





### Transparent Object Sensor with Built-in DC Amplifier

- Detects clear glass or plastic bottles, and transparent films with simple setup
- Fast, 1 ms maximum response time
- Choose PNP or NPN output models
- Light-ON/Dark-ON operation, wire selectable
- Vertical and horizontal mounting styles
- Ready-to-use: pre-leaded with 2 m (6.56 ft) cable, includes mounting bracket







## Ordering Information

### ■ PLASTIC-HOUSING COMPACT MODELS

Connection	Appearance	Sensing method	Sensing distance	Light source color	Operating modes	Part number		Typical application	
						NPN	PNP	Flat object	Cylindrical object
Pre-leaded	Horizontal 	Retro-reflective	10 to 30 cm	Infrared	Light-ON Dark-ON (selectable)	<b>E3S-R12</b>	<b>E3S-R32</b>	Ideal	Ideal
			0.1 to 1 m	Red		<b>E3S-R11</b>	<b>E3S-R31</b>	Ideal	---
	Vertical 		10 to 30 cm	Infrared		<b>E3S-R62</b>	<b>E3S-R82</b>	Ideal	Ideal
			0.1 to 1 m	Red		<b>E3S-R61</b>	<b>E3S-R81</b>	Ideal	---
M12 quick disconnect	Horizontal 	Retro-reflective	10 to 30 cm	Infrared	Light-ON Dark-ON (selectable)	<b>E3S-R17</b>	<b>E3S-R37</b>	Ideal	Ideal
			0.1 to 1 m	Red		<b>E3S-R16</b>	<b>E3S-R36</b>	Ideal	---
	Vertical 		10 to 30 cm	Infrared		<b>E3S-R67</b>	<b>E3S-R87</b>	Ideal	Ideal
			0.1 to 1 m	Red		<b>E3S-R66</b>	<b>E3S-R86</b>	Ideal	---

Note: Consult your OMRON representative before using the product under conditions not described in the manual. Make sure that the ratings and performance characteristics of the product are correct for the systems, machines, and equipment and provide double safety mechanisms.

## ■ METAL-HOUSING MODELS

Method of detection		Retroreflective			
Sensing distance		30 cm (11.81 in)		1 m (3.28 ft)	
Mounting style		Horizontal	Vertical	Horizontal	Vertical
					
Part number	NPN output	E3S-RS30E4-30	E3S-RS30E42-30	E3S-R1E4	E3S-R1E42
	PNP output	E3S-RS30B4-30	E3S-RS30B42-30	E3S-R1B4	E3S-R1B42

## ■ CONNECTOR CORDSETS

Description			Part number	
Connector	Cable size	Length	Straight Connector	Right angle connector
3-wire DC MicroChange®	22 AWG	2 m (6.56 ft)	Y96E-43SD2	Y96E-43RD2
		5 m (16.40 ft)	Y96E-43SD5	Y96E-43RD5
		10 m (32.8 ft)	Y96E-43SD10	Y96E-43RD10

## ■ ACCESSORIES

Description		Part number
Optional mounting brackets	Side mounting bracket for E3S-RS30 and E3S-R1 metal body sensors	E39-L2
	Side mounting bracket for E3S-R plastic body sensors	E39-L59
	Contact mounting plate for E3S-R connector versions	E39-L60
	For E39-R1 reflector	E39-L7

## ■ REPLACEMENT PARTS

Description	Part number
Reflector supplied with each E3S-R sensor	E39-R1
Horizontal mounting bracket for E3S-R plastic body sensors	E39-L69
Vertical mounting bracket for E3S-R plastic body sensors	E39-L70
Mounting bracket for E3S-RS30 and E3S-R1 metal body sensors	E39-L6
Sensitivity adjuster knob for E3S-RS30 and E3S-R1 metal body sensors	E39-G1
Sensitivity adjuster knob for E39-R plastic body sensors	E39-G2

