

E3S-R

Ideal for Detecting Glass Wafers and Other Transparent Objects

- Detects glass wafers and LCD glass circuit boards.



(Compact models with plastic housing only)

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

Ordering Information

Sensors

Compact Models with Plastic Housing (Refer to *Dimensions* on page 8.)

Red light Infrared light



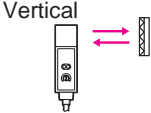

| Sensing method | Appearance | Connection method | Sensing distance | Model | | Recommended application *2 | |
|------------------|------------|------------------------|--------------------|------------|------------|---|--|
| | | | | NPN | PNP | Flat object | Cylindrical object |
| | | | | | | Detecting glass wafers and LCD glass circuit boards | Detecting plastic bottles and other transparent containers |
| Retro-reflective | Horizontal | Pre-wired (2 m) | 300 mm [100 mm] *1 | E3S-R12 2M | --- | Ideal | Ideal |
| | | | 1 m [100 mm] *1 | E3S-R11 2M | E3S-R31 2M | Ideal | --- |
| | | Standard M12 Connector | 300 mm [100 mm] *1 | E3S-R17 | --- | Ideal | Ideal |
| | | | 1 m [100 mm] *1 | E3S-R16 | E3S-R36 | Ideal | --- |
| | Vertical | Pre-wired (2 m) | 300 mm [100 mm] *1 | E3S-R62 2M | --- | Ideal | Ideal |
| | | | 1 m [100 mm] *1 | E3S-R61 2M | E3S-R81 2M | Ideal | --- |
| | | Standard M12 Connector | 300 mm [100 mm] *1 | E3S-R67 | --- | Ideal | Ideal |
| | | | 1 m [100 mm] *1 | E3S-R66 | E3S-R86 | Ideal | --- |

*1. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

*2. The E3S-R may not detect some glass wafer materials or plastic bottle shapes. Before using the E3S-R, be sure to test it on samples to make sure it can detect the items reliably.

Models with Metal Housing (Refer to Dimensions on page 10.)

 Red light

| Sensing method | Appearance | Connection method | Sensing distance | | Model | Recommended application * | |
|------------------|---|-------------------|--|-----|-------------|---|--|
| | | | | | | Flat object | Cylindrical object |
| | | | | | | Detecting glass wafers and LCD glass circuit boards | Detecting plastic bottles and other transparent containers |
| Retro-reflective | Horizontal  | Pre-wired |  300 mm | | E3S-RS30E4 | --- | Ideal |
| | | | | 1 m | E3S-R1E4 | --- | Applicable |
| | Vertical  | |  300 mm | | E3S-RS30E42 | --- | Ideal |
| | | | | 1 m | E3S-R1E42 | --- | Applicable |

* The E3S-R may not detect some glass wafer materials or plastic bottle shapes. Before using the E3S-R, be sure to test it on samples to make sure it can detect the items reliably.

Accessories (Order Separately)

Sensitivity Adjuster/Screwdriver (Refer to Dimensions on E39-L/F39-L/E39-S/E39-R.)




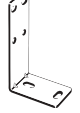



| Name | Model | Quantity | Remarks |
|--|--------|----------|---|
| Sensitivity adjuster | E39-G1 | 1 | Provided with the E3S-RS30E4□ and E3S-R1E4□. |
| Screwdriver for sensitivity adjustment | E39-G2 | 1 | Provided with the E3S-R1□, E3S-R3□, E3S-R6□, and E3S-R8□. |

Reflector (Refer to Dimensions on E39-L/F39-L/E39-S/E39-R.)

| Name | Sensing distance | Model | Quantity | Remarks |
|-----------|--------------------------------------|--------|----------|--------------------------|
| Reflector | Refer to Ratings and Specifications. | E39-R1 | 1 | Provided with the E3S-R. |

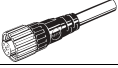

Note: Refer to Reflectors on E39-L/F39-L/E39-S/E39-R for details.

