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

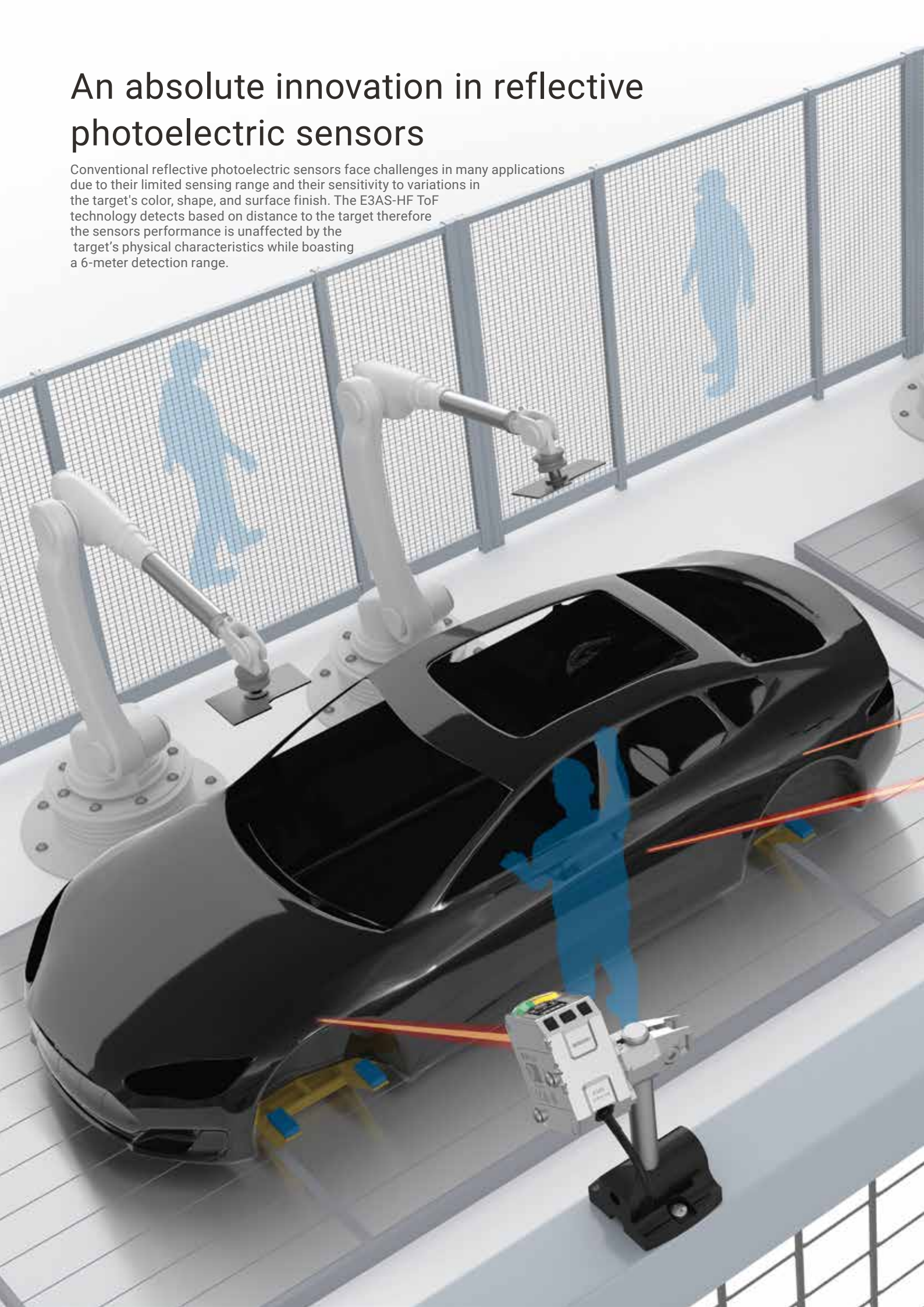
OMRON

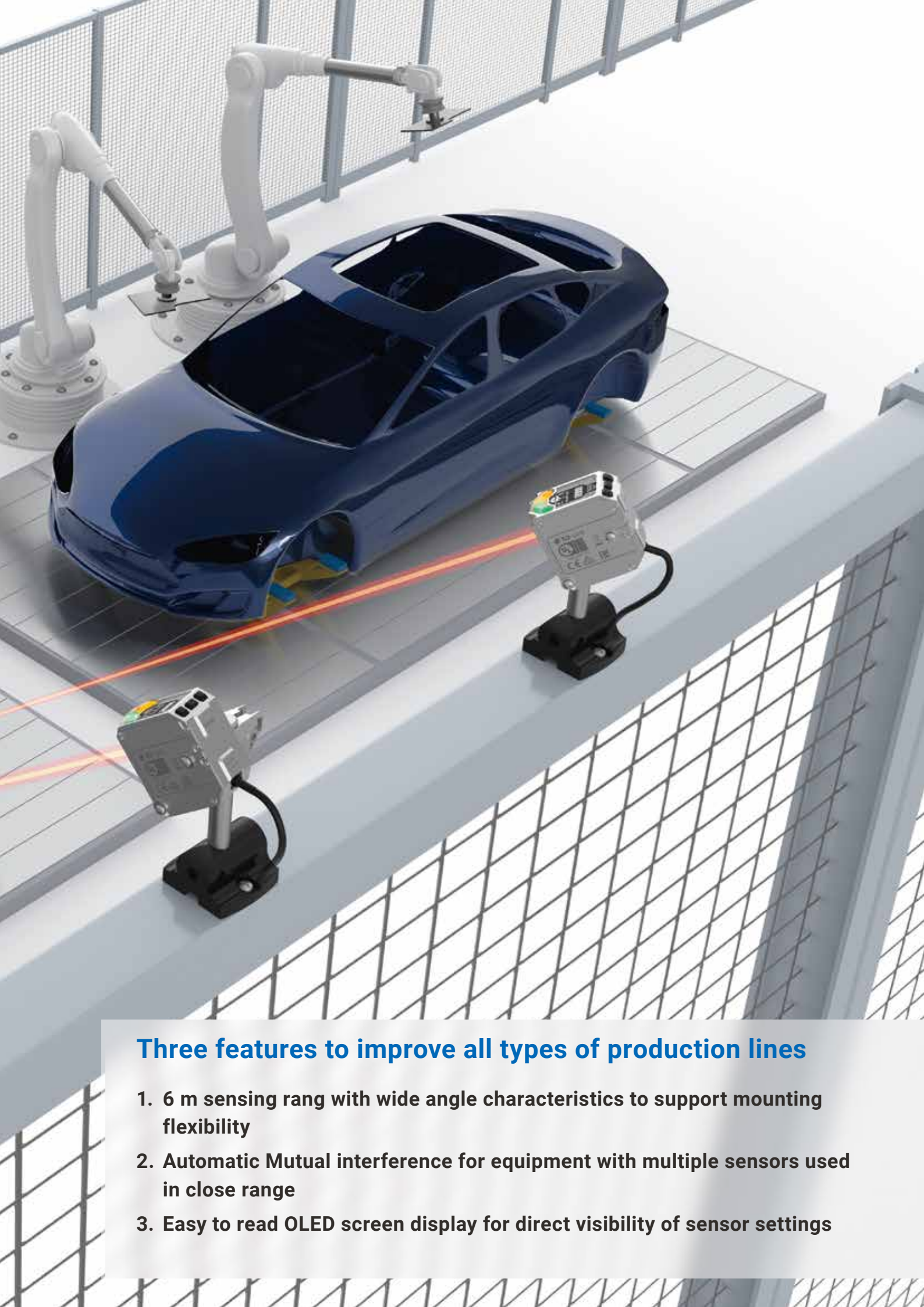
High-sensitivity TOF Laser Sensor to increase equipment design flexibility

IO-Link ECOLAB UL CERTIFIED CE

An absolute innovation in reflective photoelectric sensors

Conventional reflective photoelectric sensors face challenges in many applications due to their limited sensing range and their sensitivity to variations in the target's color, shape, and surface finish. The E3AS-HF ToF technology detects based on distance to the target therefore the sensors performance is unaffected by the target's physical characteristics while boasting a 6-meter detection range.





Three features to improve all types of production lines

