1	±1	±4	±1	±1	±1
	1000	±4	±2	±1	±1	±4	±1	±1	±1	±5	±2	±1	±1
	2000	±4	±2	±1	±1	±5	±3	±2	±1	±6	±4	±1	±1
	3000	±4	±2	±1	±1	±6	±3	±2	±1	±9	±5	±3	±1
	5000	±6	±2	±1	±1	±17	±6	±2	±1	±24	±8	±4	±1
	6000	±7	±3	±1	±1	±21	±7	±3	±1	±31	±10	±4	±2

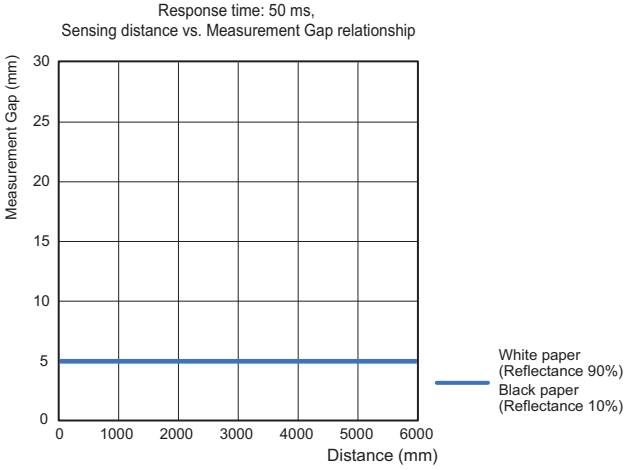
Minimum Measurement Gap vs. Distance

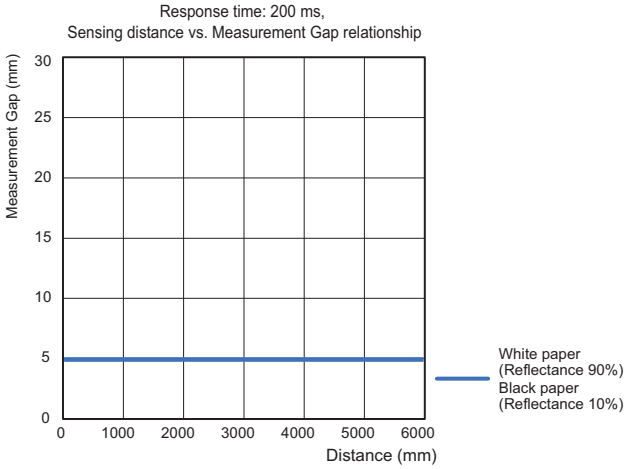
Hysteresis: Auto setting (10 mm)





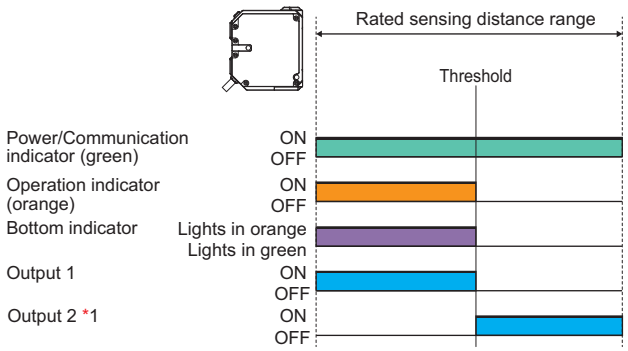
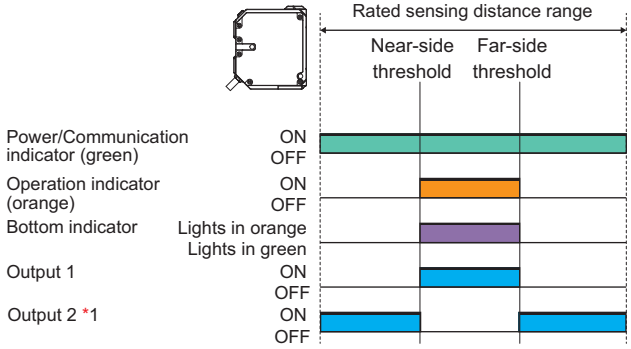
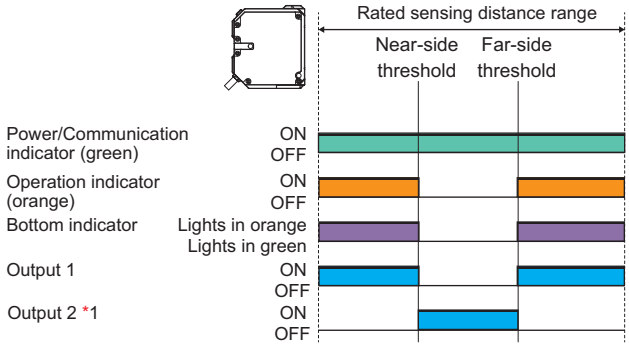
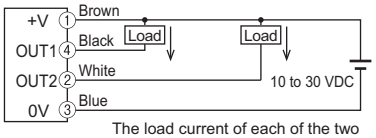
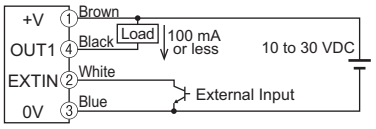
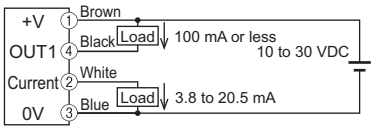
Hysteresis: Manual setting (3 mm)





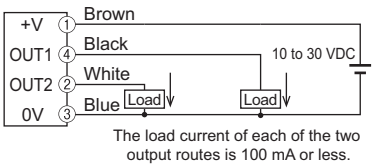
I/O Circuit Diagrams/ Timing Charts

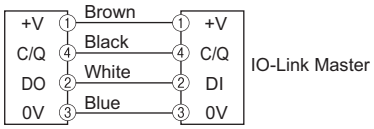
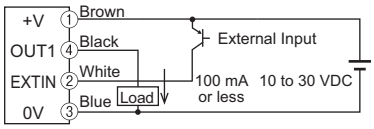
NPN Output