# Specifications

## ■ RATINGS/CHARACTERISTICS

Part number	E3S-R12/-R62/ -R17/-R67	E3S-R11/-R61/ -R16/-R66	E3S-R32/-R82/ -R37/-R87	E3S-R31/-R81/ -R36/-R86	E3S-RS30□4/ -RS30□42	E3S-R1□4/ -R1□42	
Method of detection	Retroreflective	Retroreflective with polarized function	Retroreflective	Retroreflective with polarized function	Retroreflective		
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.		
Sensing distance with E39-R1 reflector	10 to 30 cm (3.94 in to 11.81 in)	0.1 to 1 m (3.94 in to 3.28 ft)	10 to 30 cm (3.94 to 11.81 in)	0.1 to 1 m (3.94 to 3.28 ft)	30 cm (11.81 in)	1 cm (3.28 ft)	
Light source	Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (950 nm)		
Detectable object type	0.7-mm-thick LCD glass boards; 10-mm-dia., 1.0-mm-thick, 30-mm-long cylindrical glass objects	0.7-mm-thick LCD glass boards	0.7-mm-thick LCD glass boards; 10-mm-dia., 1.0-mm-thick, 30-mm-long cylindrical glass objects	0.7-mm-thick LCD glass boards	10-mm-dia., 1.0-mm-thick, 30-mm-long cylindrical glass objects		
Operation mode	Light-ON/Dark-ON, wire selectable						
Sensitivity adjustment	Two-turn adjuster with an indicator				One-turn adjuster		
Control output	NPN open collector, 30 VDC, 100 mA max.		PNP open collector, 30 VDC, 100 mA max.		NPN output (with suffix -E): Load (relay, sink logic): 80 mA max. Voltage (source) logic: 1.5 to 4 mA max. PNP output (with suffix -B): Load (relay, source) logic: 100 mA		
Response time	1 ms max. for both operation and release						
Circuit protection	Load short-circuit protection, reverse polarity protection, mutual interference prevention				Load short-circuit protection, mutual interference prevention		
Indicators	Light incident indicator (red), excess gain indicator (green)				Light incident indicator (red)	Light incident indicator (red), stability indicator (green)	
Materials	Case	Polybutylene terephthalate			Zinc die-cast		
	Lens	Denatured polyallylate			Polycarbonate		
	Bracket	304 stainless steel			Iron		
Connections	2 m (6.56 ft) cable: E3S-R11/-R12/-R61/-R62/-R31/-R32/-R81/-R82 M12 quick disconnect: E3S-R16/-R17/-R66/-R67/-R36/-R37/-R86/-R87				2 m (6.56 ft) cable		
Weight	110g with cable: E3S-R11/-R12/-R61/-R62/-R31/-R32/-R81/-R82 60 g with connector: E3S-R16/-R17/-R66/-R67/-R36/-R37/-R86/-R87				Approx. 190 g		
Enclosure rating	IP67						
Ambient operating temperature	0°C to 40°C (32°F to 104°F) with no icing				-25°C to 55°C (-13°F to 131°F) with no icing		
Relative humidity	35% to 85% RH						
Ambient illumination	Incandescent lamp	5,000 lx max.				Illumination on optical spot: 3,000 lx max.	
	Sunlight	10,000 lx max.				Illumination on optical spot: 10,000 lx max.	
Insulation resistance	20 MΩ min. (at 500 VDC)						
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min						
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude for 2 h each in X, Y, and Z axes						
Shock resistance	500 m/s <sup>2</sup> (approx. 50G) for 3 times each in X, Y, and Z axes						

- Note: 1. The above sensing distances are possible when the E39-R1 Reflector is used. The E39-R1 Reflector is provided with the E3S-R.  
 2. Even though the excess gain indicator of the E3S-R is dimly lit during sensitivity adjustment of the E3S-R, the E3S-R will provide stable operation if the ambient temperature does not rise or fall by more than 5°C (91°F) while the E3S-R is operating.

## ■ CHARACTERISTIC DATA (REFERENCE VALUES)

### Light Level Change Rates with Various Transparent Objects

The following are the permeation rates of a 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 the stable sensing of the object. Before using the E3S-R to sense objects, use samples of the objects to check if the E3S-R can sense the samples easily. (See Note 1.)

Sensing object		E3S-R12/-R62/-R17/ -R67/-R32/-R82/ -R37/-R87	E3S-R11/-R61/-R16/ -R66/-R31/-R81/ -R36/-R86	E3S-RS30□□	E3S-R1□□
		Center	Center	Center	Center
Cylindrical glass object	10-dia. x 30, t = 1.0	27	---	20	33
	15-dia. x 30, t = 1.25	27	---	20	13
	20-dia. x 30, t = 1.7	22	---	28	13
	30-dia. x 30, t = 1.9	41	---	43	23
	100-dia. x 30, t = 2.5	58	---	55	50
	200-dia. x 30, t = 5.0	55	---	58	58
Glass plate	50 x 50, t = 0.5	82	91.5	78	---
	50 x 50, t = 1	74	82.5	70	75
	50 x 50, t = 2	73	81	70	75
	50 x 50, t = 3	62	69	58	65
	50 x 50, t = 5	53	59	50	55
	50 x 50, t = 10	38	42	35	40
Liquid crystal glass	t = 0.5 (permeability of 98%) (See Note 2.)	86	96	---	---
	t = 0.7 (permeability of 95%) (see note 2)	81	90	---	---
	t = 1.1 (permeability of 91%) (See Note 2.)	75	83	---	---
Operating range		95 max.	95 max.	90 max.	80 max.
Stable operating range		90 max.	90 max.	70 max.	60 max.

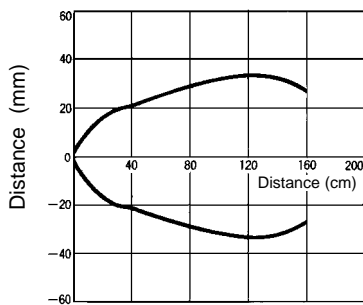
Note: 1. The sensing distance of each model was set to the rated sensing distance.

