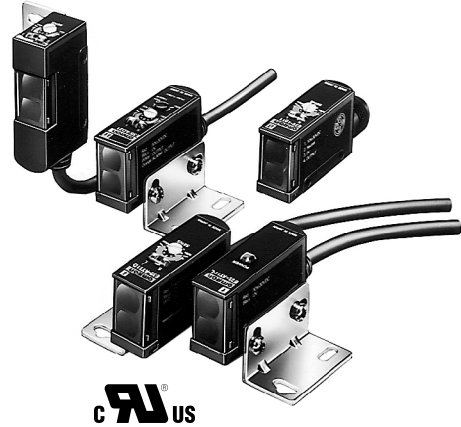


## General-Purpose Photoelectric Sensor

## E3S-A

Wide Selection of High Performance Small DC Sensors Offers Longer Sensing Distances

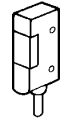
- Fast 0.5 msec response time for high-speed sensing
- Extended sensing distances up to 7 meters
- Self-diagnostic functions available
- Timer, alarm and turbo functions
- Meets: NEMA 4X, 6 and IP67
- Many mounting configurations available
- Choose pre-leaded or connector-ready models
- E3S-AD Series includes 10 cm short range diffuse version



## Ordering Information

### ■ SENSORS

Through-beam sensors include both emitter and receiver. The polarized retroreflective sensors include E39-R1 reflector. All sensors include mounting hardware. Optional mounting brackets are available as accessories.

| Method of detection                                                                 |        |                        |            | Through-beam   | Polarized retroreflective | Diffuse reflective |                 |                |
|-------------------------------------------------------------------------------------|--------|------------------------|------------|----------------|---------------------------|--------------------|-----------------|----------------|
| Sensing distance                                                                    |        |                        |            | 7 m (22.97 ft) | 2 m (6.56 ft)             | 10 cm (3.94 in)    | 20 cm (7.87 in) | 70 cm (2.3 ft) |
| Mounting                                                                            | Output | Extra features         | Connection | Part number    |                           |                    |                 |                |
|  | NPN    | None                   | Pre-leaded | E3S-AT11       | E3S-AR11                  | E3S-AD13           | E3S-AD11        | E3S-AD12       |
|                                                                                     |        | None                   | Connector  | E3S-AT16       | E3S-AR16                  | E3S-AD18           | E3S-AD16        | E3S-AD17       |
|                                                                                     |        | Timer, alarm and turbo | Pre-leaded | E3S-AT21       | E3S-AR21                  | E3S-AD23*          | E3S-AD21        | E3S-AD22*      |
|                                                                                     | PNP    | None                   | Pre-leaded | E3S-AT31       | E3S-AR31                  | E3S-AD33           | E3S-AD31        | E3S-AD32       |
|                                                                                     |        | None                   | Connector  | E3S-AT36       | E3S-AR36                  | E3S-AD38           | E3S-AD36        | E3S-AD37       |
|                                                                                     |        | Timer, alarm and turbo | Pre-leaded | E3S-AT41       | E3S-AR41                  | E3S-AD43*          | E3S-AD41        | E3S-AD42*      |
|  | NPN    | None                   | Pre-leaded | E3S-AT61       | E3S-AR61                  | E3S-AD63           | E3S-AD61        | E3S-AD62       |
|                                                                                     |        | None                   | Connector  | E3S-AT66       | E3S-AR66                  | E3S-AD68           | E3S-AD66        | E3S-AD67       |
|                                                                                     |        | Timer, alarm and turbo | Pre-leaded | E3S-AT71       | E3S-AR71                  | E3S-AD73*          | E3S-AD71        | E3S-AD72*      |
|                                                                                     | PNP    | None                   | Pre-leaded | E3S-AT81       | E3S-AR81                  | E3S-AD83           | E3S-AD81        | E3S-AD82       |
|                                                                                     |        | None                   | Connector  | E3S-AT86       | E3S-AR86                  | E3S-AD88           | E3S-AD86        | E3S-AD87       |
|                                                                                     |        | Timer, alarm and turbo | Pre-leaded | E3S-AT91       | E3S-AR91                  | E3S-AD93*          | E3S-AD91        | E3S-AD92*      |

\*10 and 70 cm diffuse versions do not have turbo function

## ■ ACCESSORIES

| Description                                                                                                     |                                 | Part number |
|-----------------------------------------------------------------------------------------------------------------|---------------------------------|-------------|
| Mounting bracket for vertical sensors (2 required for through-beam type)                                        |                                 | E39-L59     |
| Slits for E3S-AT□□ sensors (3 pairs: 2 mm, 1 mm and 0.5 mm wide, includes mounting hardware)                    |                                 | E39-S46     |
| Mutual interference filters for E3S-AT□□ sensors (2 pairs: horizontal and vertical, includes mounting hardware) |                                 | E39-E6      |
| Optical alignment reflector for E3S-AT□□                                                                        |                                 | E39-R5      |
| Straight connector cordsets<br>(4-pole female connector)                                                        | 2 m (6.56 ft) cable             | Y96E-43SD2  |
|                                                                                                                 | 5 m (16.40 ft) cable            | Y96E-43SD5  |
|                                                                                                                 | 10 m (32.81 ft) cable           | Y96E-43SD10 |
| Right-angle connector cordsets<br>(4-pole female connector)                                                     | 2 m (6.56 ft) cable             | Y96E-43RD2  |
|                                                                                                                 | 5 m (16.40 ft) cable            | Y96E-43RD5  |
|                                                                                                                 | 10 m (32.81 ft) cable           | Y96E-43RD10 |
| Small corner cube reflector                                                                                     | 10 to 130 cm (3.94 to 51.18 in) | E39-R3      |
|                                                                                                                 | 7 to 60 cm (2.76 to 23.62 in)   | E39-R4      |
| Adhesive back reflector                                                                                         | 10 to 30 cm (3.94 to 11.81 in)  | E39-RSA     |
|                                                                                                                 | 10 to 60 cm (3.94 to 23.62 in)  | E39-RSB     |
| Mounting bracket for E39-R1 reflector                                                                           |                                 | E39-L7      |

## ■ REPLACEMENT PARTS

| Description                                                         | Part number |
|---------------------------------------------------------------------|-------------|
| Knob for sensitivity adjuster                                       | E39-G2      |
| Mounting bracket spacer for connector versions                      | E39-L60     |
| Corner cube reflector (supplied with E3S-AR□□)                      | E39-R1      |
| Mounting bracket for horizontal sensors (supplied with each sensor) | E39-L69     |
| Mounting bracket for vertical sensors (supplied with each sensor)   | E39-L70     |

