Distance-settable Photoelectric Sensor with Metal Case

E3S-CL

CSM_E3S-CL_DS_E_5_2

Simply Set the Distance to Reliably Detect Workpieces of Various Colors

- Reliable detection regardless of color or material. Black/white error of only 2% max. (E3S-CL1)
- Long sensing distance of 500 mm (E3S-CL2).
- Eliminates background influence. (Differential travel of only 2% max. with E3S-CL1.)
- Metal body with IP67 protection. Oil resistance (E3S-CL2).

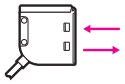
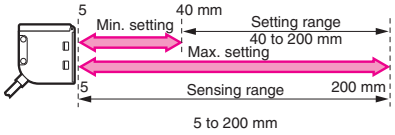
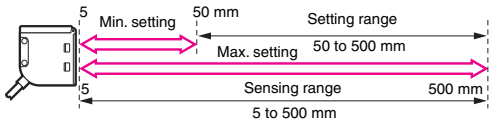
Be sure to read *Safety Precautions* on page 7.

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

Ordering Information

Sensors (Refer to *Dimensions* on page 8.)

Red light Infrared light

Appearance	Sensing/Setting range	Model
	 5 to 200 mm	**E3S-CL1 2M**
	 5 to 500 mm	**E3S-CL2 2M**

Ratings and Specifications

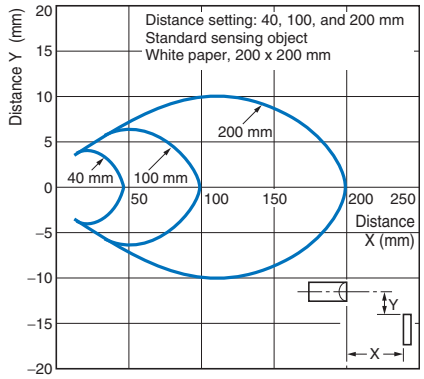
Sensing method	Distance-settable	
Item / Model	E3S-CL1	E3S-CL2
Sensing distance	5 to 200 mm (white paper: 200 x 200 mm, setting distance: 200 mm)	5 to 500 mm (white paper: 200 x 200 mm, setting distance: 500 mm)
Setting range	40 to 200 mm (white paper: 200 x 200 mm)	50 to 500 mm (white paper: 200 x 200 mm)
Differential travel	2% max. of setting distance	10% max. of setting distance
Reflectivity characteristics (black/white error) *1	2% max. of setting distance	10% max. of setting distance
Light source (wavelength)	Red LED (700 nm)	Infrared LED (860 nm)
Power supply voltage	10 to 30 VDC; ripple: 10% max.	
Current consumption	35 mA max.	50 mA max.
Control output	Load power supply voltage: 30 VDC max., Load current: 100 mA max. Residual voltage: NPN output: 1.2 V max. PNP output: 2 V max. Open collector output (NPN/PNP depending on model) Light-ON/Dark-ON selectable	
Protection circuits	Power supply reverse polarity protection, Output short-circuit protection, Mutual interference prevention	
Response time	Operate or reset: 1 ms max.	Operate or reset: 2 ms max.
Distance setting	Six-turn endless adjustor with an indicator	
Ambient illumination (Receiver side)	Incandescent lamp: illumination on optical spot: 5,000 lx max. Sunlight: illumination on optical spot: 10,000 lx max.	
Ambient temperature range	Operating: −25 to 55°C, Storage: −40 to 70°C (with no icing or condensation)	
Ambient humidity range	Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)	
Insulation resistance	20 MΩ min. at 500 VDC	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance	Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions	
Shock resistance	Destruction: 500 m/s^2 3 times each in X, Y, and Z directions	
Degree of protection	IP67 (IEC 60529), NEMA: 6P (indoors only) *2	IP67 (IEC 60529) (in-house standards: oil-resistant), NEMA: 6P (indoors only) *2
Connection method	Pre-wired (standard length: 2 m)	
Weight (packed state)	Approx. 170 g	
Materials: Case	Zinc die-cast	
Materials: Operation panel	PES (Polyether sulfone)	
Materials: Lens	Methacrylic resin	
Materials: Mounting bracket	Stainless steel (SUS304)	
Accessories	Mounting bracket, 12 M4 hexagonal bolts (with spring and flat washers), Adjustment screwdriver, and Instruction manual	