2. The permeability values were checked with light with a wavelength of 700 μm.

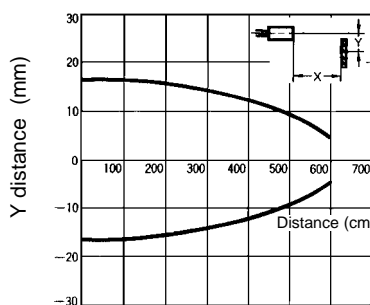
## Engineering Data

### ■ REFLECTOR OPERATION RANGE (TYPICAL)

E3S-R11/-R61/-R16/-R66/-R31/-R81/-R36/-R86

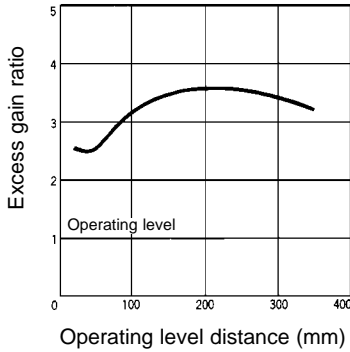


E3S-R12/-R62/-R17/-R67/-R32/-R82/-R37/-R87

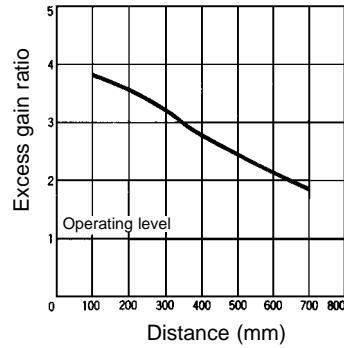


■ EXCESS GAIN VS. SET DISTANCE (TYPICAL)

E3S-R11/-R61/-R16/-R66/-R31/-R81/-R36/-R86 with E39-R1



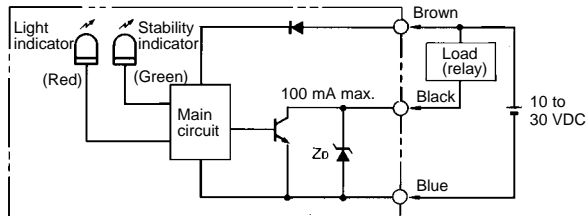
E3S-R12/-R62/-R17/-R67/-R32/-R82/-R37/-R87



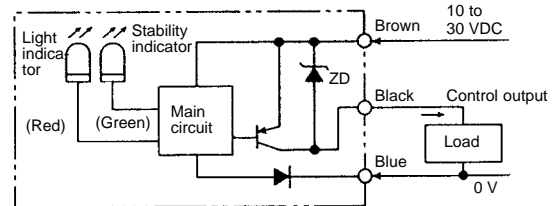
Operation

■ OUTPUT CIRCUITS

E3S-R11/-R12/-R61/-R62/-R16/-R17/-R66/-R67



E3S-R31/-R32/-R81/-R82/-R36/-R37/-R86/-R87











E3S-RS30□4/-RS30□42/-R1□4/-R1□42

Wire color	Polarity of power supply	Output configuration	Output circuit
Brown (See Note 1.)	+	Light-ON	
Blue (See Note 1.)	0 V		
Brown (See Note 1.)	0 V	Dark-ON	
Blue (See Note 1.)	+		











- Note: 1. Reverse the polarity of the power supply to change the output mode.  
 2. The E3S-RS30□ and E3S-RS30□42 do not have a stability indicator.  
 3. This load is needed when voltage output to connect a transistor circuit is required.

■ TIMING CHARTS

E3S-R11/-R12/-R61/-R62/-R16/-R17/-R66/-R67/-R31/-R32/-R81/-R82/-R36/-R37/-R86/-R87

Output transistor	Timing charts
ON when light is received	Light received Light not received  Light indicator (red) ON OFF  Output transistor ON OFF  Load (relay) Operate Release  (Between brown and black)
ON when light is not received	Light received Light not received  Light indicator (Orange) ON OFF  Output transistor ON OFF  Load (relay) Operate Release  (Between brown and black)

E3S-RS30□4/-RS30□42/-R1E□/-R1□42

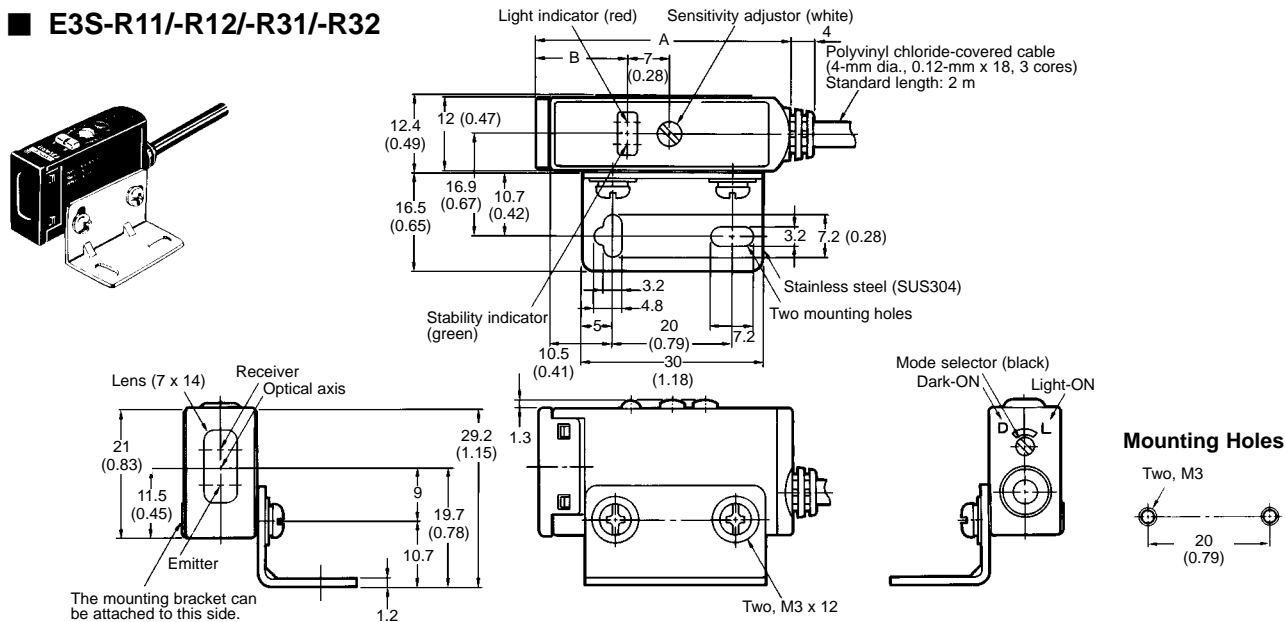
Wire color	Polarity of power supply	Output transistor	Timing charts
Brown (See Note.)	+	ON when light is received.	Light received Light not received  Light indicator (red) ON OFF  Output transistor ON OFF  Load (relay) Operate Release  (Between brown and black) Output voltage (logic, etc.) H L  (Between blue and black)
Blue (See Note.)	0 V		
Brown (See Note.)	0 V	ON when light is not received.	Light received Light not received  Light indicator (red) ON OFF  Output transistor ON OFF  Load (relay) Operate Release  (Between blue and black) Output voltage (logic, etc.) H L  (Between brown and black)
Blue (See Note.)	+		