# Specifications

|                     |                     |                                                                                                                                                 |                                                                                                                                                                                                    |                                                |                                        |                                                   |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------|---------------------------------------------------|
| Part number         |                     | E3S-AT□□                                                                                                                                        | E3S-AR□□                                                                                                                                                                                           | E3S-AD□3,<br>E3S-AD□8                          | E3S-AD□1,<br>E3S-AD□6                  | E3S-AD□2,<br>E3S-AD□7                             |
| Method of detection |                     | Through-beam                                                                                                                                    | Polarized<br>retroreflective                                                                                                                                                                       | Diffuse reflective                             |                                        |                                                   |
| Supply voltage      |                     | 10 to 30 VDC, ±10%                                                                                                                              |                                                                                                                                                                                                    |                                                |                                        |                                                   |
| Current consumption |                     | 40 mA max.<br>(emitter and<br>receiver)<br>55 mA with turbo                                                                                     | 30 mA max.<br>45 mA with turbo                                                                                                                                                                     | 35 mA max.                                     | 30 mA max.<br>45 mA with turbo         | 35 mA max.                                        |
| Sensing<br>distance | White<br>mat paper  | 0 to 7 m<br>(0 to 22.97 ft)                                                                                                                     | 0.1 to 2 m with E39-R1<br>(0.33 to 6.56 ft)                                                                                                                                                        | 0 to 10 cm<br>(0 to 3.94 in)                   | 0.1 to 20 cm<br>(0.04 to 7.87 in)      | 0 to 70 cm<br>(0 to 27.56 in)                     |
|                     | Black<br>mat paper  |                                                                                                                                                 |                                                                                                                                                                                                    | 0.3 to 2.5 cm<br>(0.12 to 0.98 in)             | 0.5 to 2.3 cm<br>(0.20 to 0.91 in)     | 0.15 to 33 cm<br>(0.06 to 12.99 in)               |
|                     | With<br>accessories | 2.4 m (7.87 ft)<br>with E39-E6<br>2.5 m (8.20 ft)<br>with 2 mm slit<br>1.1 m (3.61 ft)<br>with 1 mm slit<br>0.5 m (1.64 ft)<br>with 0.5 mm slit | 10 to 130 cm with E39-R3<br>(3.94 to 51.18 in)<br>7 to 60 cm with E39-R4<br>(2.76 to 23.62 in)<br>10 to 30 cm with E39-RSA<br>(3.94 to 11.81 in)<br>10 to 60 cm with E39-RSB<br>(3.94 to 23.62 in) | —                                              | —                                      | —                                                 |
| Light source        |                     | Pulse modulated red LED (700 nm)                                                                                                                |                                                                                                                                                                                                    | Pulse modulated<br>infrared LED<br>(880 nm)    | Pulse modulated<br>red LED<br>(700 nm) | Pulse modulated<br>infrared LED<br>(880 nm)       |
| Standard<br>object  | Type                | Opaque materials                                                                                                                                |                                                                                                                                                                                                    | Opaque and transparent materials               |                                        |                                                   |
|                     | Size                | 7 mm (0.28 in)<br>minimum                                                                                                                       | 30 mm (1.18 in)<br>minimum                                                                                                                                                                         | 10 x 10 cm (3.94 x 3.94 in)<br>white mat paper |                                        | 20 x 20 cm<br>(7.87 x 7.87 in)<br>white mat paper |
| Operation mode      |                     | Light-ON/Dark-ON operation, wire selectable                                                                                                     |                                                                                                                                                                                                    |                                                |                                        |                                                   |

# SPECIFICATIONS (continued)

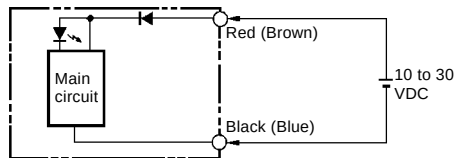
|                                                  |                            |                                                                                                                                                                                                                                        |                                    |                       |                       |                       |
|--------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------|-----------------------|-----------------------|
| Part number                                      |                            | E3S-AT□□                                                                                                                                                                                                                               | E3S-AR□□                           | E3S-AD□3,<br>E3S-AD□8 | E3S-AD□1,<br>E3S-AD□6 | E3S-AD□2,<br>E3S-AD□7 |
| Variation in sensing distance                    |                            | —                                                                                                                                                                                                                                      | —                                  | +30% max., –0% max.   |                       |                       |
| Hysteresis                                       |                            | —                                                                                                                                                                                                                                      | —                                  | 10% max.              |                       | 20% max.              |
| Variation in optical axis and mounting direction |                            | ±2° max.                                                                                                                                                                                                                               |                                    |                       |                       |                       |
| Sensitivity                                      |                            | Adjustable, 2-turn knob with clutch and indicator                                                                                                                                                                                      |                                    |                       |                       |                       |
| Mutual interference protection                   |                            | Not provided                                                                                                                                                                                                                           | Provided                           | Provided              | Provided              | Provided              |
| Control output                                   | Type                       | NPN transistor, open collector (E3S-A□1□, E3S-A□2□, E3S-A□6□, E3S-A□7□), (E3S-AD1□, E3S-AD2□, E3S-AD6□, E3S-AD7□)<br>PNP transistor, open collector (E3S-A□3□, E3S-A□4□, E3S-A□8□, E3S-A□9□), (E3S-AD3□, E3S-AD4□, E3S-AD8□, E3S-AD9□) |                                    |                       |                       |                       |
|                                                  | Max. load                  | 100 mA max. at 30 VDC                                                                                                                                                                                                                  |                                    |                       |                       |                       |
|                                                  | Max. ON-state voltage drop | 1 VDC max. at 100 mA load current                                                                                                                                                                                                      |                                    |                       |                       |                       |
| Self-diagnostics alarm output                    |                            | 50 mA max. load at 30 VDC, NPN or PNP transistor open collector to match control output                                                                                                                                                |                                    |                       |                       |                       |
| Response time                                    |                            | 0.5 ms max. ON, 0.5 ms max. OFF                                                                                                                                                                                                        |                                    |                       |                       |                       |
| OFF-delay timer                                  |                            | 0 to 100 ms with 3/4 turn adjuster                                                                                                                                                                                                     |                                    |                       |                       |                       |
| Check input                                      | NPN                        | Light OFF: gray wire connected to 0 to 1.5 VDC                                                                                                                                                                                         | —                                  | —                     | —                     |                       |
|                                                  | PNP                        | Light OFF: gray wire connected to supply voltage (30 VDC max.)                                                                                                                                                                         | —                                  | —                     | —                     |                       |
|                                                  | Response time              | 0.5 ms max.                                                                                                                                                                                                                            | —                                  | 0.5 ms max.           |                       |                       |
| Circuit protection                               |                            | Load short-circuit protection, reverse polarity protection                                                                                                                                                                             |                                    |                       |                       |                       |
| Indicators                                       |                            | Emitter:<br>Operation (red)<br>Receiver:<br>Operation (red)<br>Stability (green)                                                                                                                                                       | Operation (red), Stability (green) |                       |                       |                       |
| Materials                                        | Lens                       | Denatured polyarylate                                                                                                                                                                                                                  |                                    |                       |                       |                       |
|                                                  | Case                       | Polybutylene terephthalate (PBT)                                                                                                                                                                                                       |                                    |                       |                       |                       |
|                                                  | Bracket                    | Stainless steel                                                                                                                                                                                                                        |                                    |                       |                       |                       |
| Mounting                                         |                            | Either side surface with two threaded holes. Bracket E39-L69 for horizontal or E39-L70 for vertical sensors and hardware included.                                                                                                     |                                    |                       |                       |                       |
| Connections                                      | Prewired                   | 2 m (6.56 ft) long cable                                                                                                                                                                                                               |                                    |                       |                       |                       |
|                                                  | Connector                  | M12 threaded connector, 4 pin                                                                                                                                                                                                          |                                    |                       |                       |                       |
| Weight                                           | Prewired                   | Emitter:<br>60 g (2.1 oz.)<br>Receiver:<br>60 g (2.1 oz.)                                                                                                                                                                              | 60 g (2.1 oz.)                     | 60 g (2.1 oz.)        | 60 g (2.1 oz.)        | 60 g (2.1 oz.)        |
|                                                  | Connector                  | Emitter:<br>11 g (0.4 oz.)<br>Receiver:<br>11 g (0.4 oz.)                                                                                                                                                                              | 11 g (0.4 oz.)                     | 11 g (0.4 oz.)        | 11 g (0.4 oz.)        | 11 g (0.4 oz.)        |
| Enclosure rating                                 | IEC 144                    | IP67                                                                                                                                                                                                                                   |                                    |                       |                       |                       |
|                                                  | NEMA                       | 4X, 6                                                                                                                                                                                                                                  |                                    |                       |                       |                       |
| Ambient temperature                              | Operating                  | -25° to 55°C (-13° to 131°F) with no ice build-up                                                                                                                                                                                      |                                    |                       |                       |                       |
|                                                  | Storage                    | -40° to 70°C (-40° to 158°F)                                                                                                                                                                                                           |                                    |                       |                       |                       |