1. 6 m sensing rang with wide angle characteristics to support mounting flexibility
2. Automatic Mutual interference for equipment with multiple sensors used in close range
3. Easy to read OLED screen display for direct visibility of sensor settings

1. Long sensing range and wide angle characteristics to support mounting flexibility

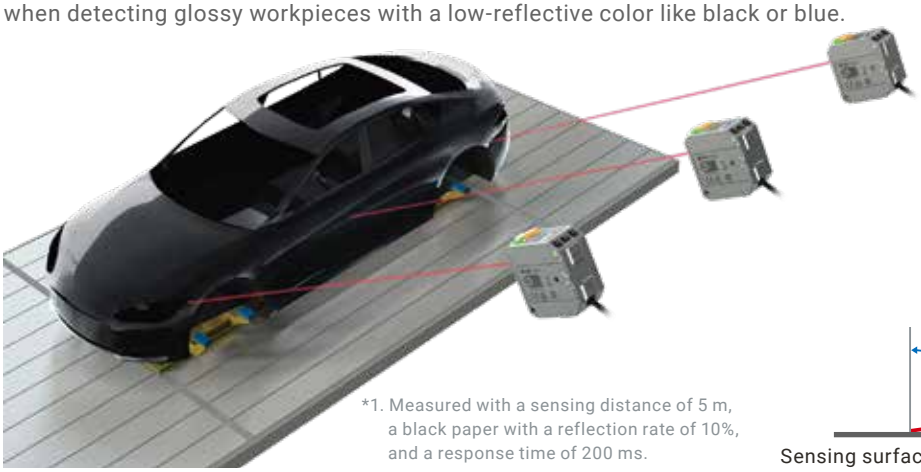
Performance of conventional reflective photoelectric sensors are not stable in every application since their detection abilities vary based on the target's color, shape, angle, and surface finish. The E3AS-HF's unique sensing algorithm overcomes these issues, eliminating the headache associated with picking out and setting 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