Note: Reverse the polarity of the power supply to change the output mode of the E3S-R.

# Dimensions

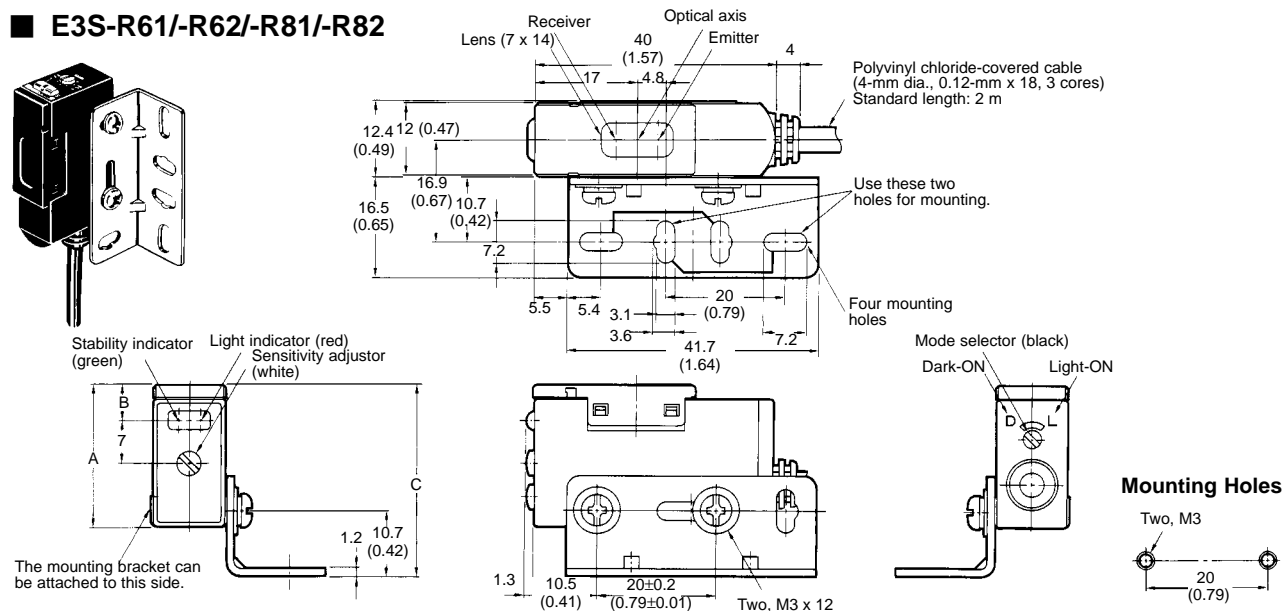
Unit: mm (inch)

## E3S-R11/-R12/-R31/-R32



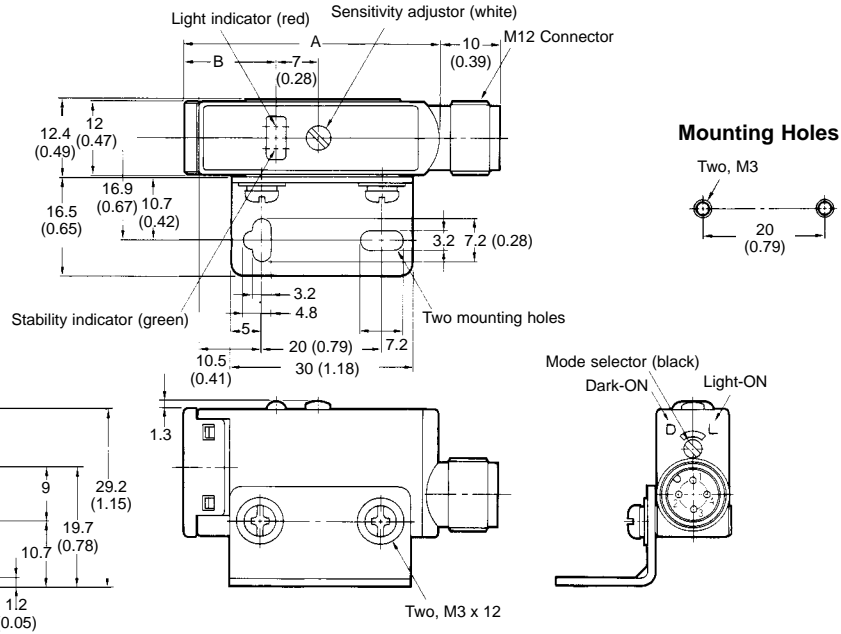
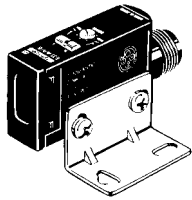
Type	NPN output	E3S-R11	E3S-R12
	PNP output	E3S-R31	E3S-R32
Size	A	42.3 (1.67)	40 (1.57)
	B	15.2 (0.60)	12.9 (0.51)