# Operation

## ■ OUTPUT CIRCUIT DIAGRAMS

### NPN Cable Type

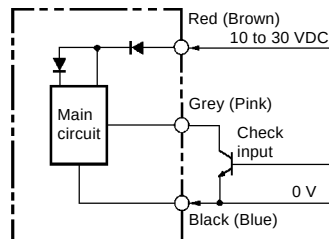
Through-beam emitter E3S-AT11, E3S-AT61



NOTE: IEC colors are shown in parentheses.

### NPN Cable Type with Self-Diagnostic Functions

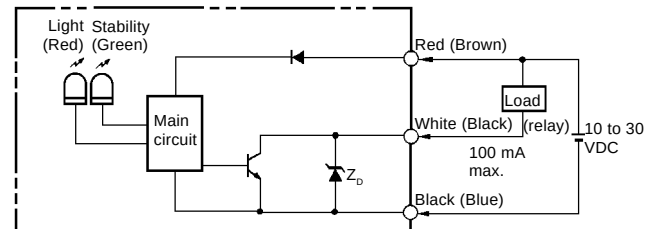
Through-beam emitter E3S-AT21, E3S-AT71



Through-beam receiver E3S-AT11, E3S-AT61

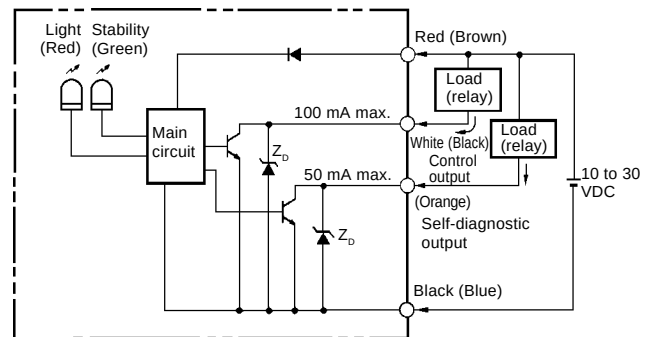
Retroreflective E3S-AR11, E3S-AR61

Diffuse reflective E3S-AD11, E3S-AD12, E3S-AD13, E3S-AD61, E3S-AD62, E3S-AD63



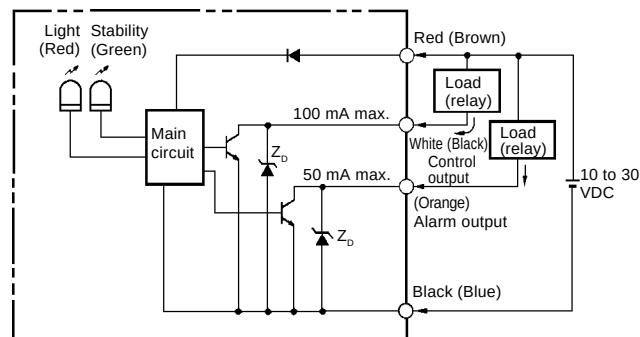
Through-beam receiver E3S-AT21, E3S-AT71

Diffuse reflective E3S-AD21, E3S-AD22, E3S-AD71, E3S-AD72



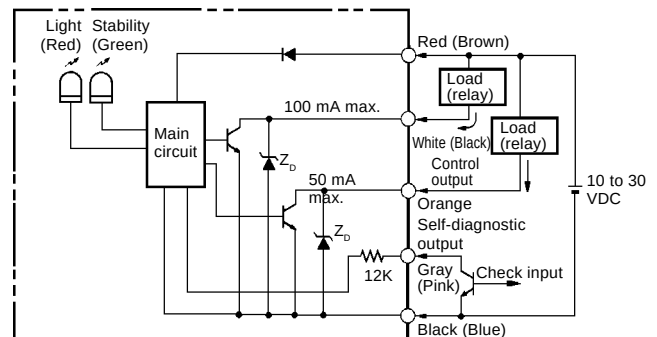
### NPN Cable Type with Alarm Output

Diffuse reflective E3S-AD23, E3S-AD73



### NPN Cable Type with Self-Diagnostic Functions

Retroreflective E3S-AR21, E3S-AR71



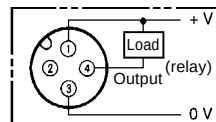
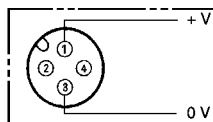
### NPN Connector Type

Through-beam emitter E3S-AT16, E3S-AT66

Through-beam receiver E3S-AT16, E3S-AT66

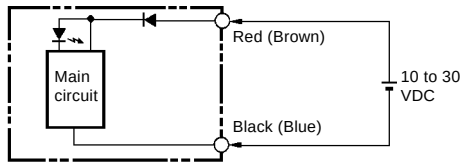
Retroreflective E3S-AR16, E3S-AR66

Diffuse reflective E3S-AD16, E3S-AD17, E3S-AD18, E3S-AD66, E3S-AD67, E3S-AD68



## PNP Cable Type

Through-beam emitter E3S-AT31, E3S-AT81

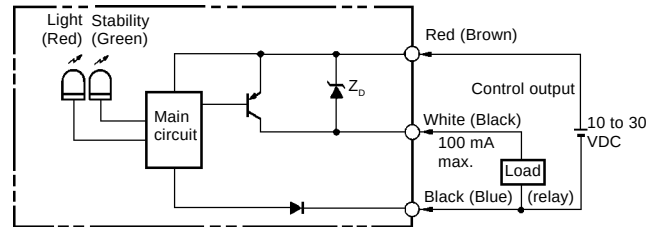


NOTE: IEC colors are shown in parentheses.

Through-beam receiver E3S-AT31, E3S-AT81

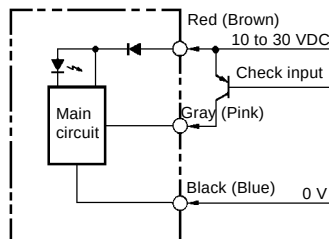
Retroreflective E3S-AR31, E3S-AR81

Diffuse reflective E3S-AD31, E3S-AD32, E3S-AD33, E3S-AD81, E3S-AD82, E3S-AD83



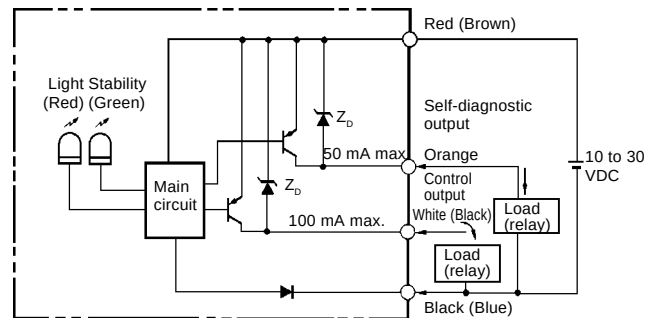
## PNP Cable Type with Self-Diagnostic Functions