Mounting Brackets and Other Products (Refer to Dimensions on E39-L/F39-L/E39-S/E39-R.)

| Appearance | Model | Quantity | Remarks |
|---|---------|----------|--|
|  | E39-L69 | 1 | Provided with the E3S-R1□ and E3S-R3□. |
|  | E39-L70 | 1 | Provided with the E3S-R6□ and E3S-R8□. |
|  | E39-L6 | 1 | Provided with the E3S-RS30E4□ and E3S-R1E4□. |
|  | E39-L2 | 1 | Can be used with the E3S-RS30E4□ and E3S-R1E4□. |
|  | E39-L97 | 1 | Horizontal protective cover bracket Can be used for compact models with plastic housing. Refer to E39-L□. |
|  | E39-L98 | 1 | Vertical protective cover bracket Can be used for compact models with plastic housing. Refer to E39-L□. |
|  | E39-L60 | 1 | Close Mounting Plate Provided with the E3S-R□6 and E3S-R□7. |

Note: 1. When using through-beam models, order one bracket for the Receiver and one for the Emitter.
2. Refer to Mounting Brackets on E39-L/F39-L/E39-S/E39-R for details.

Sensor I/O Connectors (M12) (Refer to Dimensions on XS2.)

| Cable | Appearance | Cable type | | Model |
|----------|--|------------|--------|-----------------|
| Standard | Straight  | 2 m | 3-wire | XS2F-D421-DC0-A |
| | | 5 m | | XS2F-D421-GC0-A |
| | L-shape  | 2 m | | XS2F-D422-DC0-A |
| | | 5 m | | XS2F-D422-GC0-A |

Note: For details on Sensor I/O Connectors and cables such as vibration-proof robot cables, refer to *Introduction to Sensor I/O Connectors*.

Ratings and Specifications

| Item | Sensing method Model | Retro-reflective | Retro-reflective (with MSR function) *1 | Retro-reflective | |
|---|-------------------------|---|--|---|---|
| | | NPN | E3S-R11, R16, R61, R66 | E3S-RS30E4, RS30E42 | E3S-R1E4, R1E42 |
| | | PNP | --- | --- | --- |
| Sensing distance | | 300 mm [100 mm] *2 (When using E39-R1) | 1 m [100 mm] *2 (When using E39-R1) | 300 mm (When using E39-R1) | 1 m (When using E39-R1) |
| Standard sensing object | | Opaque: 75-mm dia. min. 0.7-mm-thick LCD glass boards; 10-mm-dia., 1.0-mm-thick, 30-mm-long cylindrical glass objects | Opaque: 75-mm dia. min. 0.7-mm-thick LCD glass boards | Opaque: 75-mm dia. min. 10-mm-dia., 1.0-mm-thick, 30-mm-long cylindrical glass objects | |
| Directional angle | | 3° to 10° | | --- | |
| Light source (wavelength) | | Infrared LED (880 nm) | Red LED (700 nm) | Infrared LED (950 nm) | |
| Power supply voltage | | 10 to 30 VDC; ripple: 10% max. | | 12 to 24 VDC±10%; ripple: 10% max. | |
| Current consumption | | 30 mA max. | | 40 mA max. | |
| Control output | | Load power supply voltage: 30 VDC max. Load current: 100 mA max. with a maximum residual voltage of 1 V Open collector output configuration Light-ON/Dark-ON selector switch | | Load power supply voltage: 24 VDC max Load current: 80 mA max. with a maximum residual voltage of 2 V NPN voltage output configuration Light-ON/Dark-ON cable connection selection | |
| Protection circuits | | Power supply reverse polarity protection, Output short-circuit protection, Mutual interference prevention | | | |
| Response time | | Operate or reset: 1 ms max. | | | |
| Sensitivity adjustment | | Two-turn endless adjuster | | One-turn adjuster | |
| Ambient illumination (Receiver side) | | Incandescent lamp: 5,000 lx max. Sunlight: 10,000 lx max. | | Incandescent lamp: 3,000 lx max. Sunlight: 10,000 lx max. | |
| Ambient temperature range | | Operating: 0 to 40°C, Storage: -40 to 70°C (with no icing or condensation) | | | 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 h each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions | | | |
| Degree of protection | | IEC 60529 IP67 | | | |
| Connection method | | Pre-wired (standard length: 2 m)/Standard connector | | | |
| Weight (packed state) | | Pre-wired models: Approx. 110 g Standard connector: Approx. 60 g | | Pre-wired models: Approx. 190 g | |
| Materials | Case | Polybutylene terephthalate | | Zinc die-cast | |
| | Lens | Modified polyallylate | | Polycarbonate | |
| | Mounting Bracket | Stainless steel (SUS304) | | Iron | |
| Accessories | | Mounting Bracket (with screw), Adjustment screwdriver, Instruction manual, Reflector | | Mounting Bracket (with screw), Adjustment screwdriver, Sensitivity adjuster, Instruction manual, Reflector | |

*1. Refer to MSR function of *Technical Guide (Technical version)*.