## E3S-R61/-R62/-R81/-R82



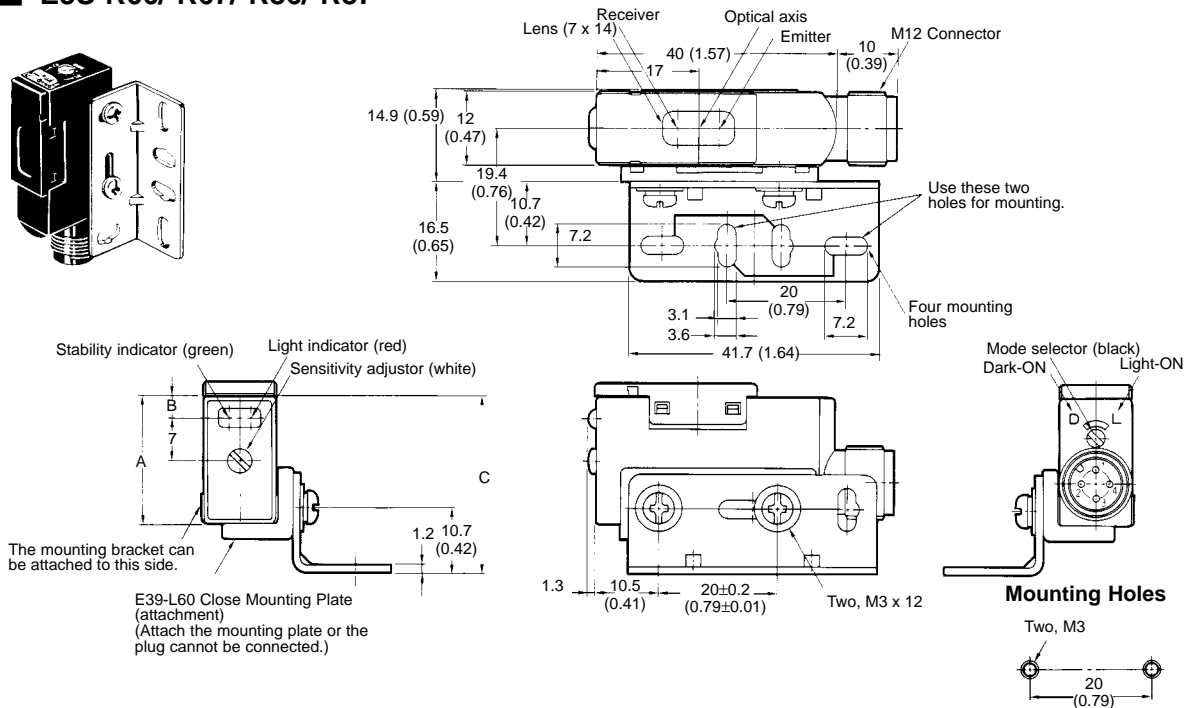
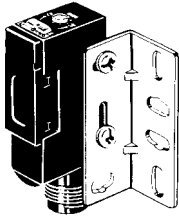
Type	NPN output	E3S-R61	E3S-R62
	PNP output	E3S-R81	E3S-R82
Size	A	23.3 (0.92)	21 (0.83)
	B	5.9 (0.23)	3.6 (0.14)
	C	31.5 (1.24)	29.2 (1.15)

■ E3S-R16/-R17/-R36/-R37



Type	NPN output	E3S-R16	E3S-R17
	PNP output	E3S-R36	E3S-R37
Size	A	42.3 (1.67)	40 (1.57)
	B	15.2 (0.60)	12.9 (0.51)

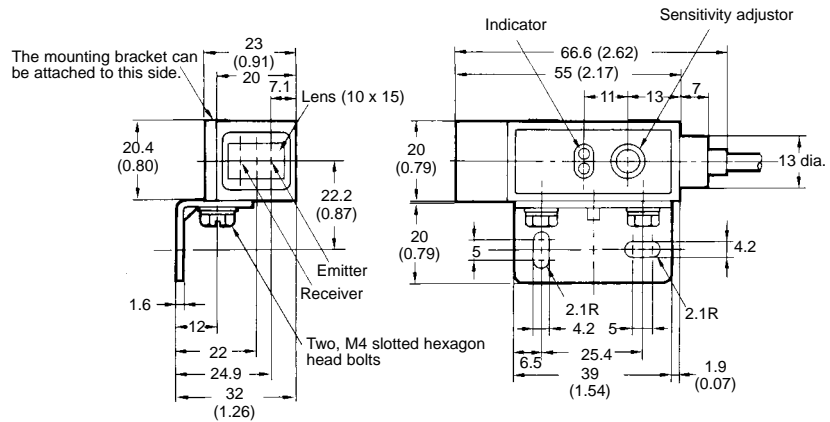
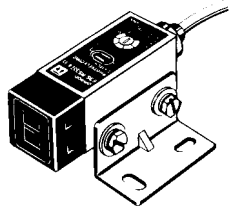
■ E3S-R66/-R67/-R86/-R87