*1. Sensing distance error for standard white (90% reflective) and black (5% reflective) paper.
*2. NEMA: National Electrical Manufacturers Association

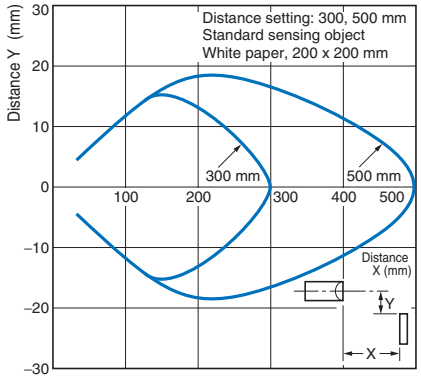
Engineering Data (Reference value)

Operating Range

E3S-CL1

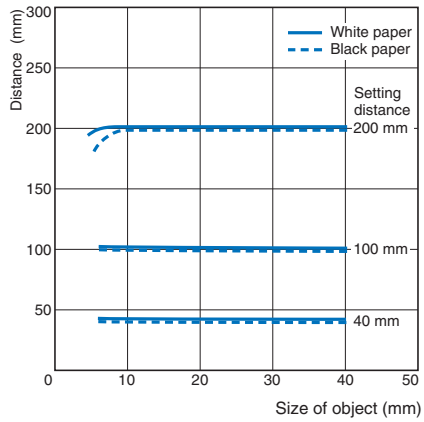


E3S-CL2

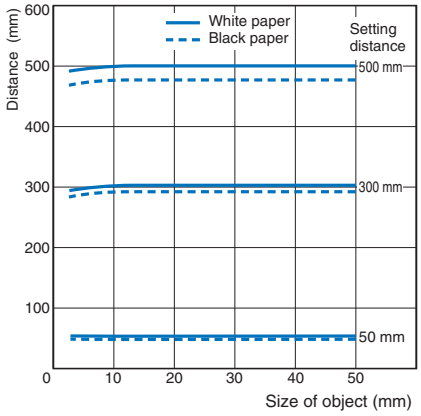


Sensing Object Size vs. Sensing Distance

E3S-CL1

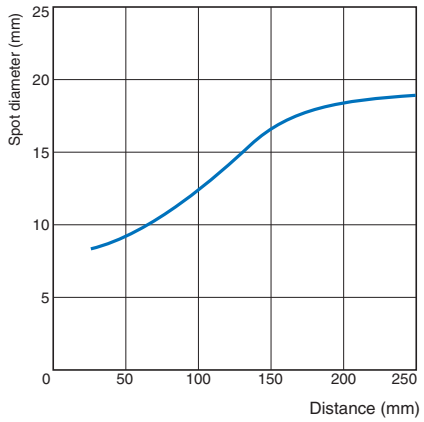


E3S-CL2

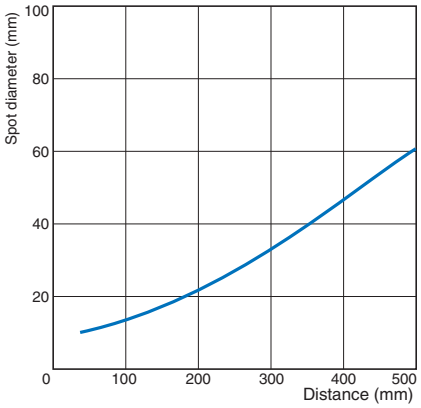