Through-beam emitter E3S-AT41, E3S-AT91



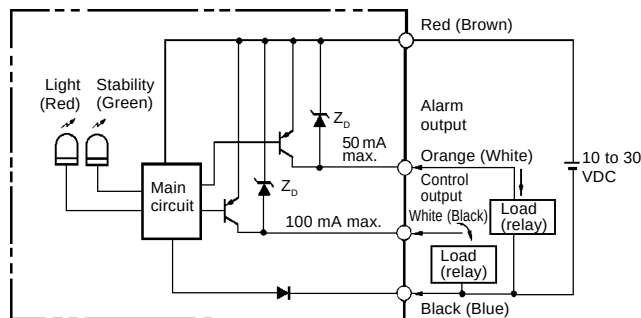
Through-beam receiver E3S-AT41, E3S-AT91

Diffuse reflective E3S-AD41, E3S-AD42, E3S-AD91, E3S-AD92

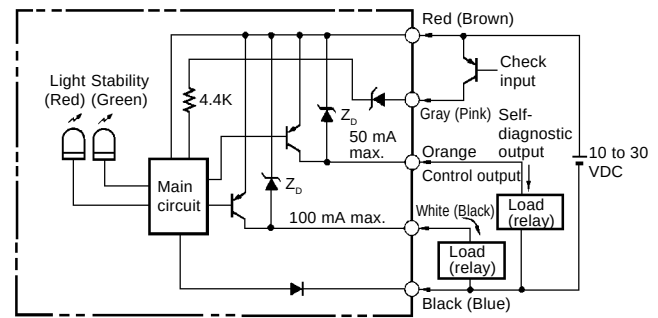


## PNP Cable Type with Alarm Output

Diffuse reflective E3S-AD43, E3S-AD93



Retroreflective E3S-AR41, E3S-AR91



## PNP Connector Type

Through-beam emitter Through-beam receiver

E3S-AT36, E3S-AT86

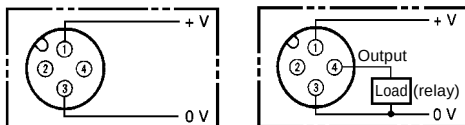
E3S-AT36, E3S-AT86

Retroreflective E3S-AR36, E3S-AR86

Diffuse reflective E3S-AD36,

E3S-AD37, E3S-AD38, E3S-AD86,

E3S-AD87, E3S-AD88,

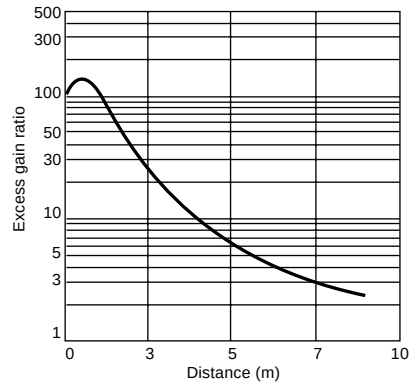


NOTE: IEC colors are shown in parentheses.

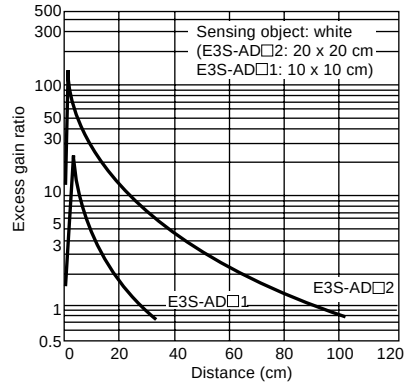
# Engineering Data

## ■ EXCESS GAIN RATIO

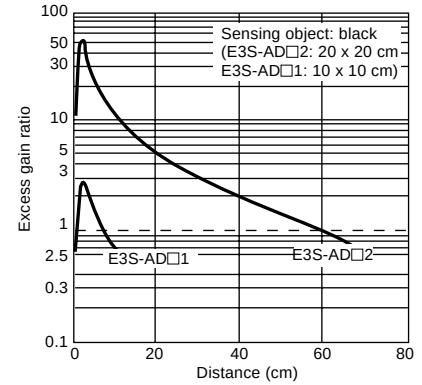
Excess Gain vs. Set Distance  
(Typical) E3S-AT□1



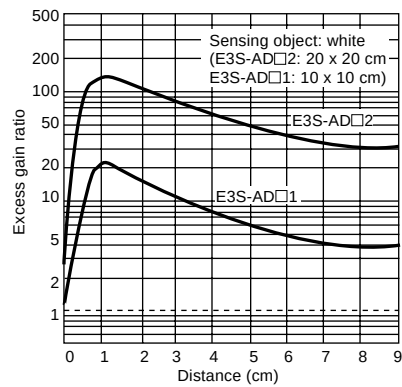
E3S-AD□1, -AD□2 (Detection of White Paper)



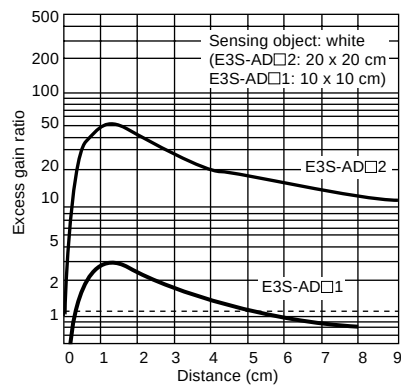
E3S-AD□1, -AD□2 (Detection of Black Paper)



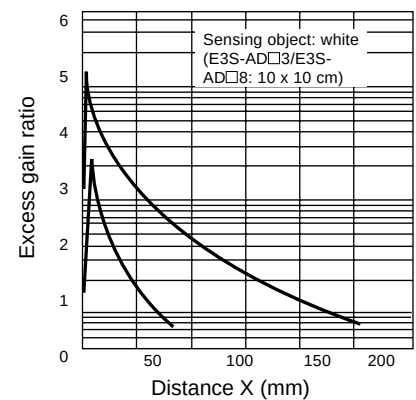
E3S-AD□1, -AD□2 (White Paper within Short Distance)



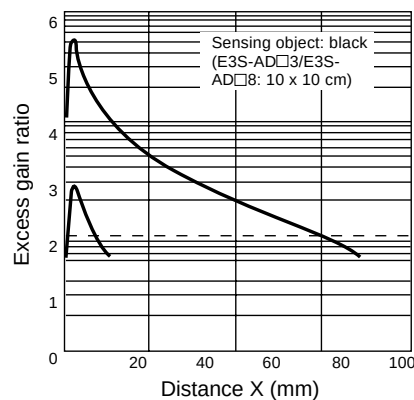
E3S-AD□1, -AD□2 (Black Paper within Short Distance)



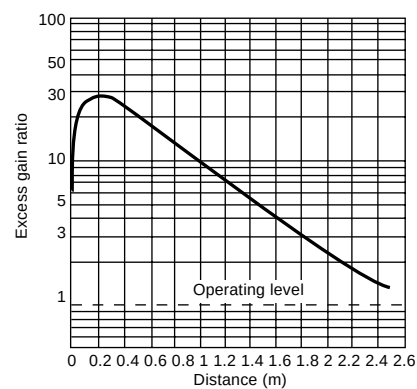
E3S-AD□3, -AD□8 (Detection of White Paper)



E3S-AD□3, -AD□8 (Detection of Black Paper)