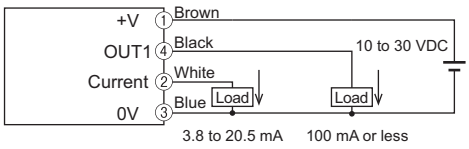
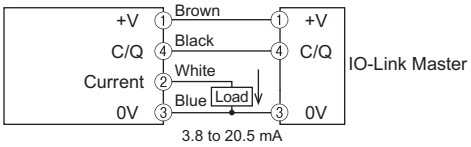
Model	Timing chart	Output circuit
E3AS-HF6000DMN□ E3AS-HF6000SMN□	**Single Point Mode [Single]**  **Window BGS mode [Window BGS]**  **Window FGS mode [Window FGS]** 	**Using Pin2 (white wire) as output**  The load current of each of the two output routes is 100 mA or less. **Using Pin2 (white wire) as external input**  **External Input** / **NPN** **ON time**: 0 V short-circuit or 1.5 V or less (Outflow current: 1 mA or less) **OFF time**: Power supply voltage short-circuit or open **Using Pin2 (white wire) as current**  Connector Pin Arrangement M12 Pre-wired Smartclick Connector M12 Connector 

∗1. The initial value of output 2 is reverse of output 1.

PNP Output

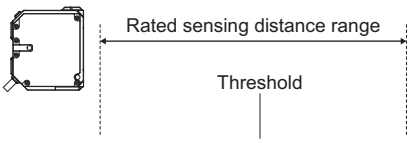
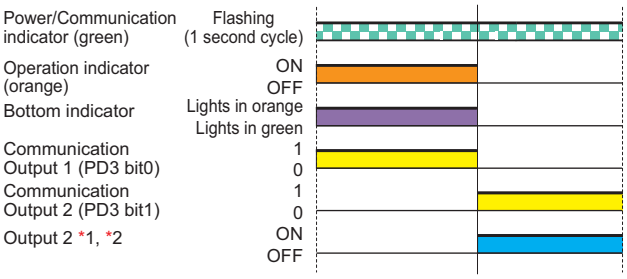
<table>
<tr><th rowspan="2">Model</th><th colspan="2">Output circuit</th></tr>
<tr><th>Standard I/O mode (SIO mode) *1</th><th>IO-Link Communication mode (COM mode) *2</th></tr>
<tr><td rowspan="3">E3AS-HF6000DMT□
E3AS-HF6000SMT□</td><td>Using Pin2 (white wire) as output
 

The load current of each of the two output routes is 100 mA or less.</td><td>Using Pin2 (white wire) as output
 
</td></tr>
<tr><td>Using Pin2 (white wire) as external input
 

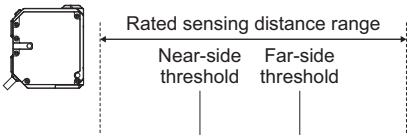
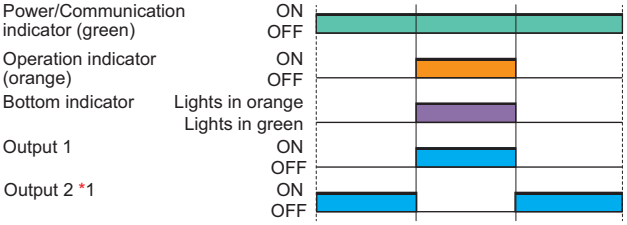
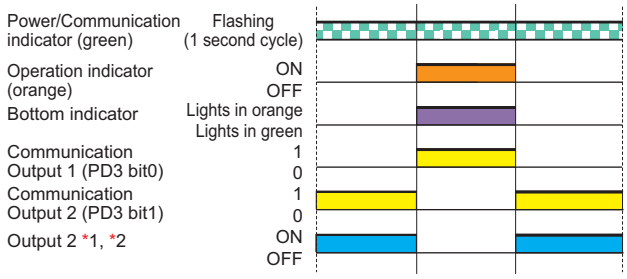
<table>
<tr><th>External Input</th><th>PNP</th></tr>
<tr><td>ON time</td><td>Power supply voltage short-circuit or within power supply voltage - 1.5 V (Sink current: 1 mA or less)</td></tr>
<tr><td>OFF time</td><td>0 V short-circuit or open</td></tr>
</table></td><td>---</td></tr>
<tr><td>Using Pin2 (white wire) as current *3
 
</td><td>Using Pin2 (white wire) as current *3
 
</td></tr>
<tr><td colspan="2">Connector Pin Arrangement
M12 Pre-wired Smartclick Connector
M12 Connector
 
</td></tr>
</table>

***1.** Standard I/O mode is used as PNP ON/OFF output.
***2.** IO-Link Communication mode is used for communications with the IO-Link Master. C/Q performs IO-Link communications. Sensor output DO performs ON/OFF output.
***3.** Switch Pin2 setting to "Current" before wiring. There is a risk of a load short-circuit error.

Single Point Mode [Single]

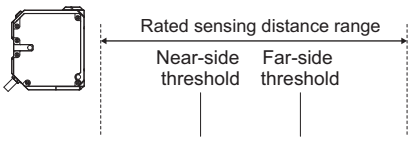
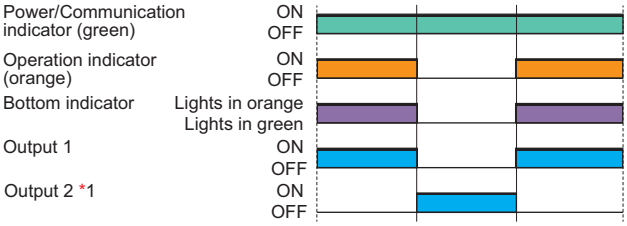
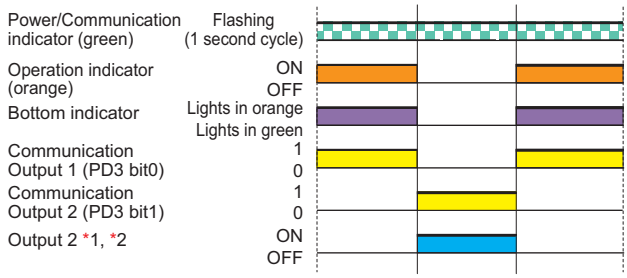
	Timing charts
Output mode	
Standard I/O mode (SIO mode)	
IO-Link Communication mode (COM mode)	

Window BGS mode [Window BGS]

	Timing charts
Output mode	
Standard I/O mode (SIO mode)	
IO-Link Communication mode (COM mode)	

✻1. The initial value of output 2 is reverse of output 1.
✻2. In IO-Link mode, output 2 can also be used in addition to communication output.