Spot Diameter vs. Sensing Distance

E3S-CL1

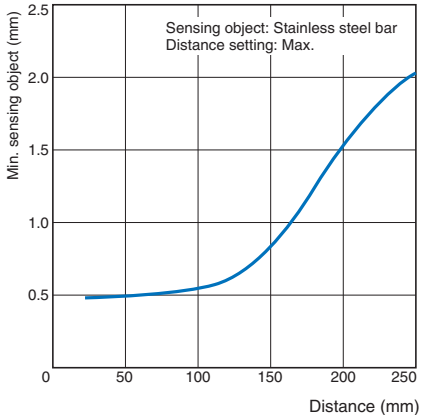


E3S-CL2

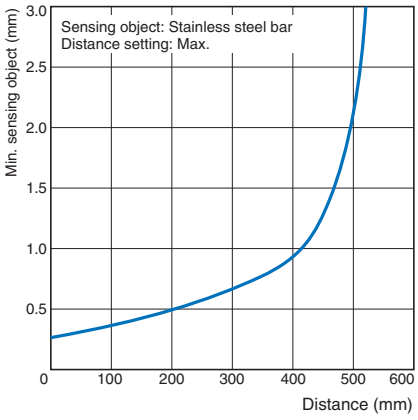


Sensing Distance vs. Minimum Detectable Object Size

E3S-CL1

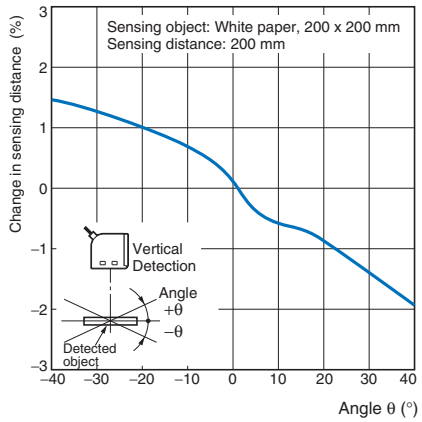


E3S-CL2

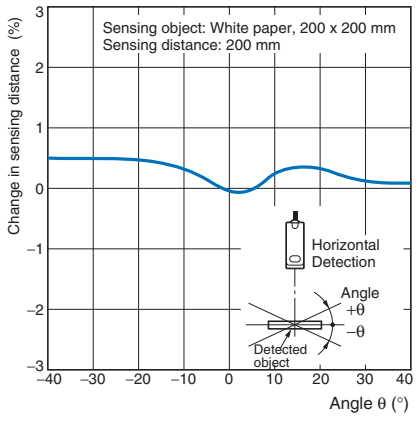


Sensing Object Angle Characteristics

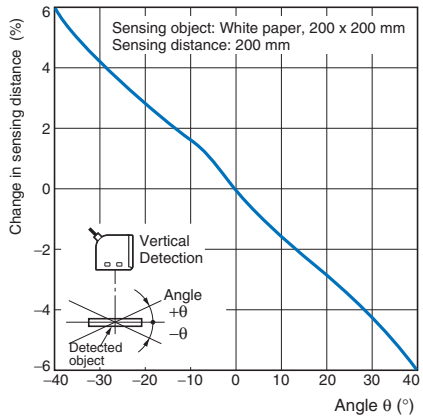
E3S-CL1 Vertical



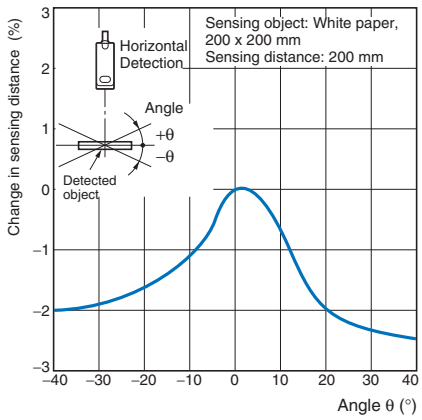
E3S-CL1 Horizontal



E3S-CL2 Vertical



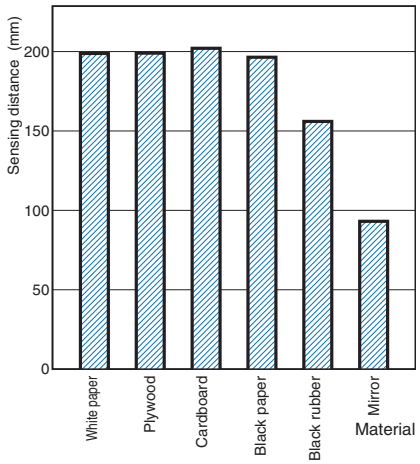