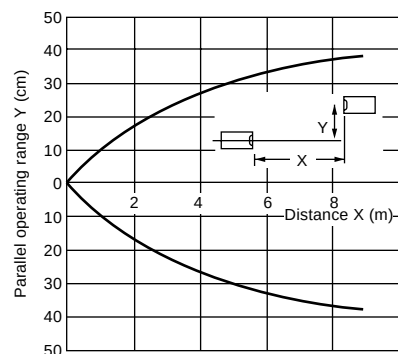
E3S-AR□1 (With Reflector: E39-R1)



## OPERATING RANGE

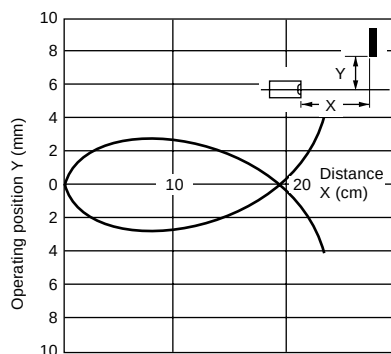
### Parallel Operating Range (Typical)

E3S-AT□1

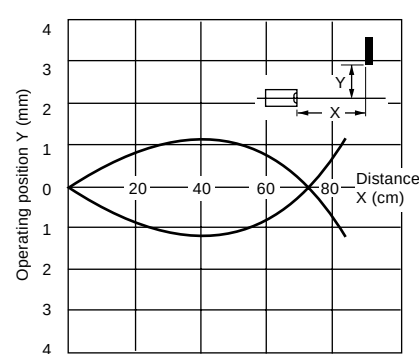


### Operating Range (Typical)

E3S-AD□1

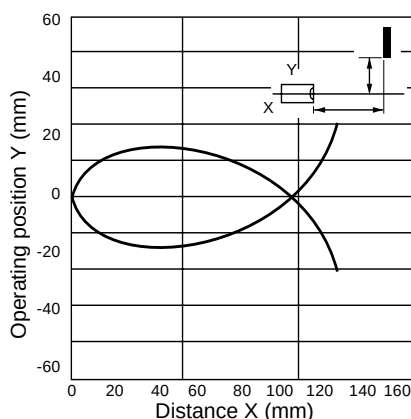


E3S-AD□2

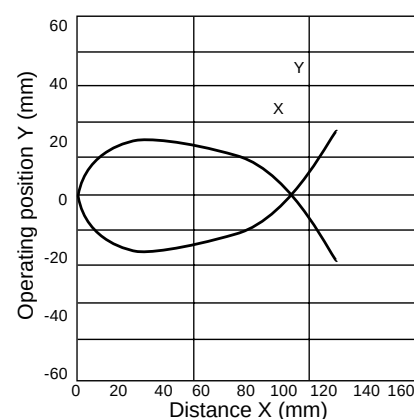


## OPERATING RANGE (typical)

E3S-AD□3, E3S-AD□8 (Left and Right)

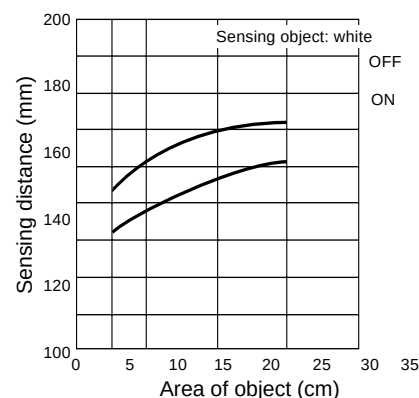


E3S-AD□3, E3S-AD□8 (Up and Down)



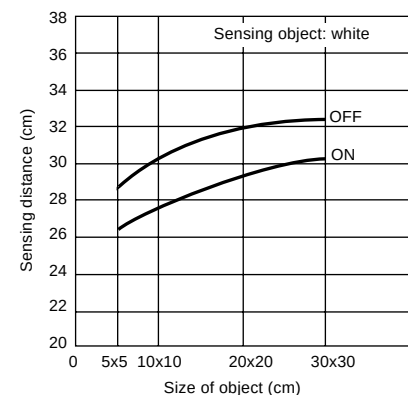
## SENSING DISTANCE VS. OBJECT SIZE

E3S-AD□3, E3S-AD□8

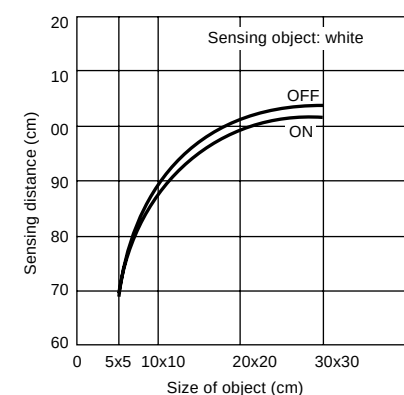


## SENSING DISTANCE VS. OBJECT SIZE

E3S-AD□1

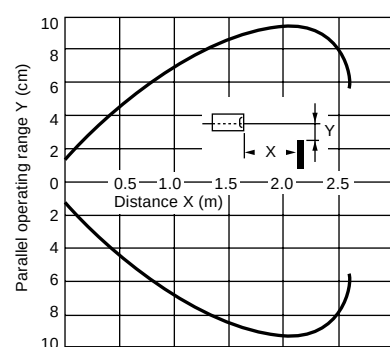


E3S-AD□2



## REFLECTOR PARALLEL MOVEMENT

(Typical) E3S-AR□1



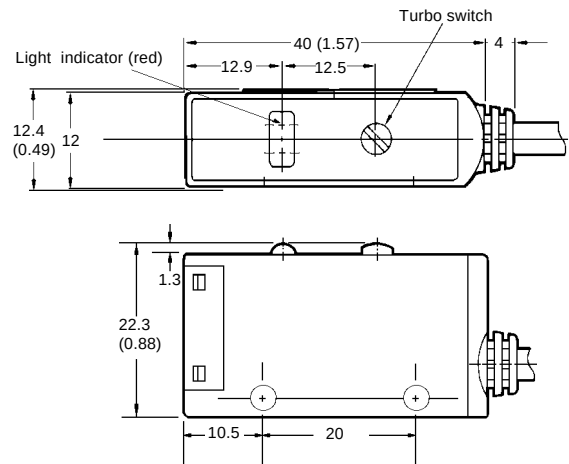
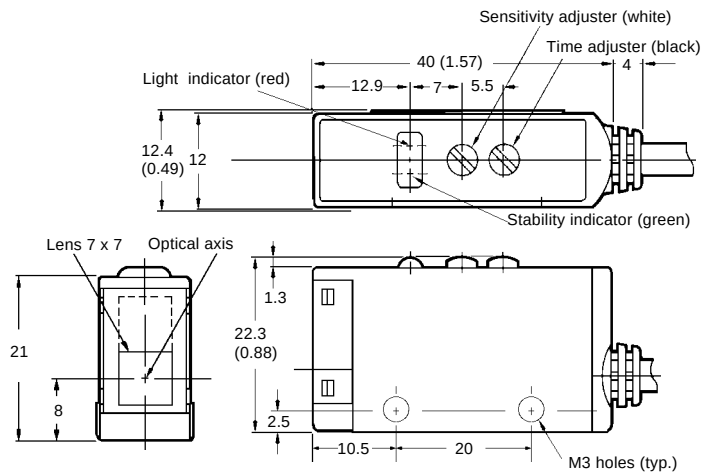
# Dimensions

Unit: mm (inch)