Window FGS mode [Window FGS]

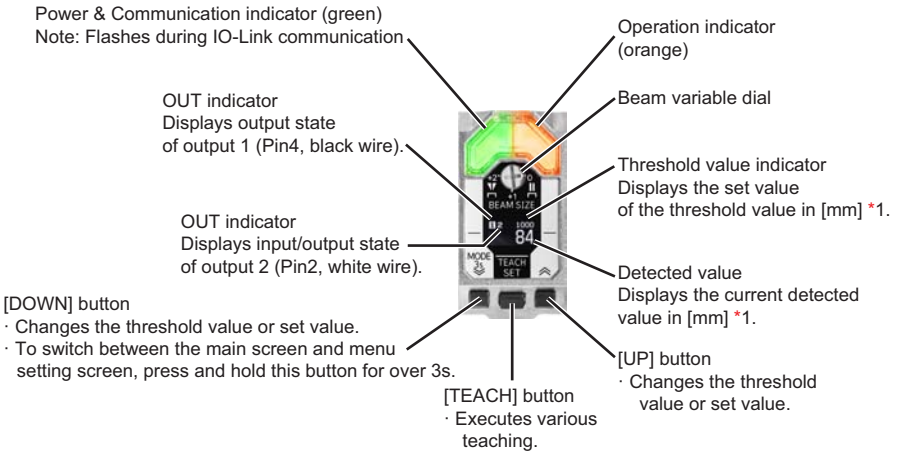
	Timing charts
Output mode	
Standard I/O mode (SIO mode)	
IO-Link Communication mode (COM mode)	

✻1. The initial value of output 2 is reverse of output 1.
✻2. In IO-Link mode, output 2 can also be used in addition to communication output.

Refer to the index list for the default settings at time of shipment from factory.
Please contact your OMRON sales representative regarding the IO-Link setup file (IODD file).

Note: Shown above are the factory settings.

Nomenclature



✻1. Reference value

Safety Precautions

Be sure to read the precautions for all models in the website at: http://www.ia.omron.com/.

Warning Indications

⚠ WARNING	**Warning level** Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
⚠ CAUTION	**Caution level** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
Precautions for Safe Use	Supplementary comments on what to do or avoid doing, to use the product safely.
Precautions for Correct Use	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

Meaning of Product Safety Symbols

	**General prohibition** Indicates the instructions of unspecified prohibited action
	**Caution, explosion** Indicates the possibility of explosion under specific conditions
	**General caution** Indicates unspecified general alert.
	**Laser Caution** Indicates information related to laser safety
	**Disassembly prohibited** Prohibit the disassembly of a device because of the possibility of injuries due to electric shock.

⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly.
Do not use it for such purposes.

Never use this product with AC power supply.
Also, do not use the product with voltage in excess of the rated voltage.
These may result in burst or fire.

⚠ CAUTION

Its component may be damaged and/or peeled off.
Also, its protection may be degraded.
Please do not apply high pressure water intensively at one place during cleaning.

When the sensor is connected to a device, changing the output by configuring the sensor settings may cause the device to malfunction. Stop the device during sensor setup.

Do not use the product in a location where the light receiving surface will be exposed to direct sunlight or strong ambient light.

To safely use laser products

⚠ WARNING

Do not expose your eyes to the laser beam either directly or indirectly (i.e., after reflection from a mirror or shiny surface). The laser beam has a high power density and exposure may result in loss of sight.

Do not disassemble this product. Doing so may cause exposure to the built-in light source which can damage eyes and skin. Never disassemble it.

Laser safety measures for laser equipment are stipulated by the country of use. Follow the instructions described below categorized in four cases.

1. Usage in Japan
The JIS C6802:2018 standard stipulates the safety precautions that users must take according to the class of the laser product. This product is classified into CLASS 1 LASER PRODUCT defined by this standard.

2. Usage in U.S.
This product is subjected to the U.S. FDA (Food and Drug Administration) laser regulations. This product is classified into CLASS 1 LASER PRODUCT by the IEC 60825-1:2014 standard according to the regulations of Laser Notice No.56 of the FDA standard. This product is already reported to CDRH (Center for Devices and Radiological Health).
Accession Number: 2420801-000
When using a device equipped with the product in the U.S., attach an FDA certification label near the sensor mounted on customer equipment.

FDA certification label

3. Usage in China
This product is classified into CLASS 1 LASER PRODUCT by the GB/T7247.1-2024 (IEC60825-1:2014) standard.

4. Usage in countries other than U.S. and China
This product is classified into CLASS 1 LASER PRODUCT by the IEC60825-1:2014/EN60825-1:2014+A11:2021 standard.

Precautions for Safe Use

The following precautions must be observed to ensure safe operation.

1. Do not reverse connection of DC power supply polarity.
2. Do not short the load.
3. Insulate unused input/output wires individually.
4. Use in an explosion-proof area is not possible. Do not use the product in environments where flammable or explosive gases are present.
5. Do not dismantle, modify, or repair the product.
6. Do not touch the metal surface with your bare hands when the temperature is low. Touching the surface may result in a cold burn.
7. Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.
8. To prevent an accident due to the product falling, wear appropriate protective gear when performing installation work in a high location.
9. Do not use the product while the case is damaged.
10. Do not use the product while the cord is pinched.
11. In the event that you notice an abnormality, immediately stop use, turn off the power, and contact your Omron representative.
12. There is a risk of damage to the current input device or burnout of the load resistor. When using Pin2 (white wire) as current output, switch the Pin2 setting to "Current" in advance and then connect the current input device or load resistor.