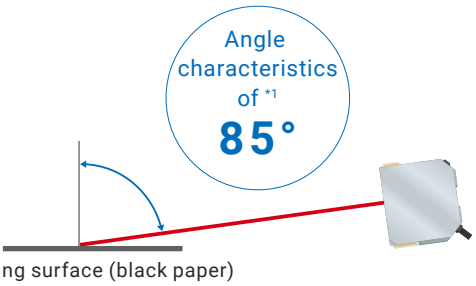
The sensors perform reliable detection even when installed at an angle in a far place or when detecting glossy workpieces with a low-reflective color like black or blue.

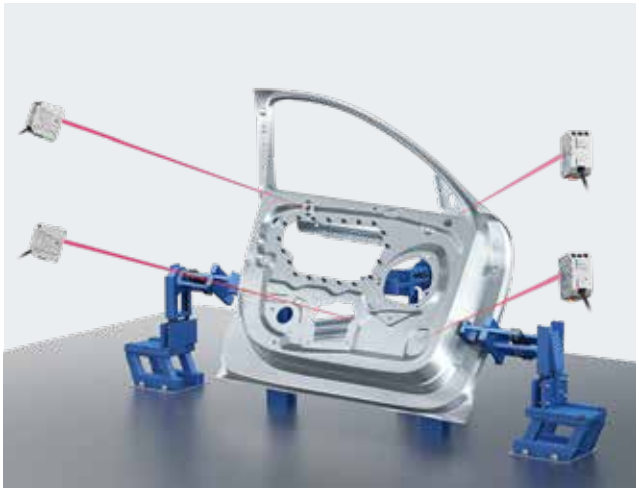


*1. Measured with a sensing distance of 5 m, a black paper with a reflection rate of 10%, and a response time of 200 ms.

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 height of 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.

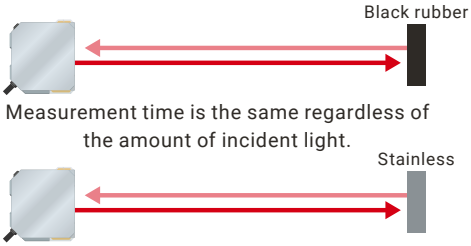
Detecting multi-color, low-reflective workpieces

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

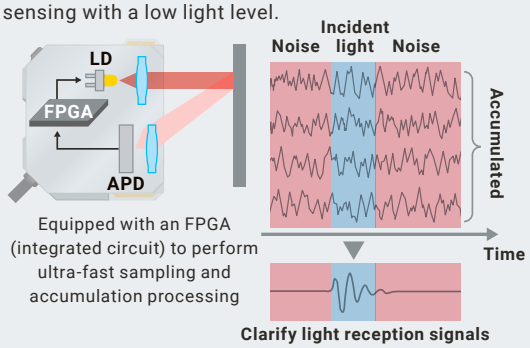
Combining as strong an emission as possible within the class 1 limit with the advanced device and high-frequency circuit design technology, the sensor can perform laser control within an extremely narrow pulse width.
This reduces the need for operator safety measures and equipment protection measures,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

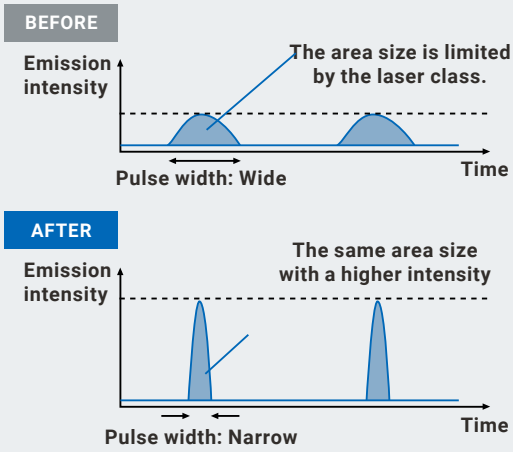
Ultra-fast sampling and unique accumulation processing PATENTED [*2]

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.