## ■ SENSORS

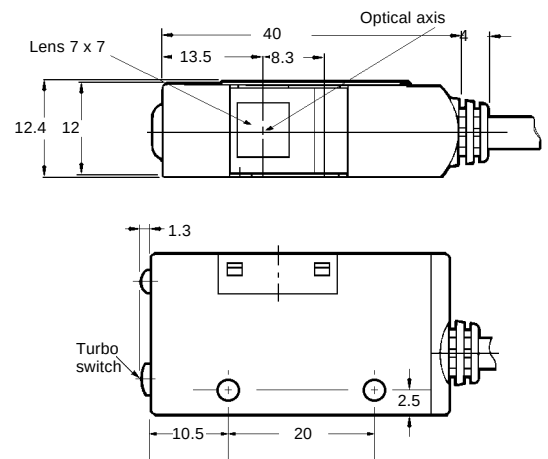
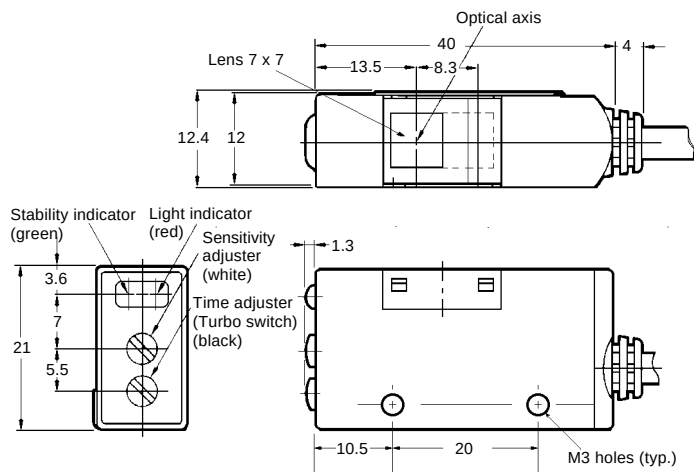
**E3S-AD11, E3S-AD12, E3S-AD13, E3S-AD31, E3S-AD32, E3S-AD33 (see note 1), E3S-AD21, E3S-AD22, E3S-AD23, E3S-AD41, E3S-AD42, E3S-AD43**  
**Receiver: E3S-AT11, E3S-AT31 (see note 2)**  
**E3S-AT21, E3S-AT41**

**Emitter: E3S-AT11, E3S-AT31 (see note 3)**  
**E3S-AT21, E3S-AT41**



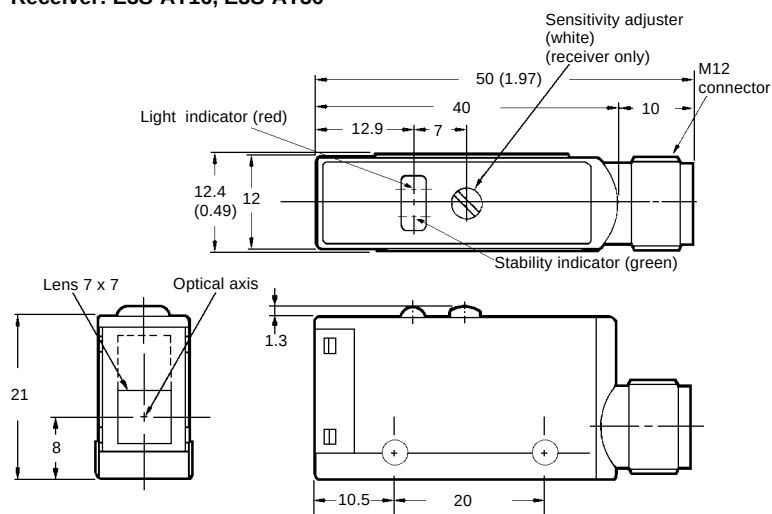
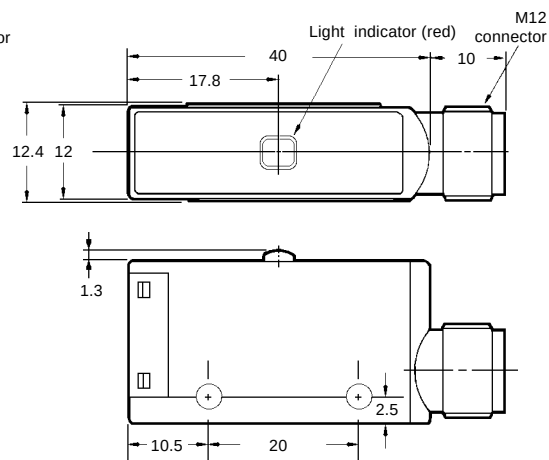
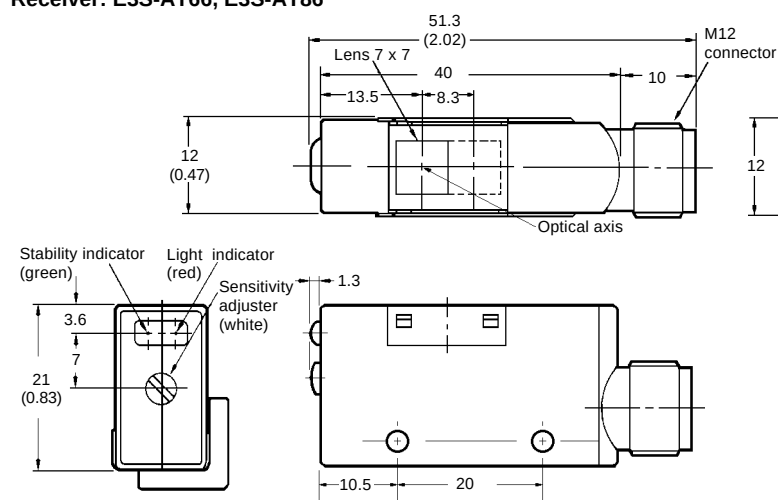
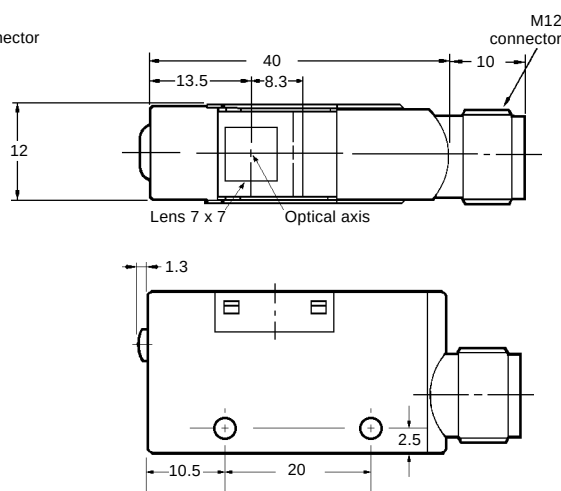
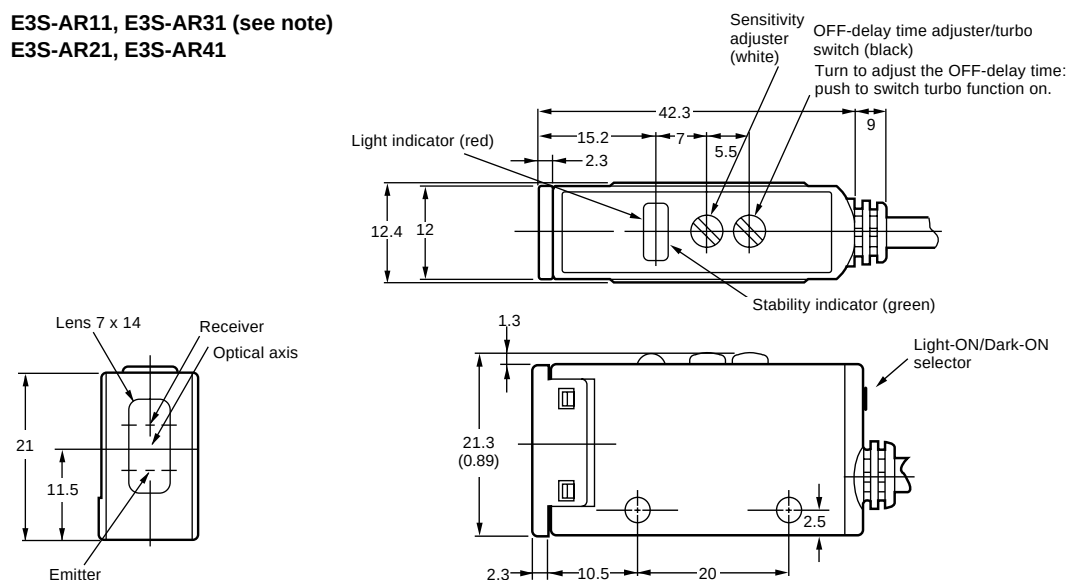
**E3S-AD61, E3S-AD62, E3S-AD63, E3S-AD81, E3S-AD82, E3S-AD83 (see note 1), E3S-AD71, E3S-AD72, E3S-AD73, E3S-AD91, E3S-AD92, E3S-AD93**  
**Receiver: E3S-AT61, E3S-AT81 (see note 2)**  
**E3S-AT71, E3S-AT91**