Precautions for Correct Use

1. Do not hit the product using a hammer for installation.
2. The product must be installed with the specified torque or less. For the M12 connector, the proper tightening torque is from 0.39 to 0.49 N·m.
   In the case of the Pre-wired M12 Smartclick Connector, firmly tighten the connector to the mating complete mark position by hand.
3. The base of the connector does not rotate. Do not try to forcibly turn it.
4. Do not use the product in any atmosphere or environment that exceeds the ratings.
5. Output pulses may occur when the power supply is turned OFF. We recommend that you turn OFF the power supply to the load or load line first.
6. The extension of the cord under the standard I/O mode should be 50 m or less with a conductor of 0.3mm^2 or more. Voltage drop may occur due to cord extension, use of a 24 V power supply is recommended.
   The extension of the cord under the IO-Link Communication mode should be 20 m or less.
7. Do not use the product in a location with an intense electric field or ferromagnetic field.
8. Do not pull on the cable with excessive strength.
9. Do not press the button with excessive force.
10. Be sure to turn off the power supply when connecting or disconnecting the cable.
11. Wait for at least 1.5 s after turning on the product's power.
12. When the product is used at an ambient temperature of -10°C or less, a warm-up time of 10 minutes maximum is required. The output remains OFF and does not change during warming up.
13. The product is rated as IP67 but please avoid using the product underwater, under rain, and outdoors.
14. If the Sensor wiring is placed in the same conduits or ducts as high-voltage or high-power lines, inductive noise may cause malfunction or damage. Wire the cables separately or use a shielded cable.
15. Do not use the product in locations subject to direct sunlight.
16. Please assess the safety beforehand when using the product in chemicals and/or oil environments.
17. Do not use the product where humidity is high and dew condensation may occur.
18. Do not use the product where corrosive gases may exist.
19. If high-pressure washing water and so on hits the button, it might lead to malfunctioning. So, consider use of the key lock function.
20. Do not apply high-pressure washing water directly to the sensor's light emitting / receiving surface from a short distance. As the antifouling feature may be impaired, keep a sufficient distance from the light emitting / receiving surface.
21. Do not use the product at a location subject to shock or vibration.
22. To use a commercially available switching regulator, FG (frame ground) must be grounded.
23. Do not use organic solvents (e.g. paint thinner and alcohol) for cleaning. Otherwise optical properties and protective structure may deteriorate.
24. Be sure to check the influence caused by surrounding environments such as background objects and LED lighting before using the product.
25. Do not exceed 100,000 writing operations of the EEPROM (non-volatile memory). Setting information is written to the EEPROM when a threshold value change, teaching, or zero reset is executed.
26.  Please dispose in accordance with applicable regulations.
27. Perform the beam size adjustment operation by using a screwdriver of the appropriate size to rotate the screw with a force of 0.06 N·m or less. Do not use the product at other than a selectable position.
28. When installing the product, install it so that the laser beam of another sensor does not directly enter the light receiving lens. This product is equipped with a mutual interference prevention function for up to 4 sensors, but a malfunction may occur if intense light is received.
29. For an object with a mirror or glossy surface, tilt the sensor so that specular reflection light from the object does not directly enter the receiver.

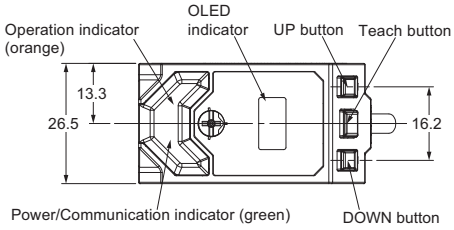
Dimensions

(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

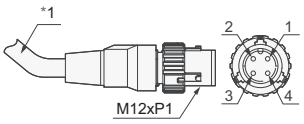
Sensors

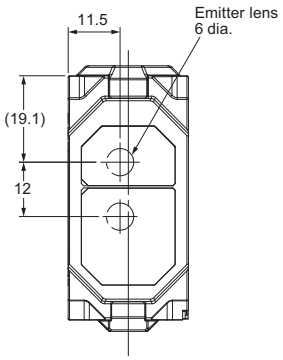
Pre-wired Models/Pre-wired Connector Models

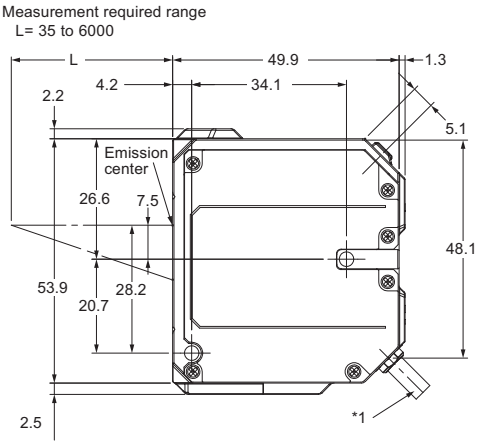
E3AS-HF6000□ (-M1TJ)

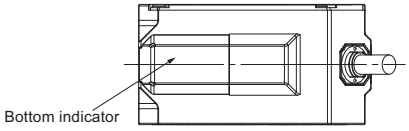


M12 Pre-wired Smartclick Connector Models E3AS-HF6000□-M1TJ

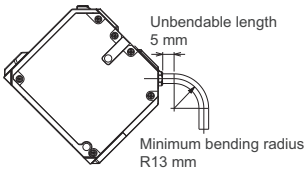








Minimum bending radius/unbendable length of cord

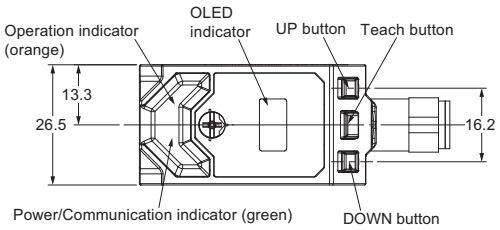


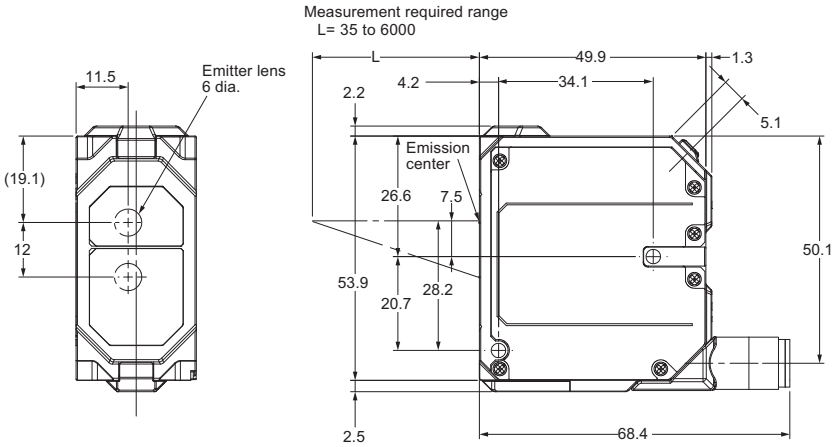
✻1. Specification of the cable

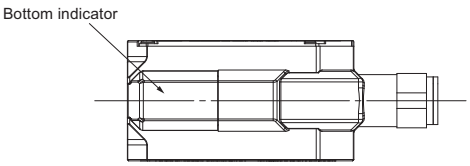
Model	Specification	Number of cores	Length
E3AS-HF6000□ 2M	PVC Cable: 4.25 dia. Conductor cross section: 0.3 mm^2 Insulator diameter: 1.05 mm	1. Brown: +V 2. White: Output 2 3. Blue: 0V 4. Black: Output 1	2 M
E3AS-HF6000□ 5M			5 M
E3AS-HF6000□-M1TJ 0.3M		PIN No.1: +V PIN No.2: Output 2 PIN No.3: 0V PIN No.4: Output 1	0.3 M