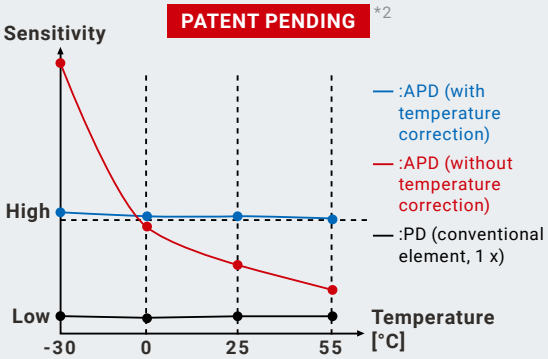


Equipped with an FPGA (integrated circuit) to perform ultra-fast sampling and accumulation processing

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. Automatically Prevent Mutual Interference on equipment with multiple sensors used in close range

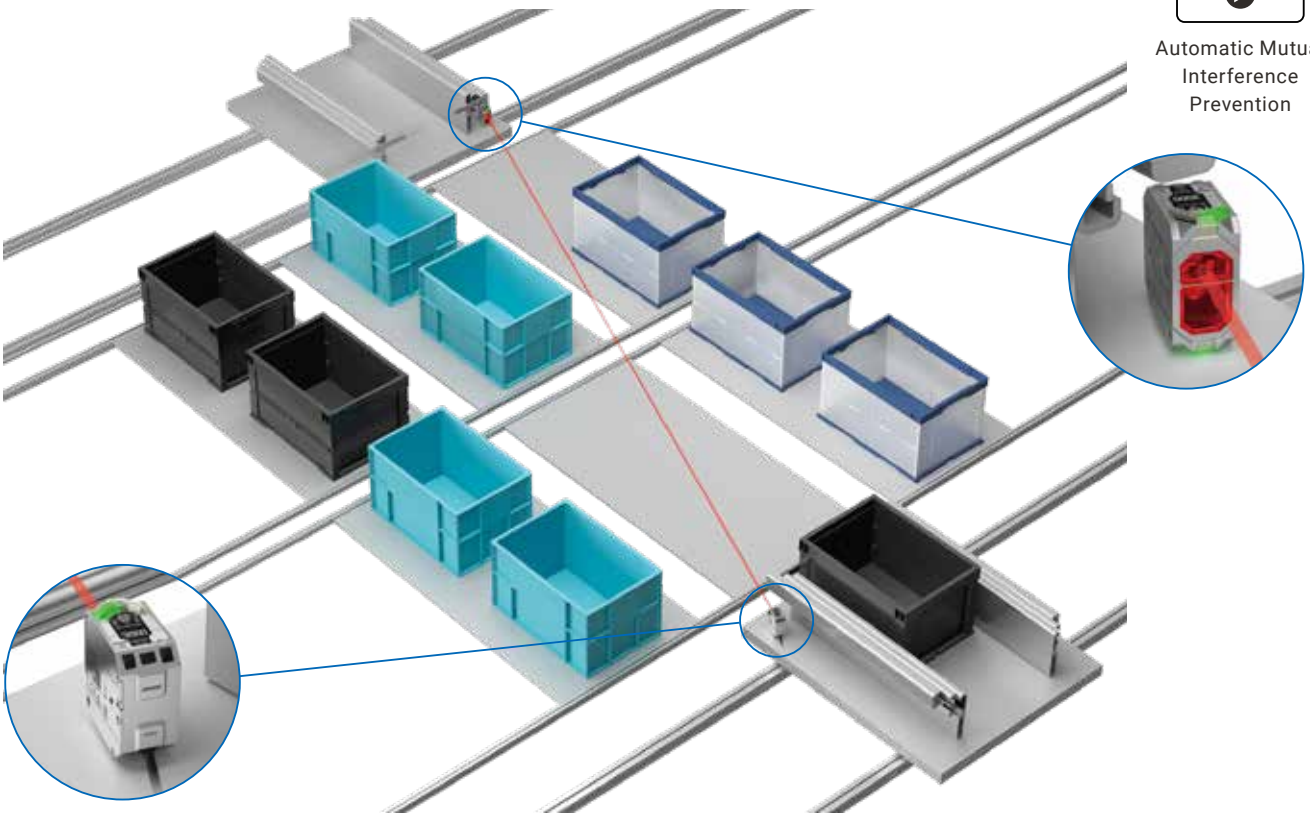
Automatic Mutual Interference Prevention

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.

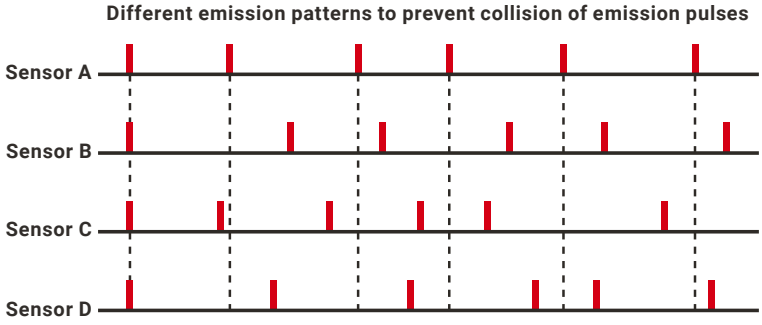
Automatic Mutual Interference Prevention