E3S-CL2 Horizontal



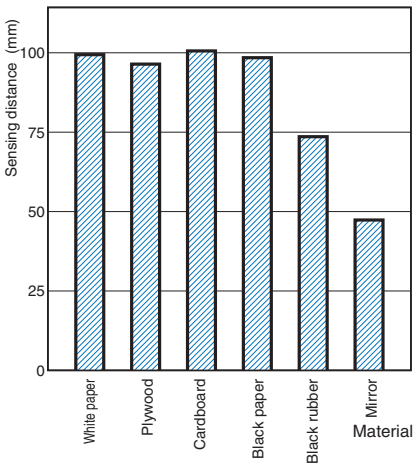
Sensing Distance vs. Sensing Object Material

E3S-CL1

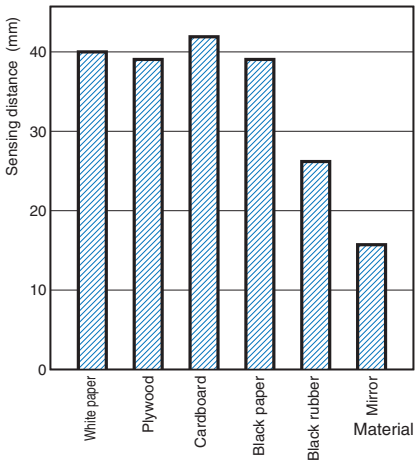
(Setting Distance of 200 mm using White Paper)



(Setting Distance of 100 mm using White Paper)

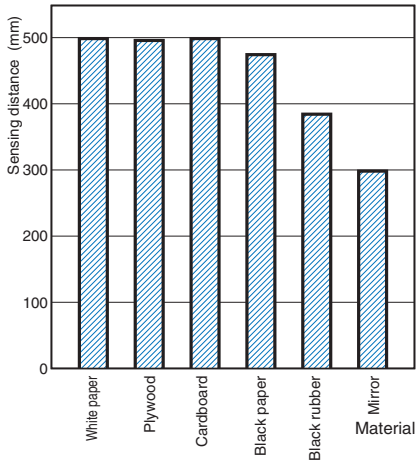


(Setting Distance of 40 mm using White Paper)

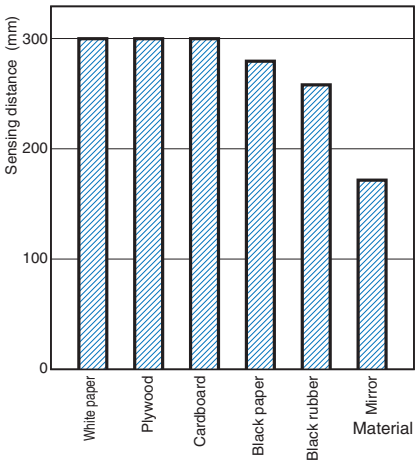


E3S-CL2

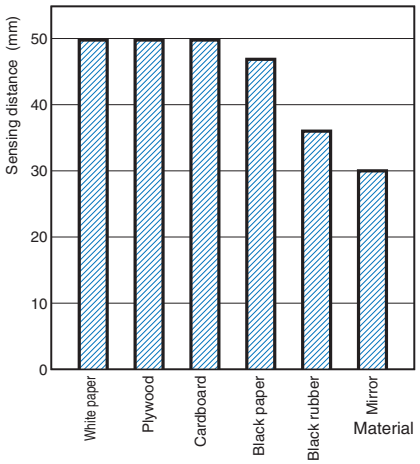
(Setting Distance of 500 mm using White Paper)