M12 Connector (horizontal)

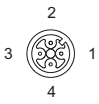
E3AS-HF6000□ M1H





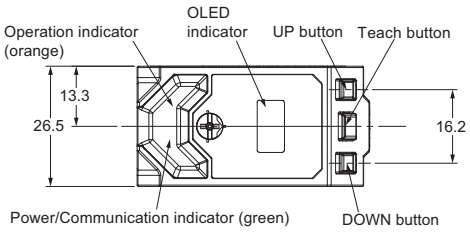


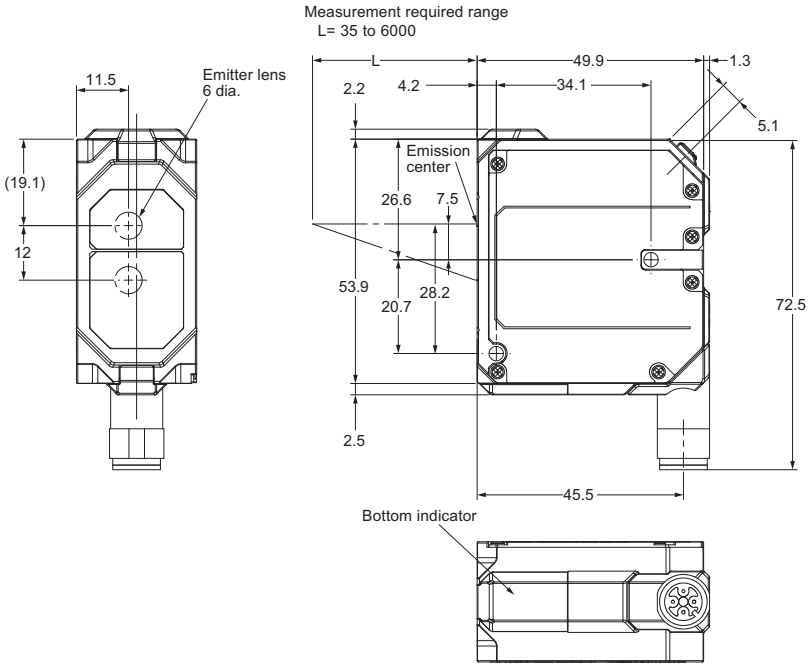
PIN No.	Connection
1	+V
2	OUTPUT 2
3	0V
4	OUTPUT 1



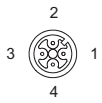
M12 Connector (vertical)

E3AS-HF6000□ M1V





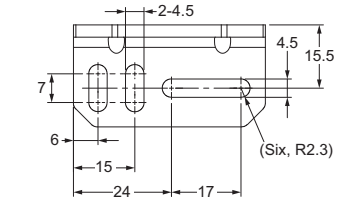
PIN No.	Connection
1	+V
2	OUTPUT 2
3	0V
4	OUTPUT 1

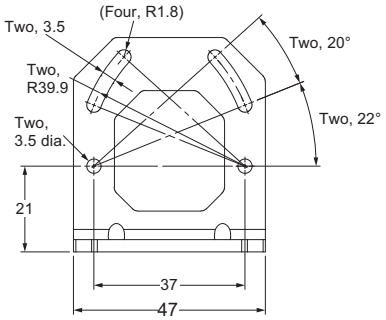


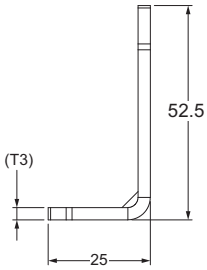
Accessories (Sold Separately)

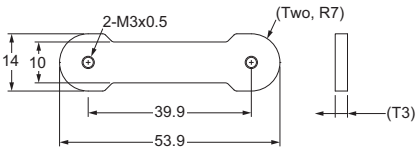
Mounting Brackets

E39-L245

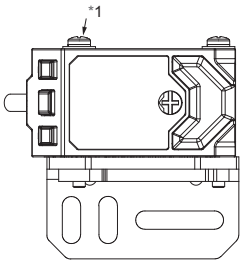


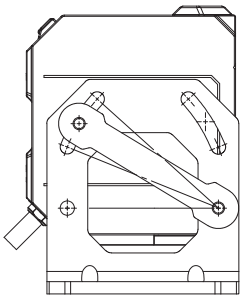


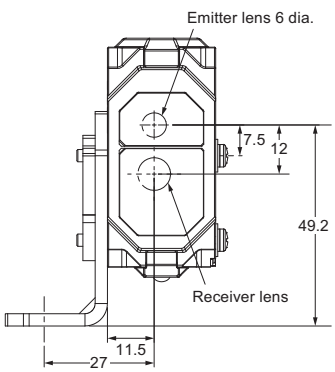


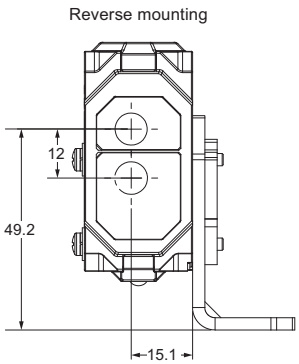


Photoelectric Sensor Accessory are installed
(Example of E3AS-HF)