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



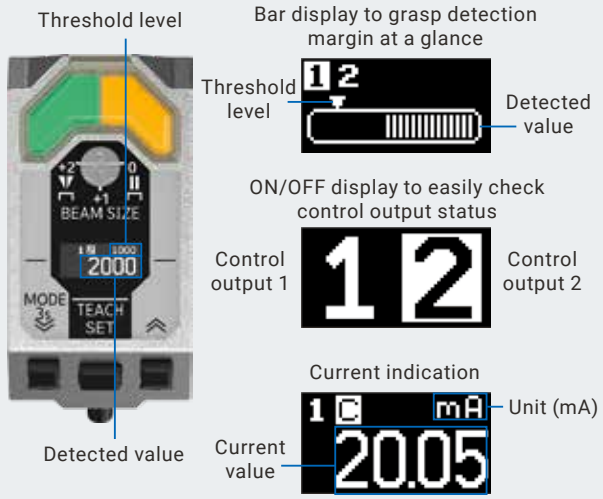
3. Easy to read OLED screen display for direct visibility of sensor settings

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.

Detection display switching based on purpose



Language setting

English Japanese Spanish Italian German

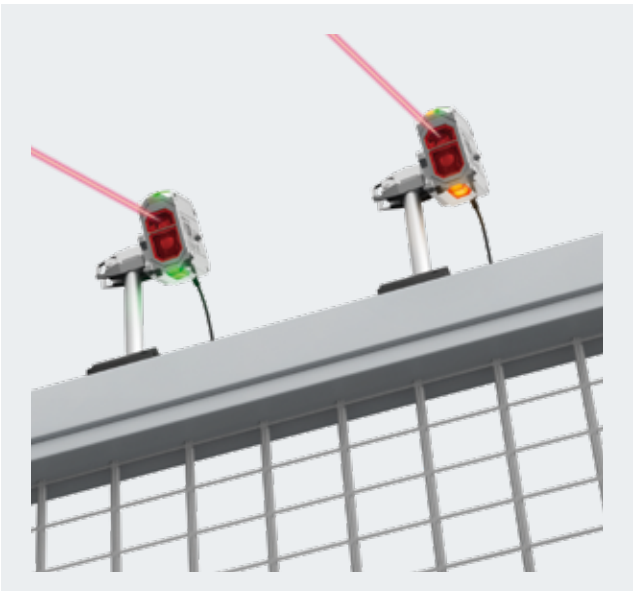
Response time

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

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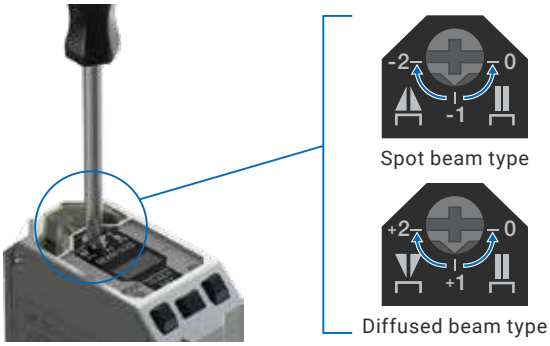
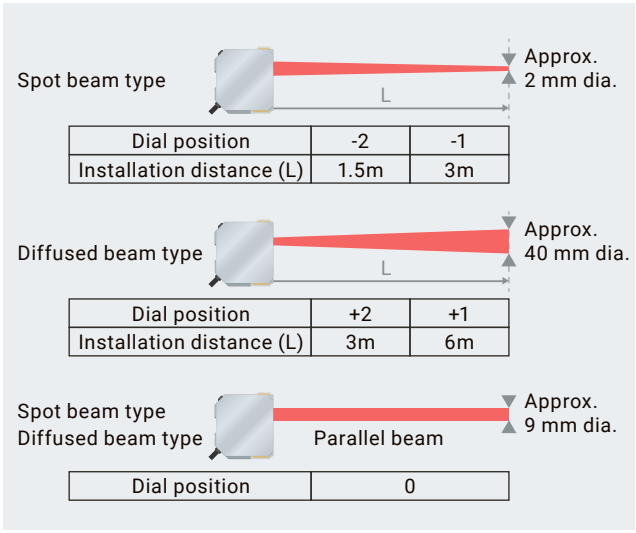
Various functions for easy use