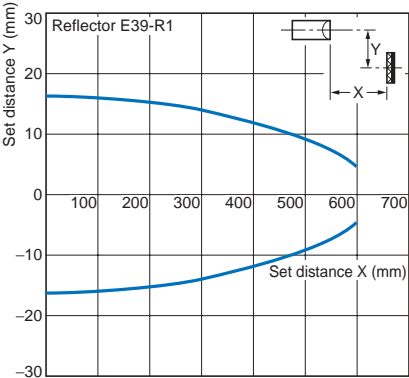
*2. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

Engineering Data (Typical)

Parallel Operating Range

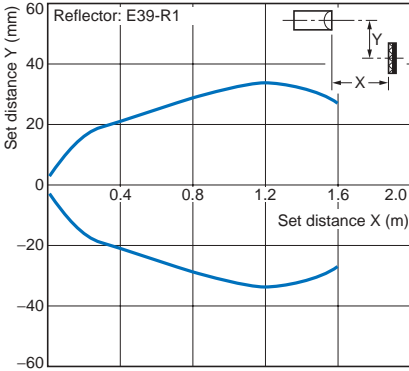
Retro-reflective

E3S-R12, E3S-R62 + E39-R1 (Supplied Reflector)



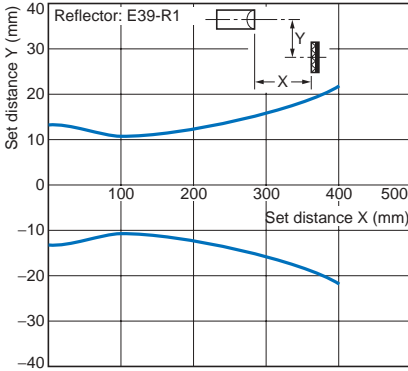
Retro-reflective

E3S-R□1, E3S-R□6 + E39-R1 (Supplied Reflector)



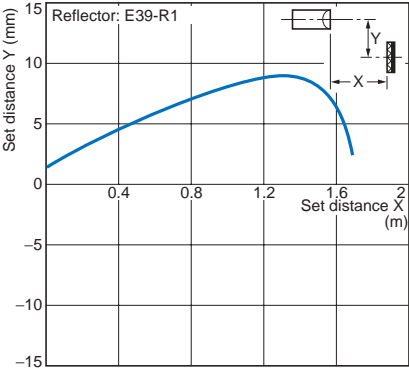
Retro-reflective

E3S-RS30E4□ + E39-R1 (Supplied Reflector)



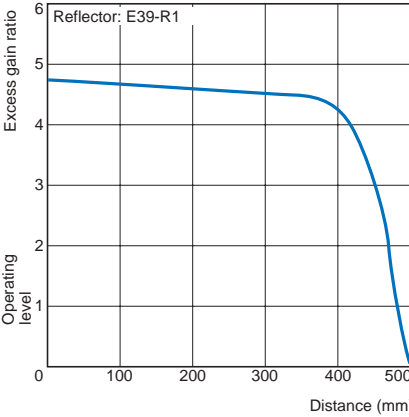
Retro-reflective

E3S-R1E4□ + E39-R1 (Supplied Reflector)