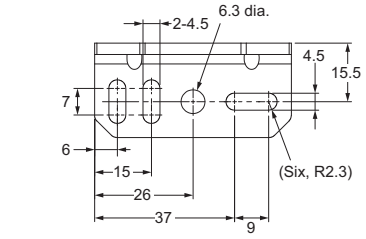


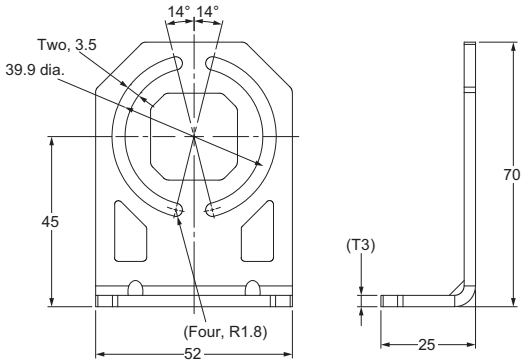


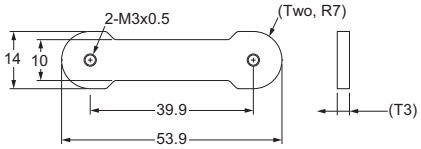
Material: Stainless steel (SUS304)

***1.** Accessories
2-M3-L35 Cross Recessed Pan Head Screws (Attached to SW+JIS W)
Material: Stainless steel (SUSXM7)

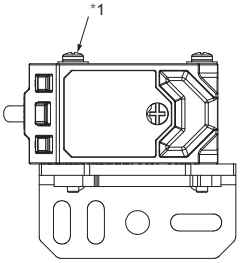
E39-L255

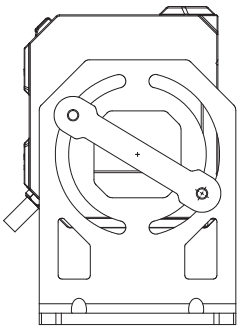


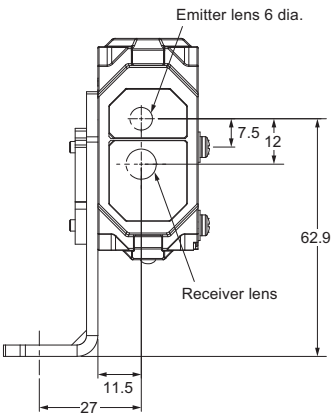


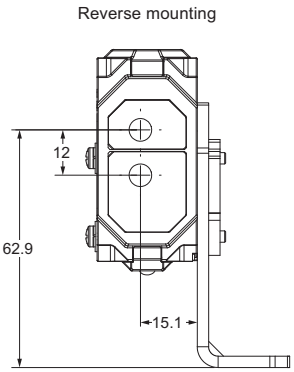


Photoelectric Sensor Accessory are installed
(Example of E3AS-HF)







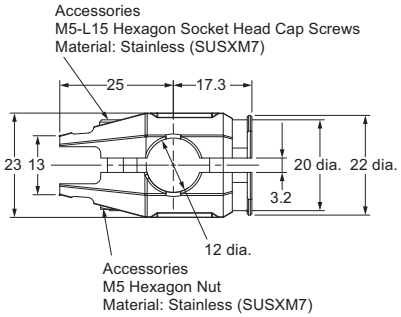


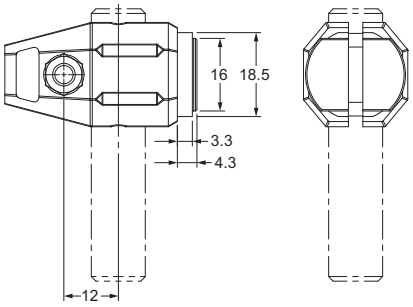
Material: Stainless steel (SUS304)

***1.** Accessories
2-M3-L35 Cross Recessed Pan Head Screws (Attached to SW+JIS W)
Material: Stainless steel (SUSXM7)

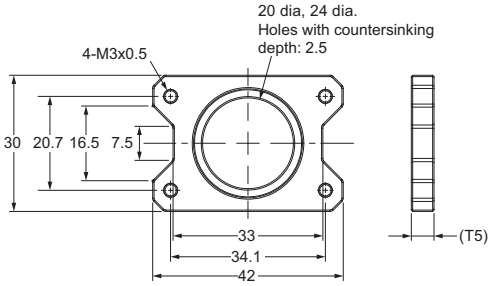
Flexible Mounting Bracket

E39-L264



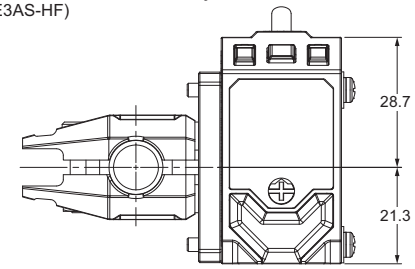


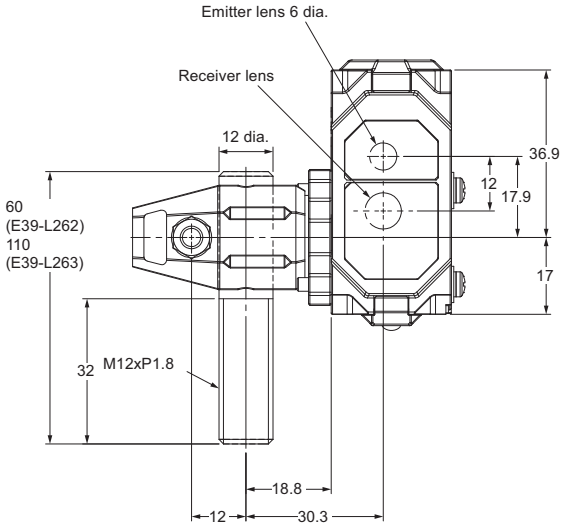
Material: ZDC2
Finished: NI Plaiting

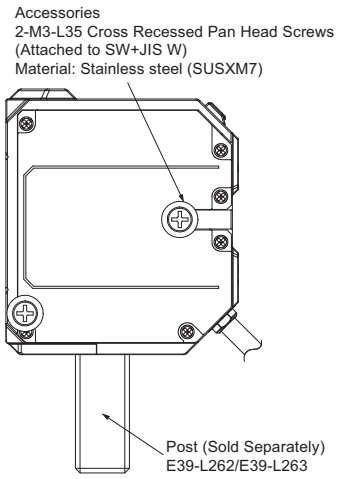


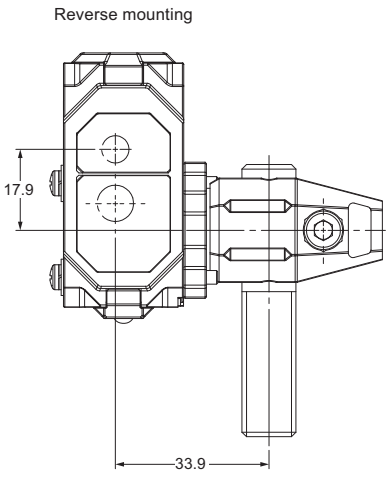
Material: Stainless steel (SUS304)