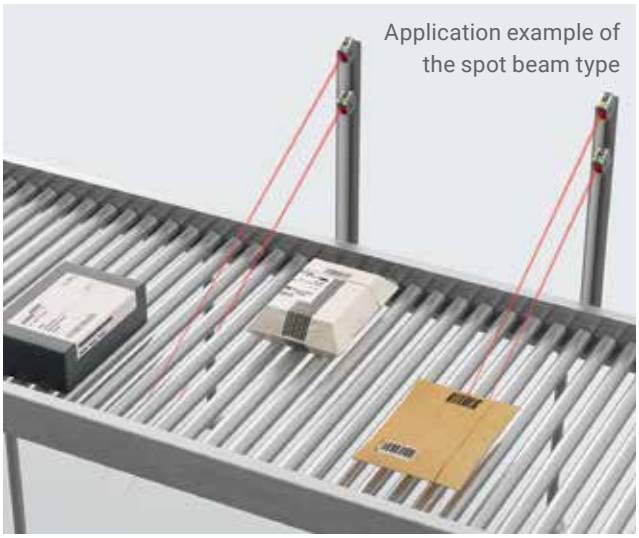
Adjustable spot diameter

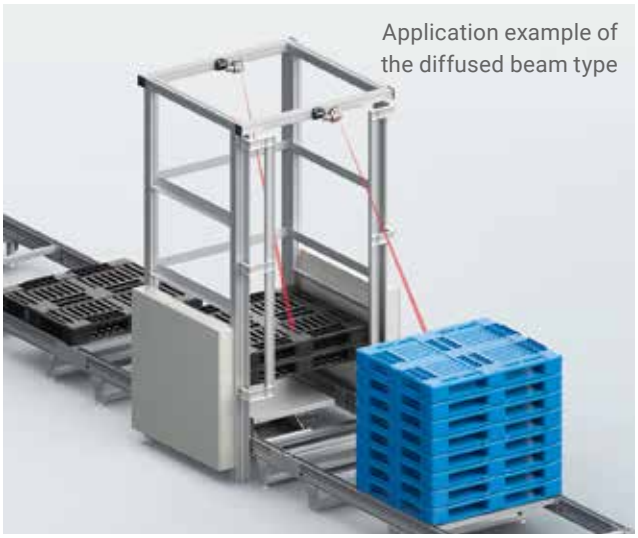
PATENT PENDING *1

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

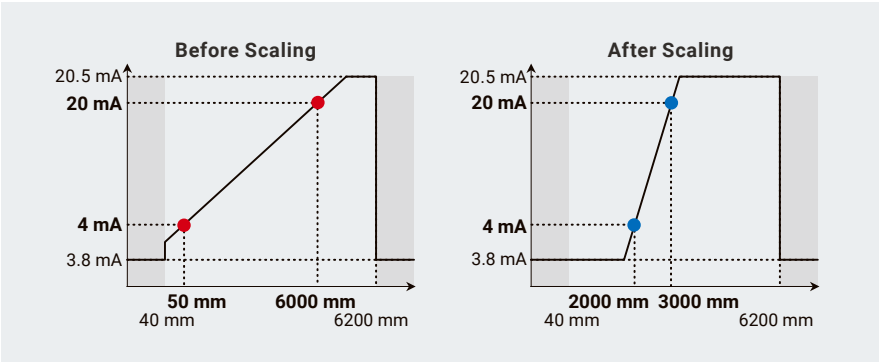
Detecting how many pallets are remaining

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

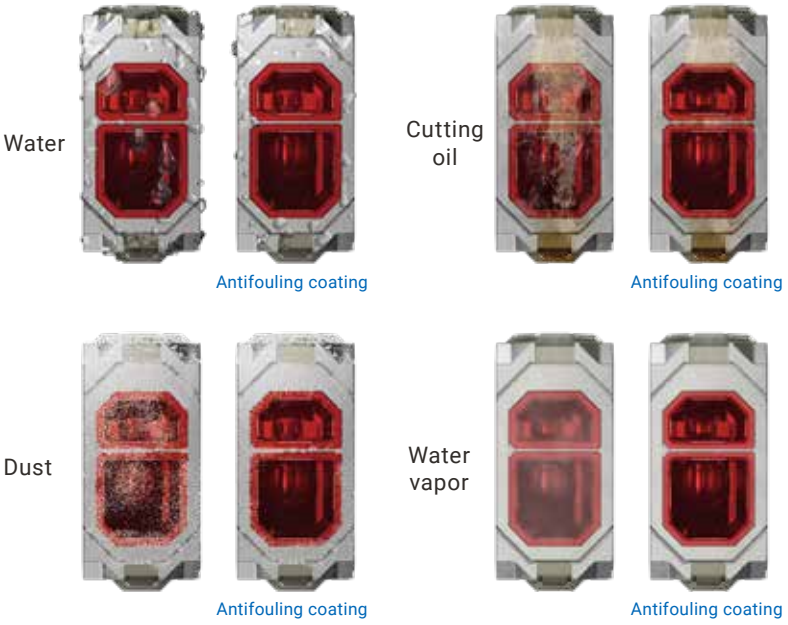
Scaling function

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

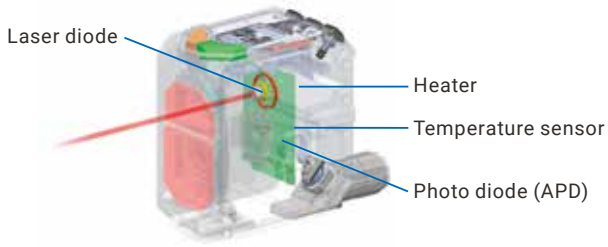
IP69K
High temperatures/ high water pressure

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.