**Emitter: E3S-AT61, E3S-AT81 (see note 3)**  
**E3S-AT71, E3S-AT91**

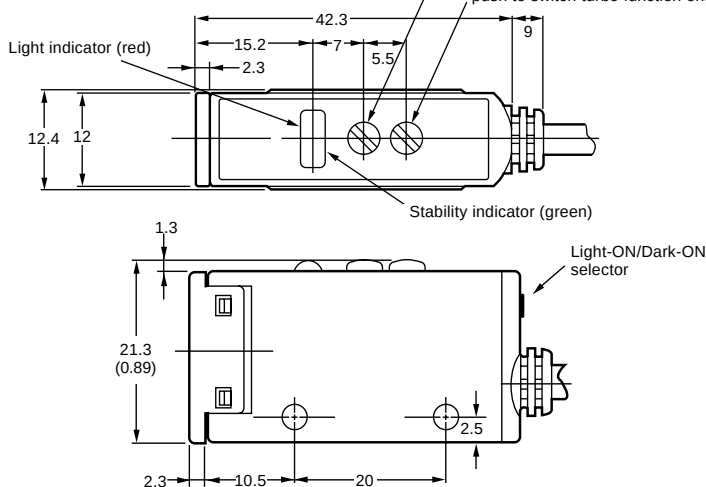


NOTES: 1. No time adjuster/turbo included on models E3S-AD61, E3S-AD62, E3S-AD81 and E3S-AD82.  
 2. No time adjuster included on models E3S-AT61 and E3S-AT81.  
 3. No turbo switch included on models E3S-AT61 and E3S-AT81.

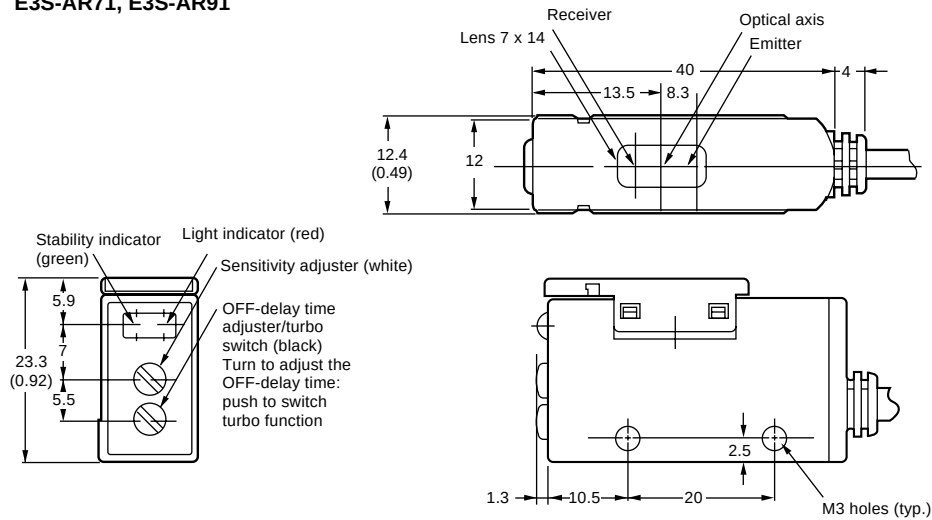
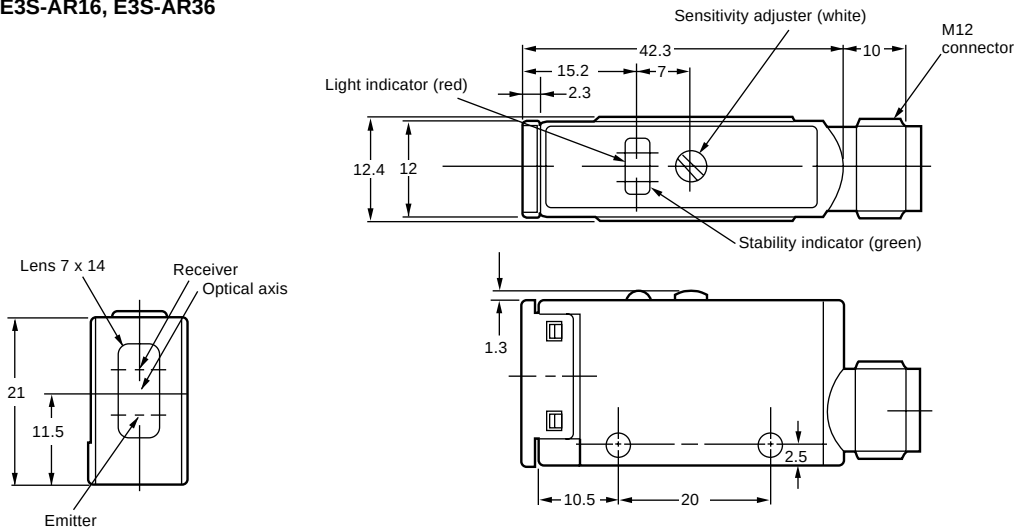
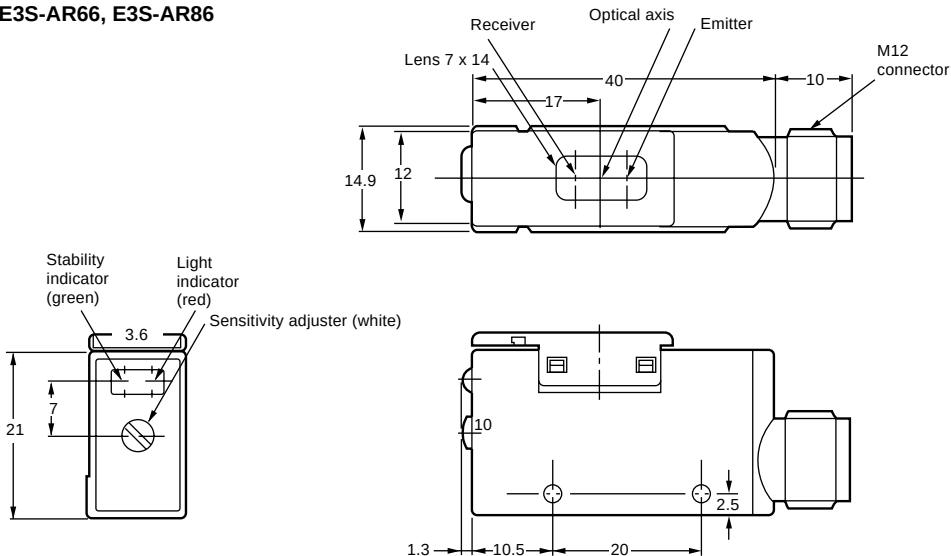