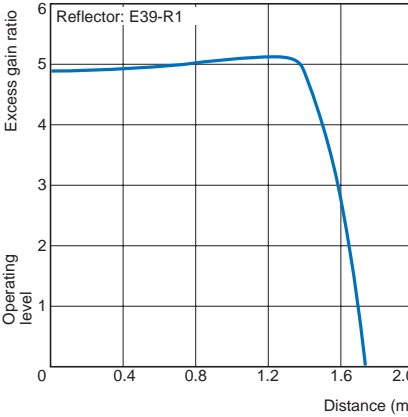


Excess Gain vs. Set Distance

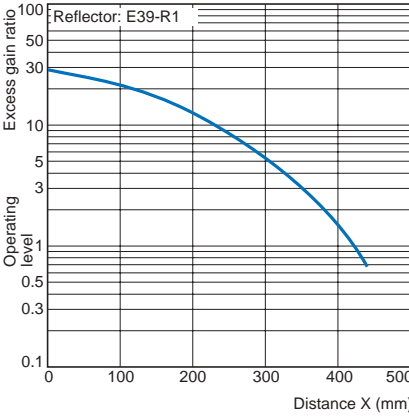
E3S-R12, E3S-R62 + E39-R1 (Supplied Reflector)



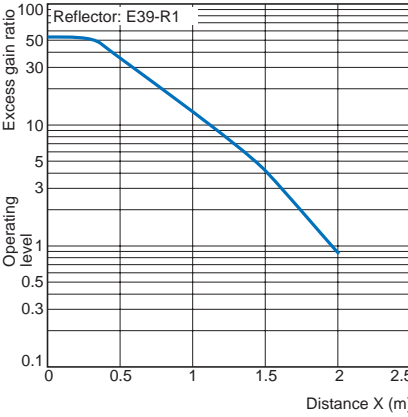
E3S-R□1, E3S-R□6 + E39-R1 (Supplied Reflector)



E3S-RS30E4□ + E39-R1 (Supplied Reflector)



E3S-R1E4□ + E39-R1 (Supplied Reflector)



Light Level Change Rates with Various Transparent Objects (*1)

The following are the permeation rates of various transparent objects on condition that a permeation rate of 100 means that there is no object within the sensing distance of the E3S-R. The permeation rate of any type of object sensed by the E3S-R must be as low as possible for reliable detection of the object. Before using the E3S-R, be sure to test it on samples to make sure it can detect the items reliably.

| Sensing object Appearance | Model Through position | E3S-R12, R62 E3S-R17, R67 | E3S-R11, R31, R61, R81 E3S-R16, R36, R66, R86 | E3S-RS30□□ | E3S-R1□□ |
|--------------------------------|-------------------------------------|------------------------------|--|------------|----------|
| | | Center | Center | Center | Center |
| Cylindrical glass object | 10 dia. × 30, t = 1.0 | 27 | --- | 20 | 33 |
| | 15 dia. × 30, t = 1.25 | 27 | --- | 20 | 13 |
| | 20 dia. × 30, t = 1.7 | 22 | --- | 28 | 13 |
| | 30 dia. × 30, t = 1.9 | 41 | --- | 43 | 23 |
| | 100 dia. × 30, t = 2.5 | 58 | --- | 55 | 50 |
| | 200 dia. × 30, t = 5.0 | 55 | --- | 58 | 58 |
| Glass plate | 50 × 50, t = 0.5 | 82 | 82 | 78 | --- |
| | 50 × 50, t = 1 | 74 | 74 | 70 | 75 |
| | 50 × 50, t = 2 | 73 | 73 | 70 | 75 |
| | 50 × 50, t = 3 | 62 | 62 | 58 | 65 |
| | 50 × 50, t = 5 | 53 | 53 | 50 | 55 |
| | 50 × 50, t = 10 | 38 | 38 | 35 | 40 |
| Liquid crystal glass | t = 0.5 (permeability of 98%) *2 | 86 | 86 | --- | --- |
| | t = 0.7 (permeability of 95%) *2 | 81 | 81 | --- | --- |
| | t = 1.1 (permeability of 91%) *2 | 75 | 75 | --- | --- |
| Operating range | | 95 max. | 95 max. | 90 max. | 80 max. |
| Stable operating range | | 90 max. | 90 max. | 70 max. | 60 max. |

*1. The sensing distance of each model was set to the rated sensing distance.
*2. The permeability values were checked with light at a wavelength of 700 μm.