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IO-Link supported as standard to visualize a manufacturing environment

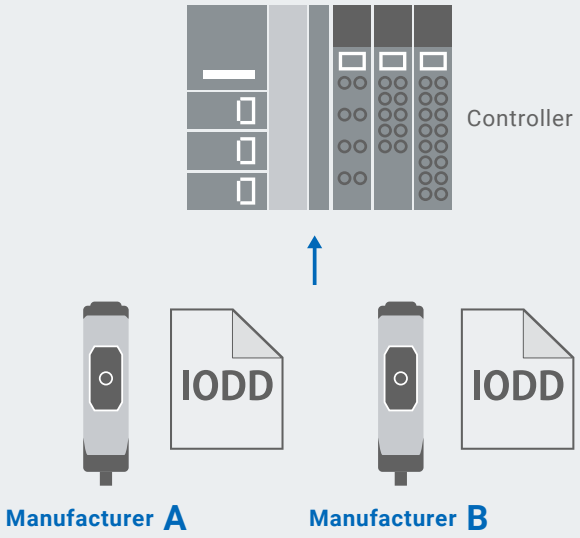
In addition to ON/OFF signals, IO-Link can send and receive the sensor information to and from an upper-level controller. This allows real-time status monitoring of the sensors, reduction of the configuration hours during setup and replacement, and reduction of unexpected equipment disruptions due to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

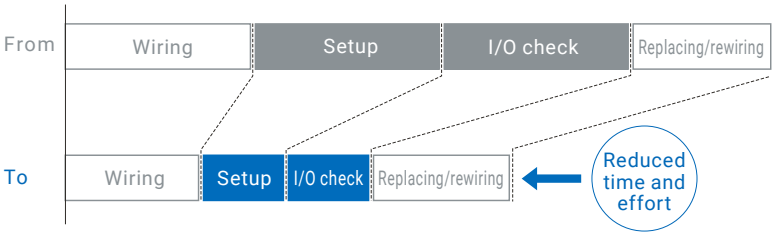
Globally deployable

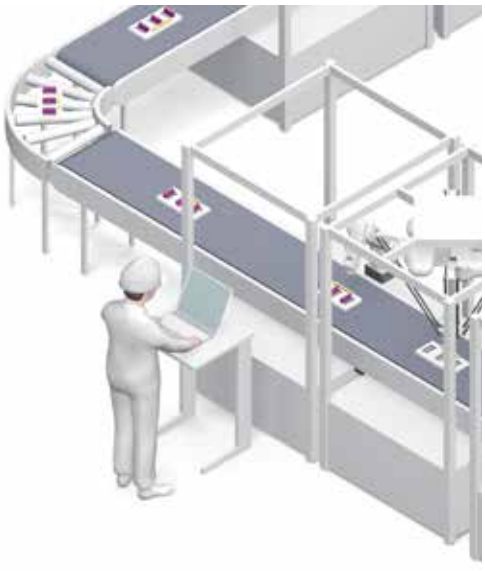
Every IO-Link sensor has an IODD (IO Data Description) file containing information about what kind of equipment it is and what parameter settings it needs. The specification of IODD file is globally common and shareable by all IO-Link sensors regardless of their manufacturers.



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.