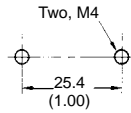
Type	NPN output	E3S-R66	E3S-R67
	PNP output	E3S-R86	E3S-R87
Size	A	23.3 (0.92)	21 (0.83)
	B	5.9 (0.23)	3.6 (0.14)
	C	31.5 (1.24)	29.2 (1.15)

■ E3S-RS30□4/R1□4

Cable: Vinyl-insulated cable (4-mm dia.,  
0.12-mm x 18, 3 cores)  
Standard length: 2 m



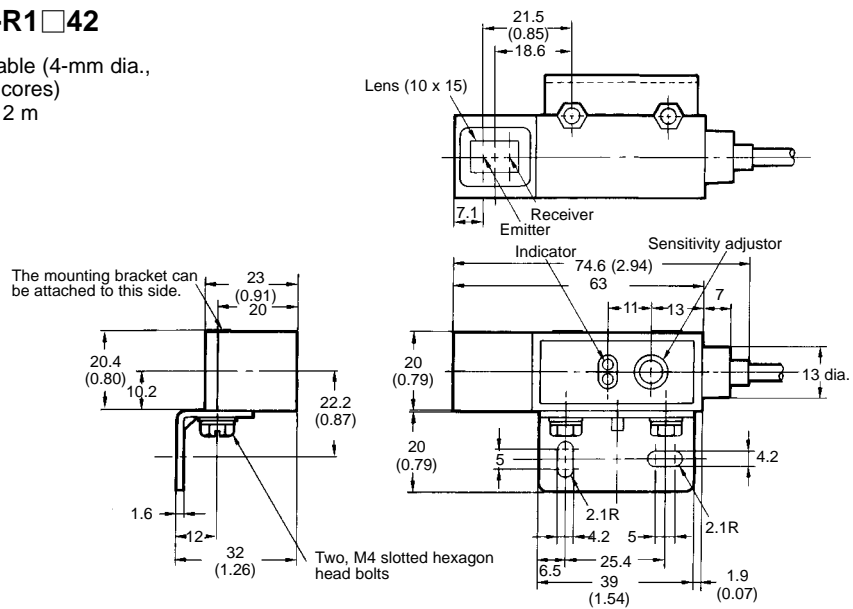
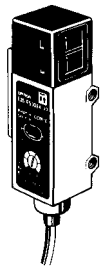
Mounting Holes



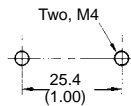
Note: The E3S-RS30□4 does not have a green stability indicator.

■ E3S-RS30□42/R1□42

Cable: Vinyl-insulated cable (4-mm dia.,  
0.12-mm x 18, 3 cores)  
Standard length: 2 m



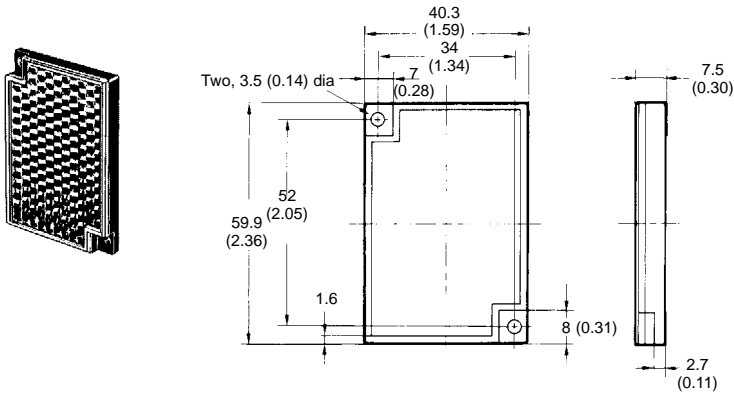
Mounting Holes



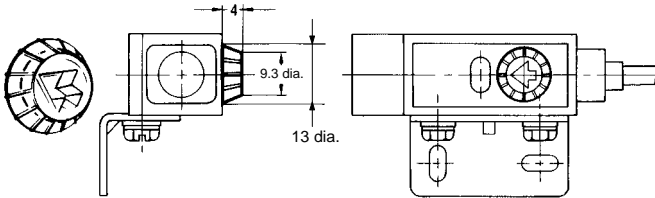
Note: The E3S-RS30□42 does not have a green stability indicator.