I/O Circuit Diagrams

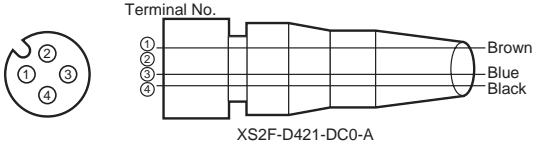
NPN Output

| Model | Operation mode | Timing Charts | Operation selector | Output circuit |
|--|----------------|---------------|----------------------|--|
| E3S-R11(12) E3S-R61(62) E3S-R16(17) E3S-R66(67) | Light-ON | | L side (LIGHT ON) | <p>Connector Pin Arrangement</p> <p>Note: Pin 2 is not used.</p> |
| | Dark-ON | | D side (DARK ON) | |

PNP Output

| Model | Operation mode | Timing Charts | Operation selector | Output circuit |
|--|----------------|---------------|----------------------|--|
| E3S-R31 E3S-R36 E3S-R81 E3S-R86 | Light-ON | | L side (LIGHT ON) | <p>Connector Pin Arrangement</p> <p>Note: Pin 2 is not used.</p> |
| | Dark-ON | | D side (DARK ON) | |

Plug (Sensor I/O Connector)



| Classification | Wire color | Connection pin No. | Application |
|----------------|------------|--------------------|--------------------|
| DC | Brown | 1 | Power supply (+V) |
| | --- | 2 | --- |
| | Blue | 3 | Power supply (0 V) |
| | Black | 4 | Output |

Refer to *Introduction to Sensor I/O connectors* for details.

Note: Pin 2 is not used.

| Model | Operation mode | Timing Charts | Cable Connection | Output circuit |
|--------------------------------|----------------|---------------|------------------------------------|----------------|
| E3S-RS30E4(42) E3S-R1E4(42) | Light-ON | | Brown cable: +V Blue cable: 0 V | |
| | Dark-ON | | Brown cable: 0 V Blue cable: +V | |

*1. Reverse the polarity of the power supply to change the output mode of the E3S-R.
*2. Voltage output (When connecting a transistor circuit, etc.)

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.

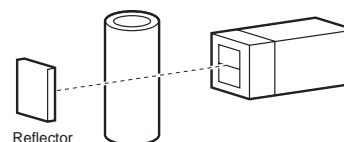


Precautions for Correct Use

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

● Adjusting

- When the E3S-R senses a cylindrical object, the amount of light received varies with the direction of the cylindrical object. To prevent this, locate the E3S-R as shown in the following illustration.



- When the E3S-R senses an uneven plastic container or glass bottle, the amount of light received varies with the direction and sensing part of the plastic container or glass bottle. To prevent this, turn a sample of the plastic container or glass bottle to the best sensing position of the E3S-R to find and decide the optimum direction and sensing part, and then make the sensitivity adjustment.
- In principle, sensing objects must pass through the center between the E3S-R and the reflector. Sensing objects must not be too close to the Reflector, otherwise sensing errors may result.
- Unless otherwise indicated, the E39-R1 Reflector is required for transparent object detection. The Receiver may not receive any light and detection capability may decline with other Reflectors.

Dimensions

Sensors

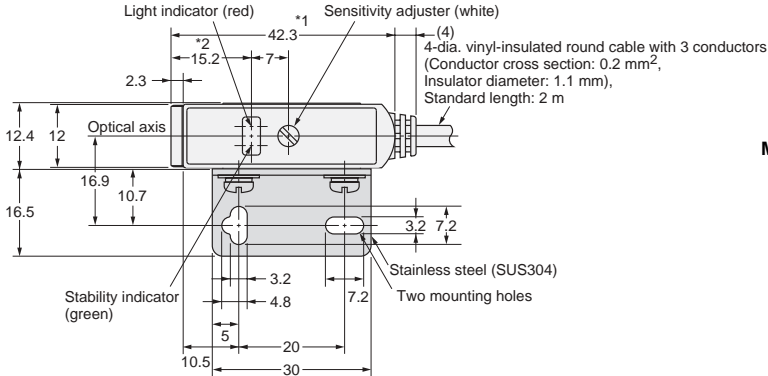
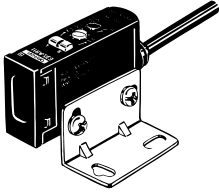
Compact Horizontal Models with Plastic Housing