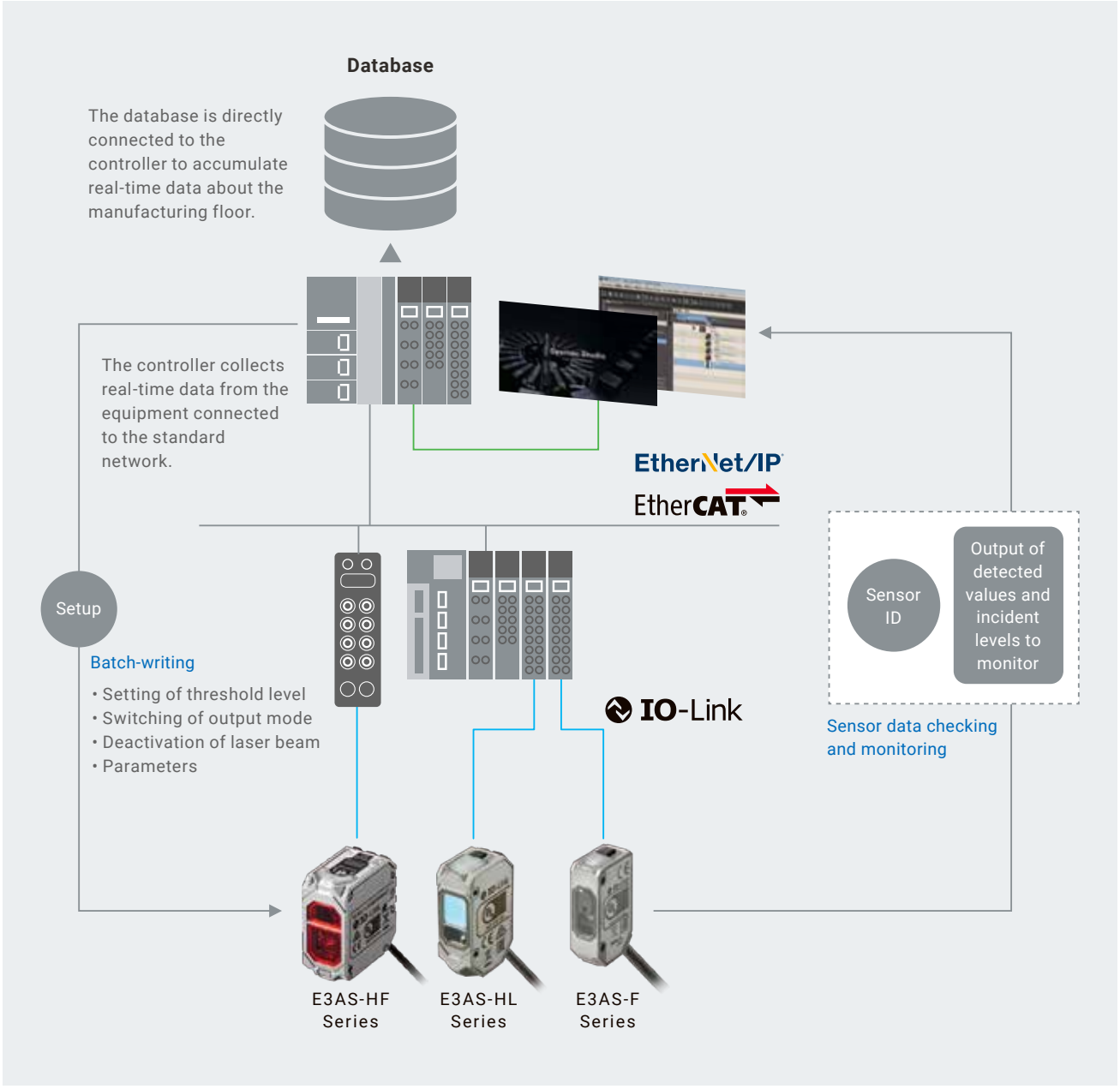
Reduce commissioning time by batch-writing settings from IO-Link device configuration tool

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

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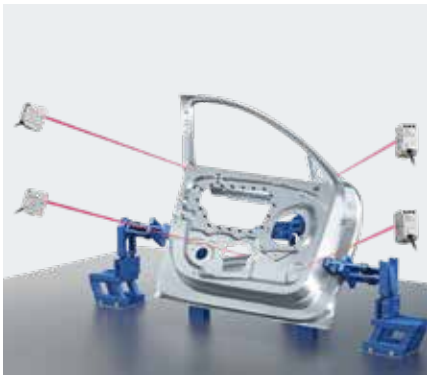
Applications and target workpieces

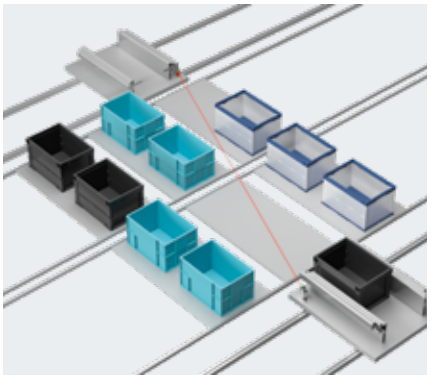
Sensing eAxle gearboxes



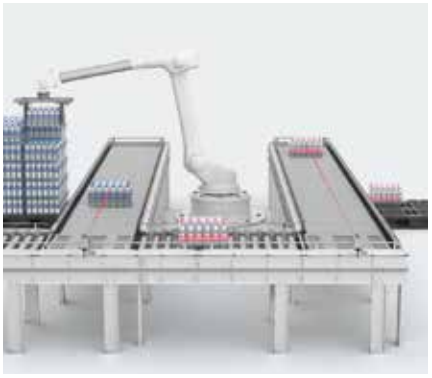
Identifying the vehicle model from the body panel

Sensing whether a black-painted body is positioned in place

Sensing an obstacle in the path of an AGV

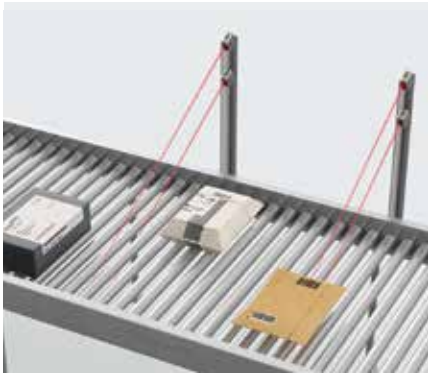


Sensing pallets in an automated warehouse



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

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.

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