Photoelectric Sensor Accessory are installed
(Example of E3AS-HF)



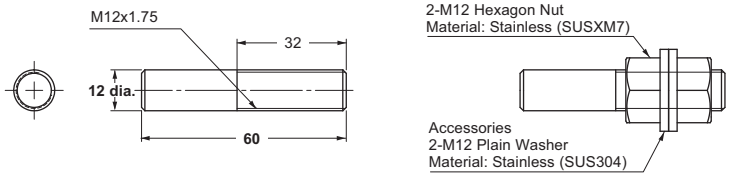






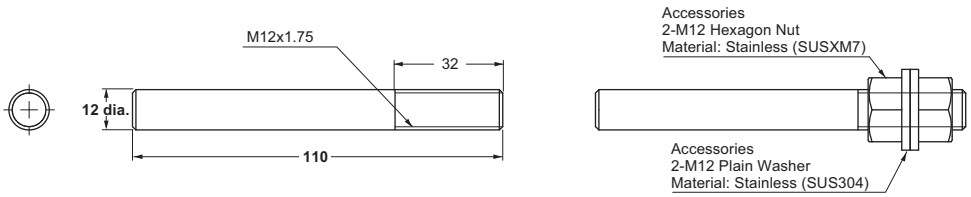
Post

50 mm
E39-L262



Material: Stainless steel (SUS304)

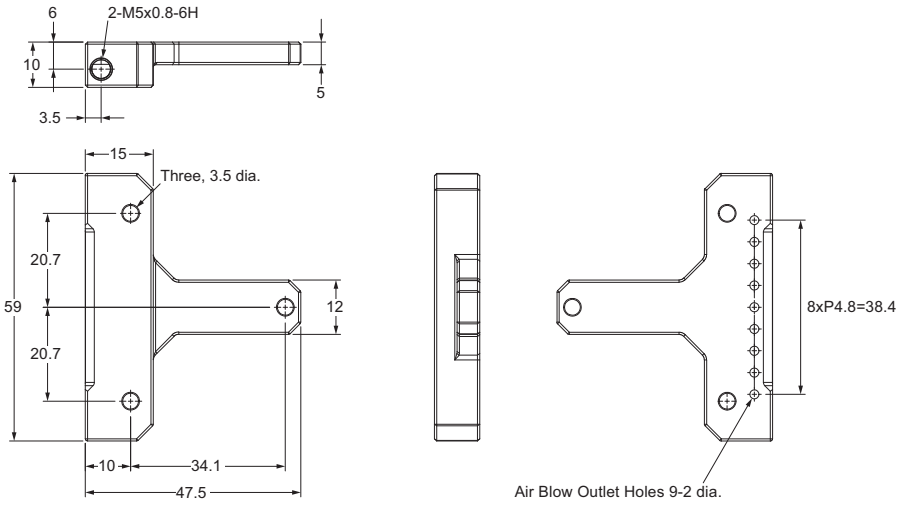
100 mm
E39-L263



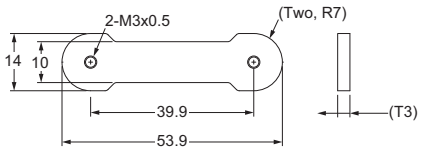
Material: Stainless steel (SUS304)

Air Blow Unit

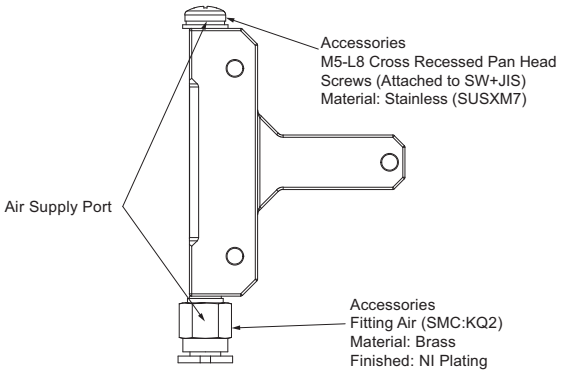
E39-E17



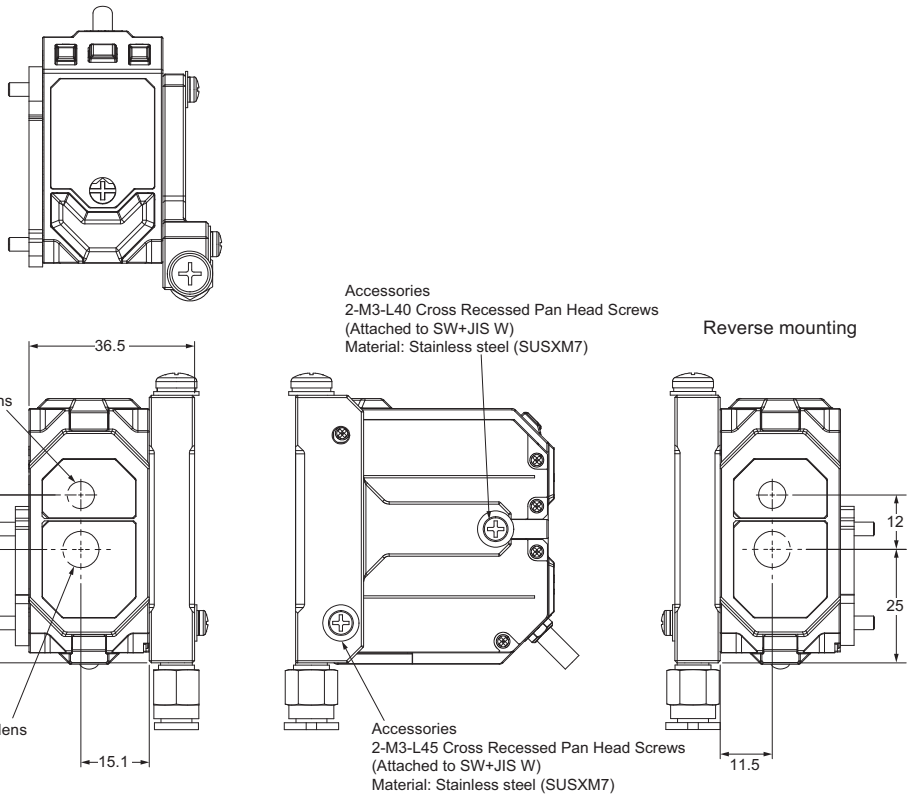
Material: ZDC2
Finished: NI Plaiting



Material: Stainless steel (SUS304)