Pre-wired Models

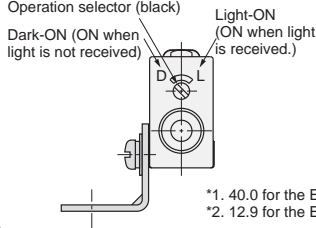
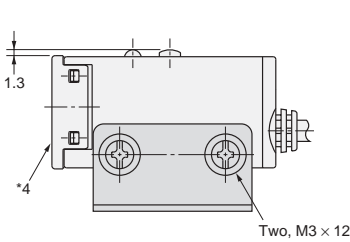
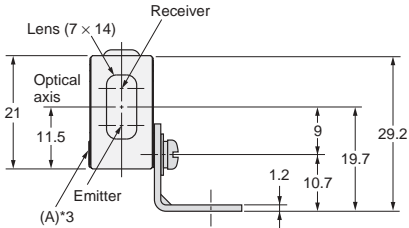
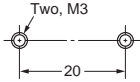
E3S-R11, E3S-R12

E3S-R31

With Mounting Bracket Attached



Mounting Holes



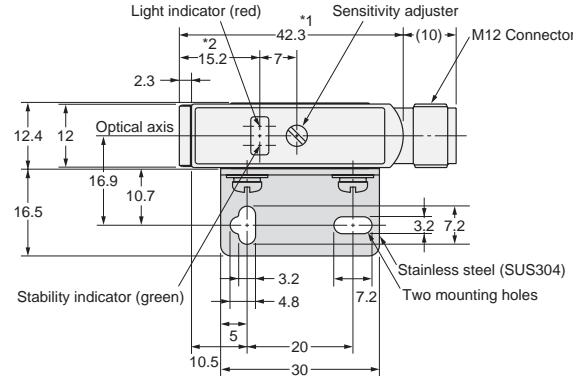
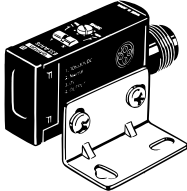
*3. The mounting bracket can be attached to this side.
*4. Not available on the E3S-R12.

Standard Connector Models

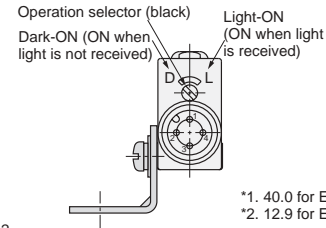
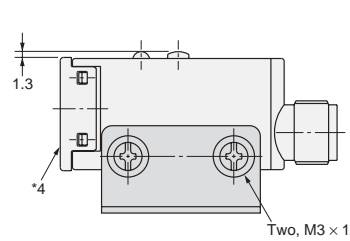
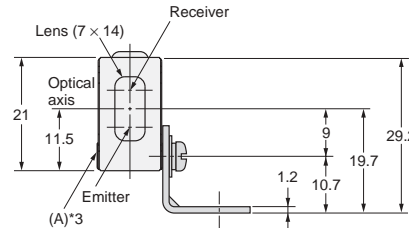
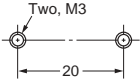
E3S-R16, E3S-R17

E3S-R36

With Mounting Bracket Attached



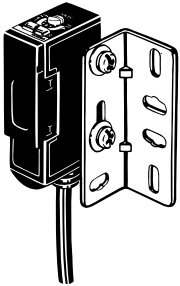
Mounting Holes



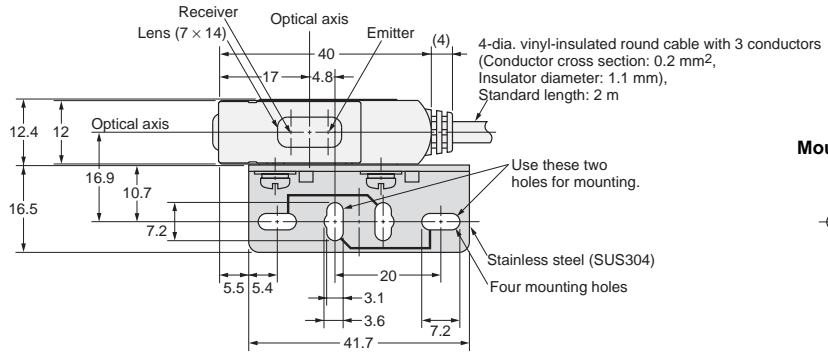
*3. The mounting bracket can be attached to this side.
*4. Not available on the E3S-R17.