## ■ ACCESSORIES

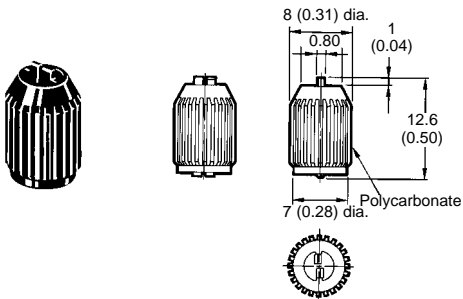
### E39-R1 Retroreflector (Included)



### E39-G1 Sensitivity Adjuster Knob for the E3S-RS30 and E3S-R1□□□/R1B□□ (Included)

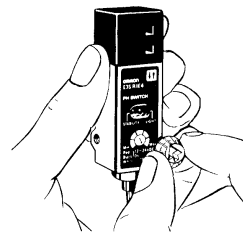


### E39-G2 Sensitivity Adjuster Knob for E3S-R□□

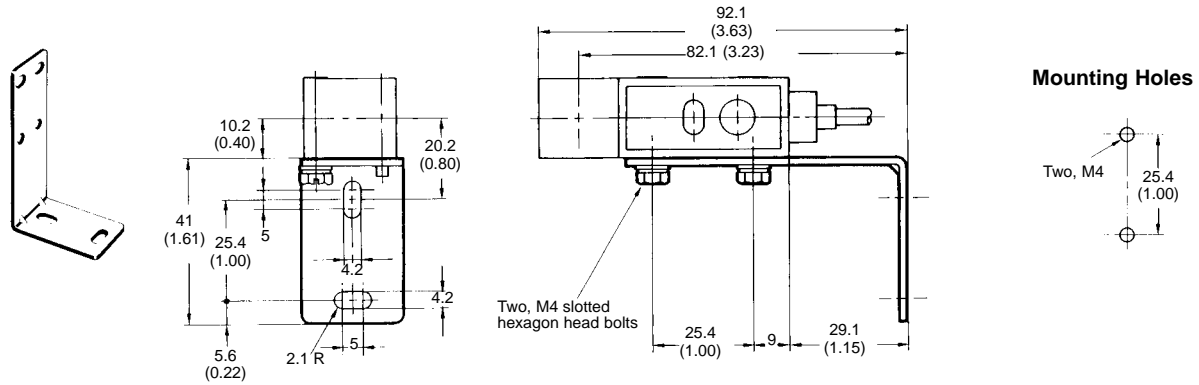


### Installing the Sensitivity Adjuster Knob

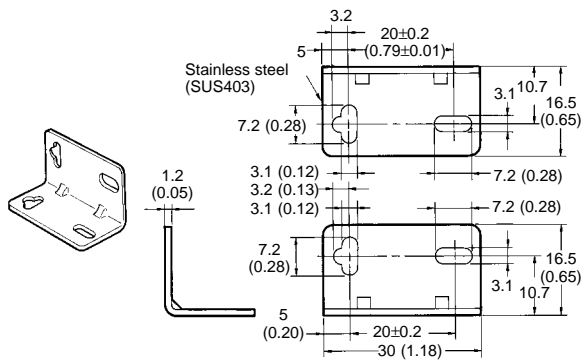
Align the sensitivity adjuster knob with the groove on the sensitivity adjuster. The arrow should point toward the sensing head as shown in the illustration. Press the knob in place. It is impossible to remove the sensitivity adjuster knob from the E3S-R after it has been installed.



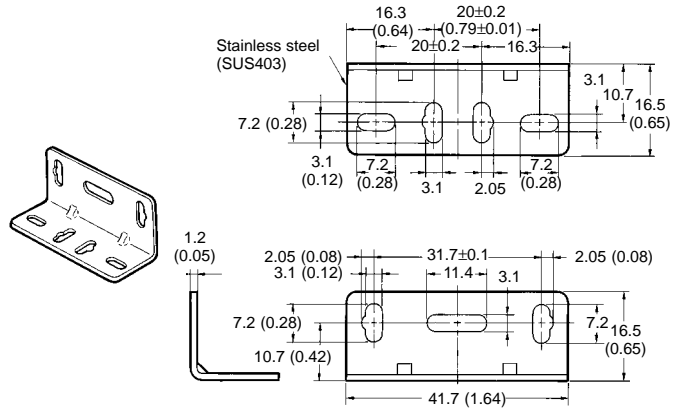
**E39-L2 Special Mounting Bracket for the E3S-RS30 and E3S-R1(Order Separately)**



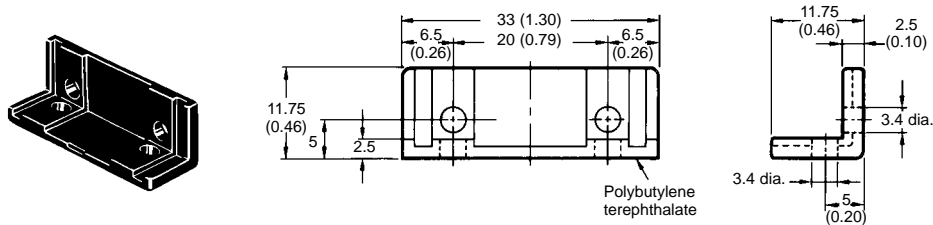
**E39-L69 Mounting Bracket for E3S-R□□ Horizontal Type (Included)**