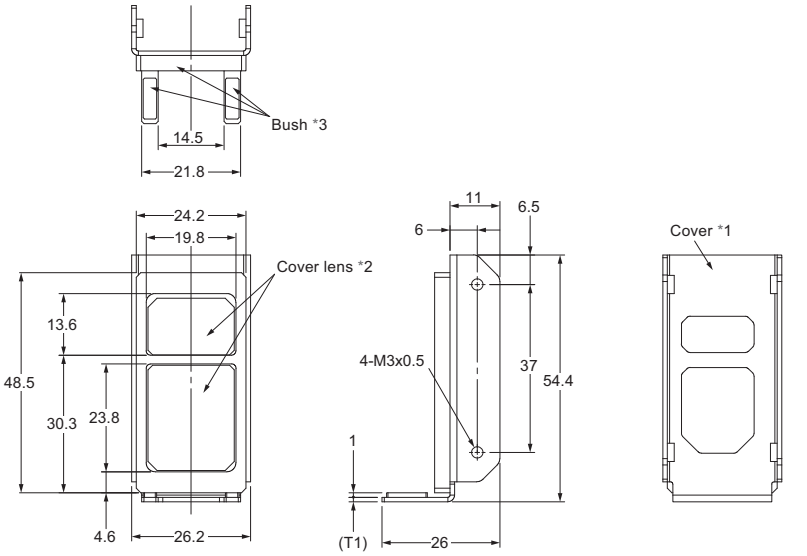


Photoelectric Sensor Accessory are installed
(Example of E3AS-HF)

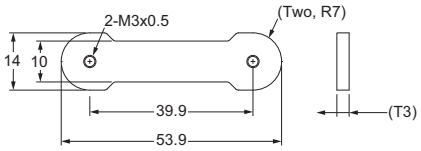


Front Protection Cover

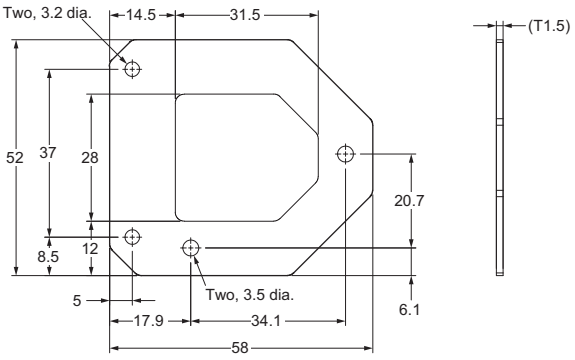
E39-E20



*1. Material: Stainless steel (SUS304)
*2. Material: PC
*3. Material: NBR

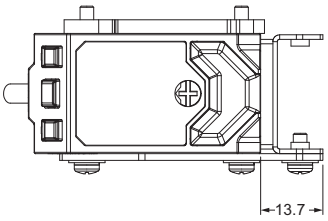


Material: Stainless steel (SUS304)



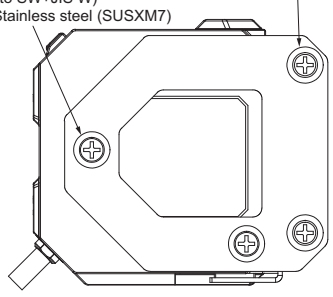
Material: Stainless steel (SUS304)

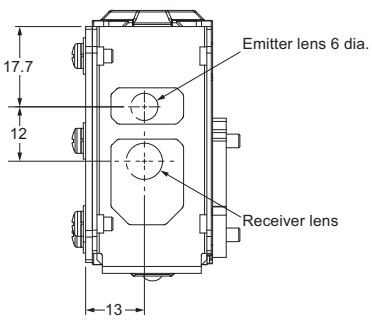
Photoelectric Sensor Accessory are installed
(Example of E3AS-HF)



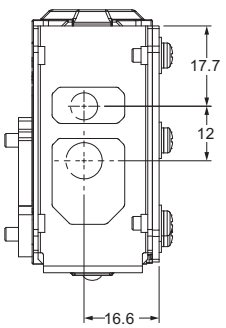
Accessories
2-M3-L7 Cross Recessed Pan Head Screws
(Attached to SW+JIS W)
Material: Stainless steel (SUSXM7)

Accessories
2-M3-L35 Cross Recessed Pan Head Screws
(Attached to SW+JIS W)
Material: Stainless steel (SUSXM7)





Reverse mounting



Terms and Conditions Agreement

Read and understand this catalog.

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranties.

(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

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Model lineup

Specifications	E3AS-HF6000SM		E3AS-HF6000DM	
Type	Spot beam type		Diffused beam type	
Appearance	 Pre-wired	 M12 Pre-wired Smartclick Connector	 Connector (horizontal)	 Connector (vertical)
Materials	Case: Aluminum die-cast (Chrome plating), Cover: SUS304			
Sensing distance	50 to 6,000 mm			
Laser class	Class 1 laser product			
Display	OLED			
Response time	2 ms / 10 ms / 50 ms / 200 ms (selectable)			
Output	NPN, PNP, output current 4 to 20 mA			
IO-Link specification	Ver.1.1			
Mutual Interference Prevention function	Auto setting (manual setting is also available; 4 units max.)			
Operating temperature range	-30 to 55°C			
Degree of protection	IP67/IP69K/IP67G/ECOLAB			

Note: For details on ratings and specifications, refer to the Ratings and Specifications in this catalog.

Introduction to Teaching methods

Object teaching

When short distance detection including the workpiece with a single button press.

Window object teaching

When detect a workpiece that falls in the range between two thresholds.

Background reference teaching

When detect a workpiece (a mirror surface, irregular surface, or low reflectivity) that cannot be stably detected by other teaching.

Note: Do not use this document to operate the Unit.

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