(Setting Distance of 300 mm using White Paper)

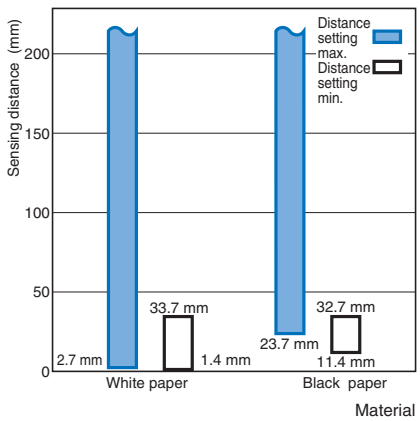


(Setting Distance of 50 mm using White Paper)

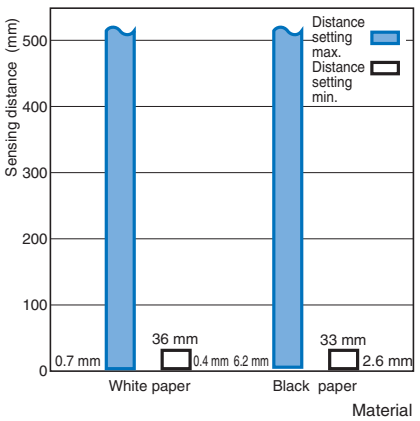


Close-range Characteristics

E3S-CL1

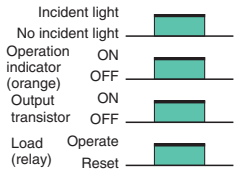
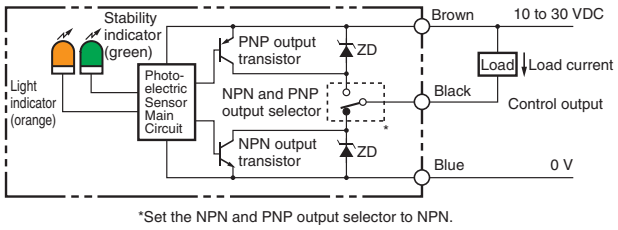
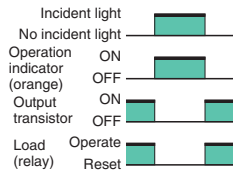


E3S-CL2

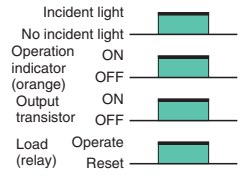
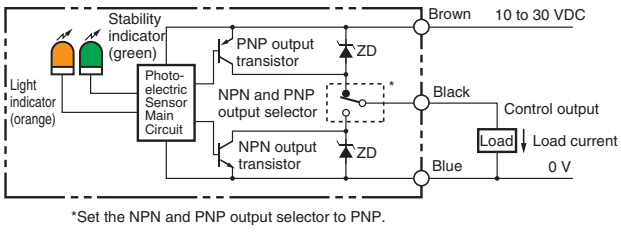
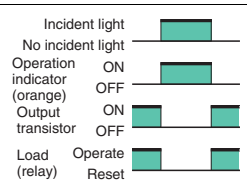