Compact Vertical Models with Plastic Housing

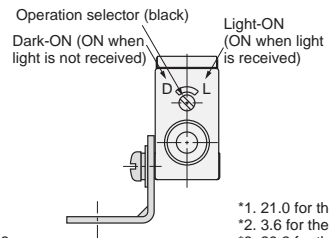
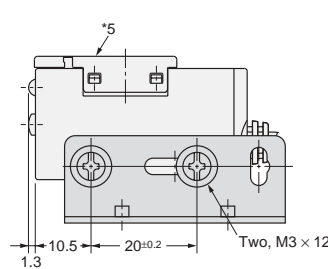
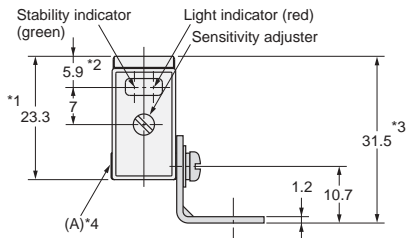
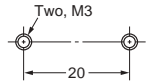
Pre-wired Models
E3S-R61, E3S-R62
E3S-R81



With Mounting Bracket Attached



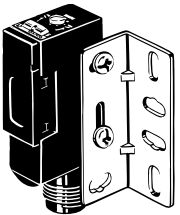
Mounting Holes



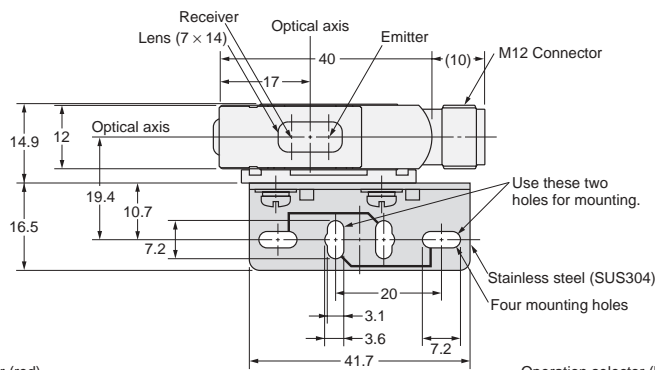
*1. 21.0 for the E3S-R62.
*2. 3.6 for the E3S-R62.
*3. 29.2 for the E3S-R62.

*4. The mounting bracket can be attached to this side.
*5. Not available on the E3S-R62.

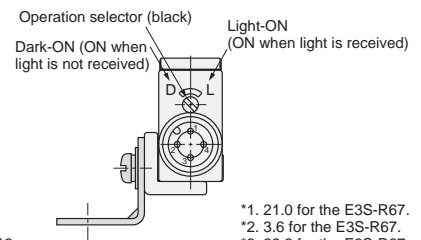
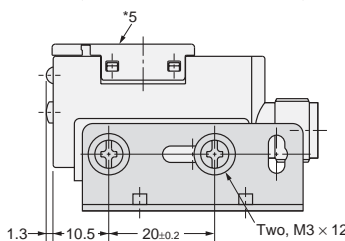
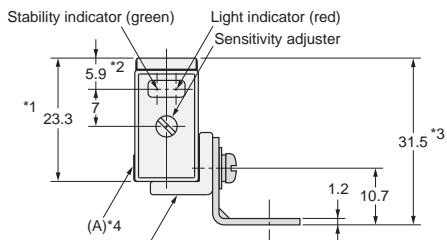
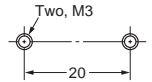
Standard Connector Models
E3S-R66, E3S-R67
E3S-R86



With Mounting Bracket Attached



Mounting Holes



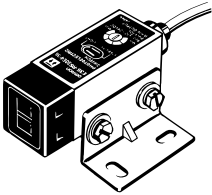
*1. 21.0 for the E3S-R67.
*2. 3.6 for the E3S-R67.
*3. 29.2 for the E3S-R67.

E39-L60 Close Mounting Plate (provided)
(Attach the mounting plate or the
plug cannot be connected.)