**E39-L70 Mounting Bracket for E3S-R□□ Vertical Type (Included)**

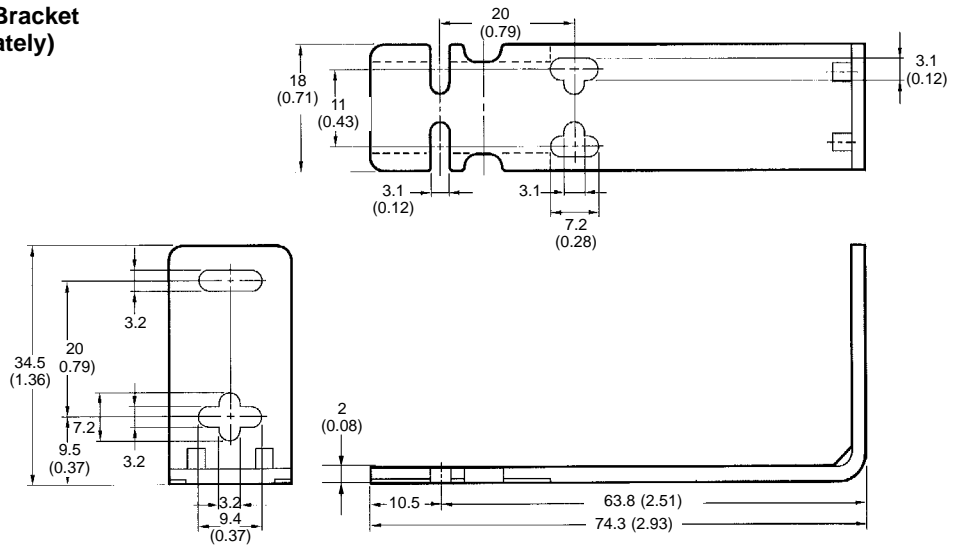
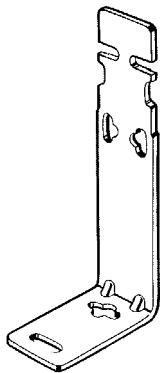


**E39-L60 Contact Mounting Plate for E3S-R□□ Plug-in Connector Type (Order Separately)**



■ ACCESSORIES

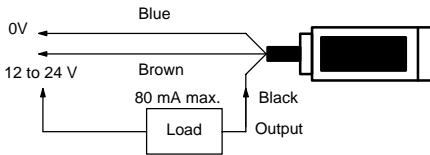
**E39-L59 Vertical Mounting Bracket for E3S-R□□ (Order Separately)**



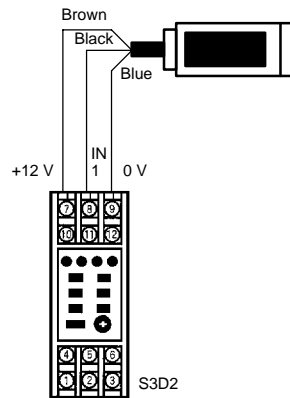
Installation

■ CONNECTIONS

If the brown and blue lead wires are connected in reverse, the output mode can be changed for the E3S-RS30E□□ and E3S-R1E□□/-R1B□□ (Light-ON, Dark-ON).

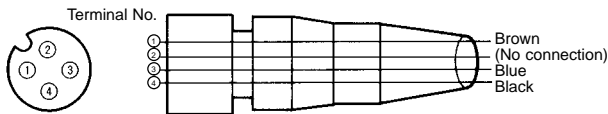


The E3S-R will operate in reverse using the signal input selector of the S3D2.



With S3D2 Sensor Controller

■ INTERNAL CONNECTION



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

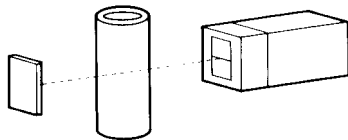
## Precautions

### ■ CONNECTIONS

- Do not impose an excessive voltage or 100 VAC on any E3S-R DC model.
- Do not short-circuit the load. The E3S-R's short-circuit protection function is valid if the polarity of the supply voltage imposed is correct and within the rated voltage range.
- Be sure to wire the E3S-R and load correctly. Make sure to connect a proper load to the E3S-R in operation, or the sensor will be damaged.

### ■ ADJUSTMENT

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.

### ■ INSTALLATION

#### Power Reset Time

The Photoelectric Sensor is ready to operate within 100 ms after power is supplied. If power supplies are connected to the Photoelectric Sensor and load respectively, be sure to supply power to the Photoelectric Sensor before supplying power to the load.

#### Power OFF

The Photoelectric Sensor may output a pulse signal when it is turned off. Therefore, it is recommended to turn off the load before turning off the Photoelectric Sensor.

#### Types of Power Supplies

The Photoelectric Sensor must not be connected to a non-smoothed, all-wave or half-wave rectified power supply.

### ■ WIRING

#### Cable

The cable can be extended up to 100 m provided that the thickness of the cable is 0.3 mm<sup>2</sup> maximum.

#### Repeated Bending

The cable must not be bent repeatedly.

#### High-tension Lines

The power supply lines of the Photoelectric Sensor must not be wired alongside power lines or high-tension lines in the same conduit, otherwise the Photoelectric Sensor may become damaged or malfunction due to induction noise that may be generated from the power lines or high-tension lines.

#### Cable Tractive Force

Do not pull cable with the tractive forces exceeding the following.

Diameter	Tractive Force
4 dia. max.	30 N max.
4 dia. min.	50 N max.

Note: Do not impose tensile stress on any shielded wire or coaxial cable.

#### Unused Lead Wired

Cut any unused lead wire of the Photoelectric Sensor, such as a lead wire for self-diagnostic output, and insulate the lead wire with insulating tape so that the wire will not touch any terminal of the Photoelectric Sensor.

**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

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