I/O Circuit Diagrams

NPN Output

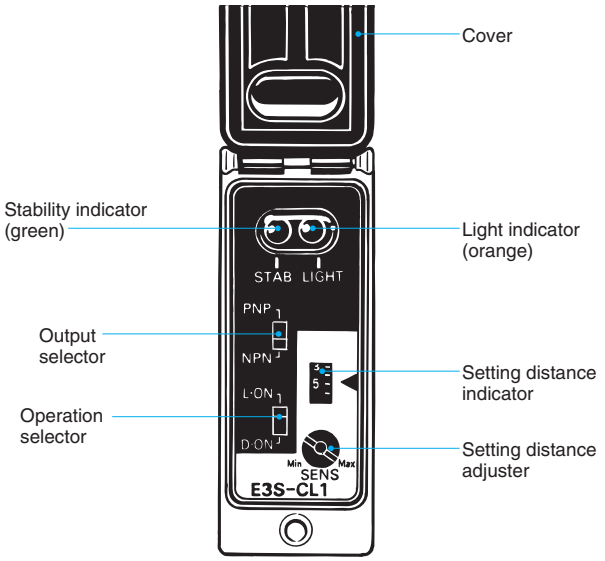
Model	Operation mode	Timing charts	Operation selector	Output circuit
E3S-CL1 E3S-CL2	Light-ON		L side (LIGHT ON)	 *Set the NPN and PNP output selector to NPN.
	Dark-ON		D side (DARK ON)	

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3S-CL1 E3S-CL2	Light-ON		L side (LIGHT ON)	 *Set the NPN and PNP output selector to PNP.
	Dark-ON		D side (DARK ON)	

Nomenclature

Operation Panel



Output Selector

1. Set the selector to NPN for NPN output.
2. Set the selector to PNP for PNP output.

Operation Selector

1. Set the selector to L-ON for ON light-ON operation.
2. Set the selector to D-ON for ON dark-ON operation.

Setting Distance Adjuster

1. The sensing distance will increase when the adjuster is turned clockwise (toward Max.) and will decrease when the knob is turn counterclockwise.
2. The adjustment can be turned up to 6 times clockwise or counterclockwise to set the sensing distance. The number of turns will be displayed by the indicator.

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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

Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings.

● Designing

Cable

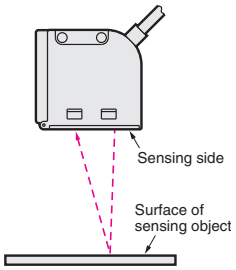
The E3S-CL2 uses an oil-resistive cord to ensure oil resistivity.

● Mounting

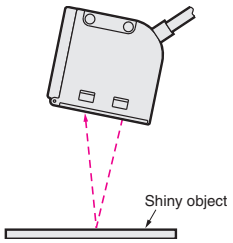
Mounting

Mounting Direction

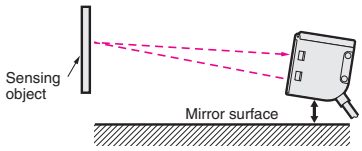
- Mount the Sensor so that the sensing face runs parallel to the surface of the object being detected as shown below, and not at an angle.



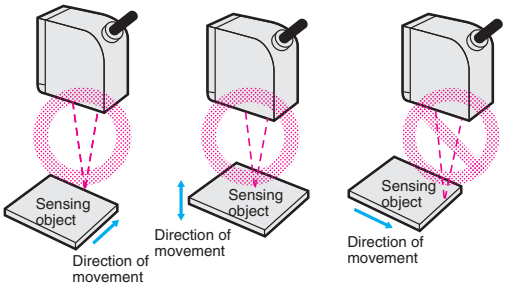
If detecting a shiny object, however, mount the Sensor so that the sensing face is at an angle of between 5° and 10° of the surface of the object being detected as shown below, and check to be sure that there is no interference from the background.



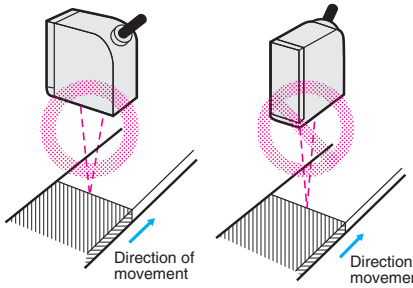
- If stable operation is not possible near a mirror surface, mount the Sensor at an angle as shown below, and separate the Sensor as far as possible from the mirror surface.