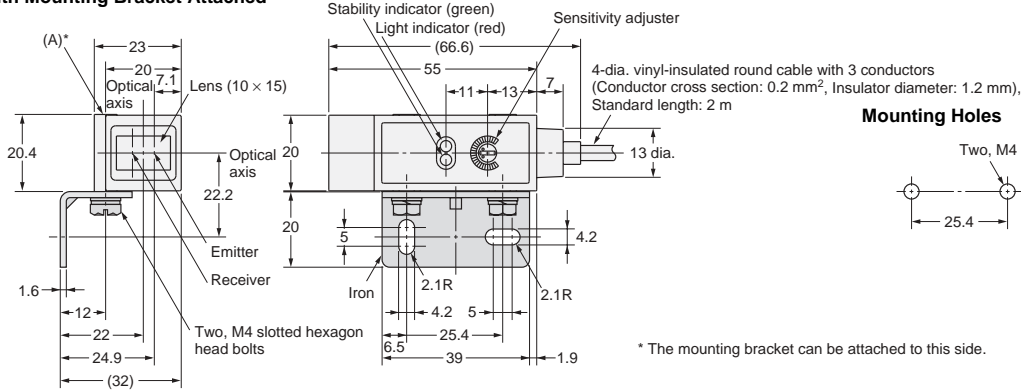
*4. The mounting bracket can be attached to this side.
*5. Not available on the E3S-R67.

Horizontal Models with Metal Housing

E3S-RS30E4
E3S-R1E4



With Mounting Bracket Attached

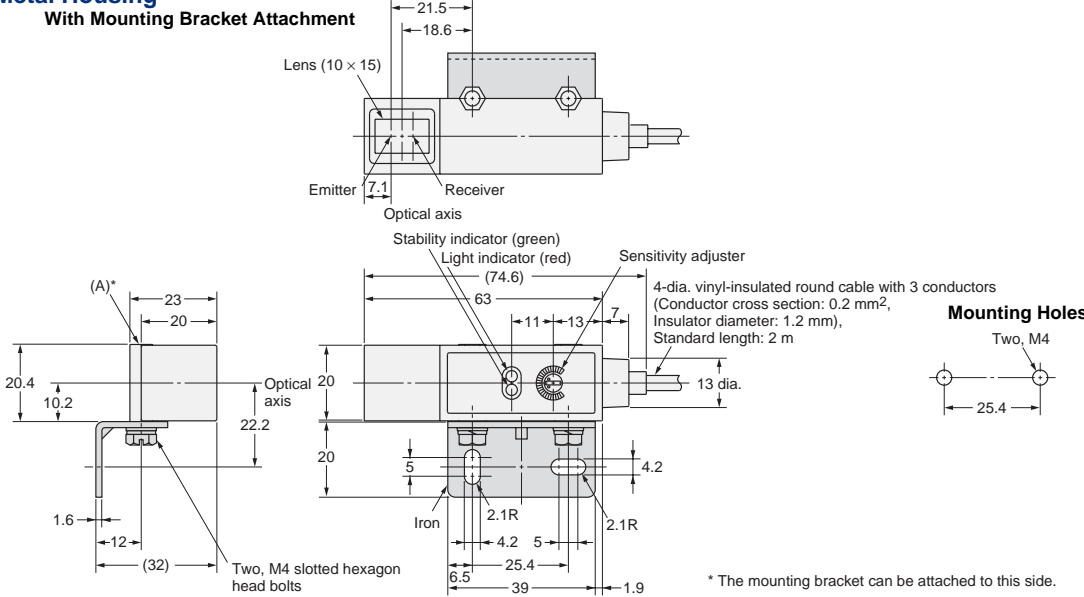


Vertical Models with Metal Housing

E3S-RS30E42
E3S-R1E42



With Mounting Bracket Attachment



Accessories (Order Separately)

- Sensitivity Adjuster**
Refer to E39-L/F39-L/E39-S/E39-R for details.
- Reflectors**
Refer to E39-L/F39-L/E39-S/E39-R for details.
- Mounting Brackets**
Refer to E39-L/F39-L/E39-S/E39-R for details.
- Close Mounting Plates**
Refer to E39-L/F39-L/E39-S/E39-R for details.
- Sensor I/O Connectors**
Refer to Introduction to Sensor I/O Connectors for details.

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2010.10

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Industrial Automation Company

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