- Mount the Sensor so that it is not aligned with the direction of movement of the sensing object, as shown below.



- Also, mount the Sensor so that it is not aligned with extreme changes in color or materials, as shown below.



- Mount the Sensor so that sunlight, fluorescent light, incandescent light, or other strong sources of light do not enter the directional angle of the Sensor.

Precautions

- When mounting the Sensor, do not hit the Sensor with a hammer, or the Sensor will lose its watertightness.
- Use M4 screws to mount the Sensor.
- The tightening torque of each screw must be 1.2 N·m maximum.

● Others

Oil and Chemical Resistivity (E3S-CL2)

The E3S-CL2 was tested for resistance to the oils given in the following table. Refer to the information in the table when deciding which type of oil to use. However, performance may be affected by certain types of oil.

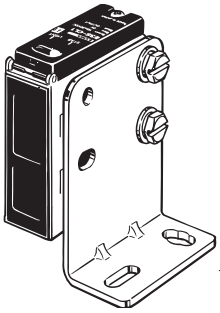
Test oil classification	Product name	Kinematic viscosity (mm^2/s (cst)) at 40°C	pH
Lubricating oil	Velocity No.3 (manufactured by Exxon Mobil)	2.02	---
Water insoluble machining oil	Yushiron Oil No. 2 ac (manufactured by Yushiro Chemical Industry Co., Ltd.)	Less than 10	
Water soluble machining oil	Yushiroken EC50T-3 (manufactured by Yushiro Chemical Industry Co., Ltd.)	---	7 to 9.5
	Yushiron Lubic HWC68 (manufactured by Yushiro Chemical Industry Co., Ltd.)		7 to 9.9
	Gryton 1700D (manufactured by Toho Chemical Industry Co., Ltd.)		7 to 9.2
	Yushiroken S50N (manufactured by Yushiro Chemical Industry Co., Ltd.)		7 to 9.8

Note: 1. The E3S-CL2 maintained a minimum insulation resistance of 100 MΩ after it was dipped in all the above oils at a temperature of 50°C for 240 hours.
2. When using the E3S-CL2 in environments subject to oils other than those listed above, use the figures for kinematic viscosity and ph values from the table as general guidelines. Additives and other substances contained in oils may affect the E3S-CL2. Be sure to consider this before use.

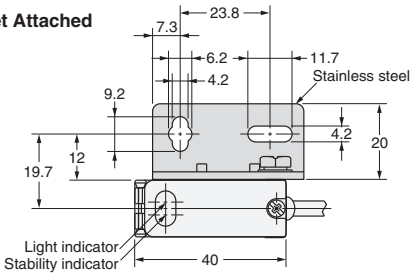
Dimensions

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

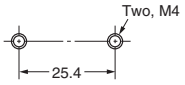
E3S-CL1
E3S-CL2

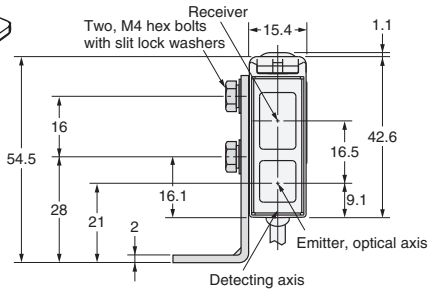


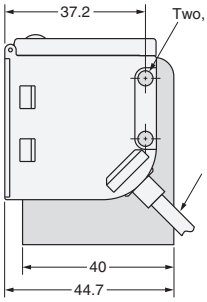
With Mounting Bracket Attached



Mounting Holes







E3S-CL1:
4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2 (AWG24),
Insulator diameter: 1.1 mm),
Standard length: 2 m
E3S-CL2:
4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section area: 0.2 mm^2 (AWG24),
Insulator diameter: 1.2 mm),
Standard length: 2 m

Note: The output selector, operation selector, and distance setting adjuster are located inside the cover.

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2015.10

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