**SENSORS (continued)****E3S-AD16, E3S-AD17, E3S-AD18, E3S-AD36, E3S-AD37, E3S-AD38****Receiver: E3S-AT16, E3S-AT36****Emitter: E3S-AT16, E3S-AT36****E3S-AD66, E3S-AD67, E3S-AD68, E3S-AD86, E3S-AD87, E3S-AD88****Receiver: E3S-AT66, E3S-AT86****Emitter: E3S-AT66, E3S-AT86****E3S-AR11, E3S-AR31 (see note)****E3S-AR21, E3S-AR41**

Sensitivity adjuster (white)  
OFF-delay time adjuster/turbo switch (black)  
Turn to adjust the OFF-delay time:  
push to switch turbo function on.



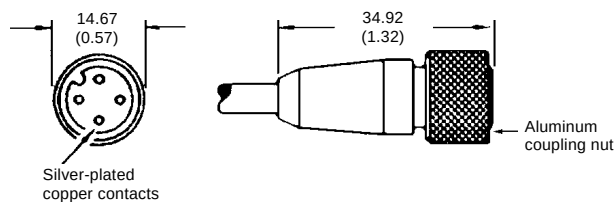
NOTE: No time adjuster/turbo included on models E3S-AR11 and E3S-AR31.

**SENSORS (continued)****E3S-AR61, E3S-AR81****E3S-AR71, E3S-AR91****E3S-AR16, E3S-AR36****E3S-AR66, E3S-AR86**

## OPTIONAL CONNECTOR CORDSETS

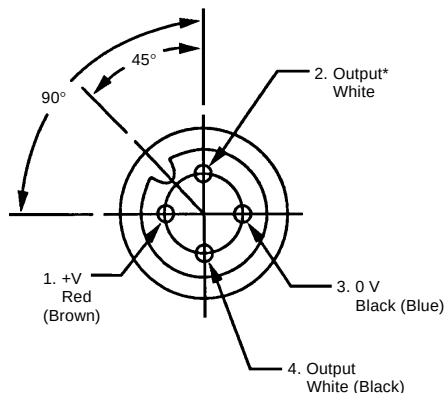
Cordsets consist of a female connector and 3-conductor, 22 AWG, PVC jacketed cable rated for 300 V, 90°C. The cable may be extended to a maximum of 200 m (656 ft).

### Straight Connector Cordsets Y96E-43SD□

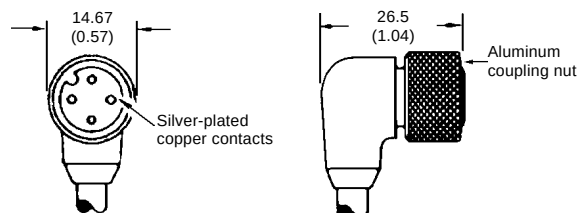


2 m (6.56 ft) length for Y96E-43SD2  
 5 m (16.40 ft) length for Y96E-43SD5  
 10 m (32.81 ft) length for Y96E-43SD10

### Face View, Female Connector



### Right Angle Connector Cordsets Y96E-43RD□



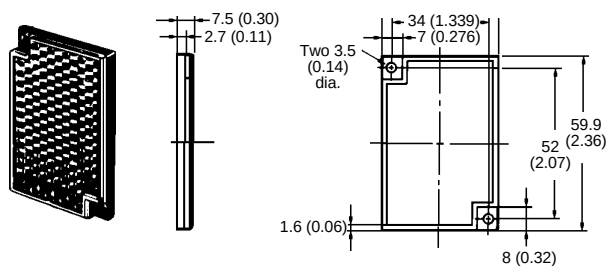
2 m (6.56 ft) length for Y96E-43RD2  
 5 m (16.40 ft) length for Y96E-43RD5  
 10 m (32.81 ft) length for Y96E-43RD10

### NOTES:

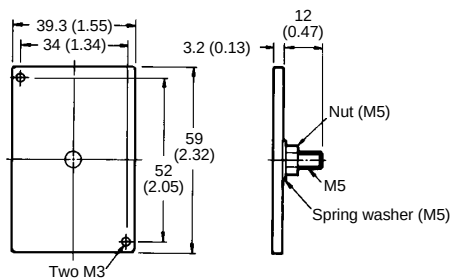
\*Not used on 3-wire models.  
 IEC colors are shown in parentheses.

## CORNER CUBE REFLECTORS

### E39-R1 Reflector (included with E3S-AR□□)



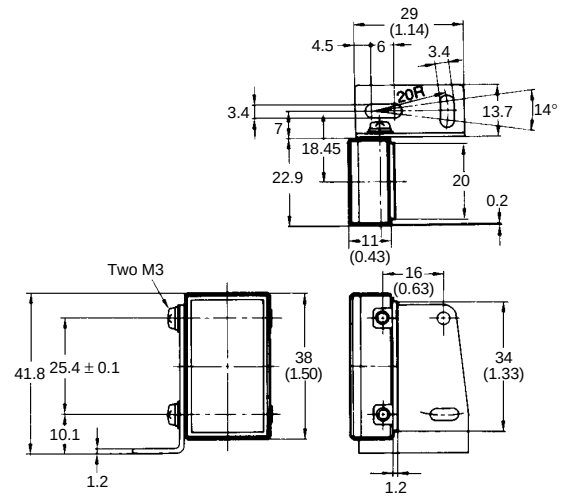
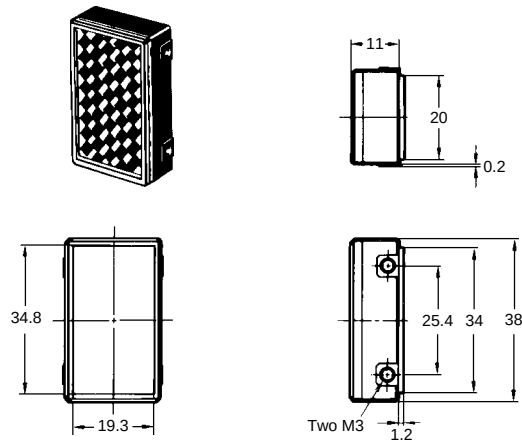
### E39-L7 Reflector Adapter for E39-R1 Reflector



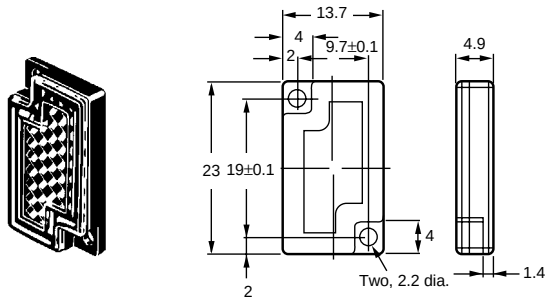
## ■ CORNER CUBE REFLECTORS (continued)

### E39-R3 Optional Reflector

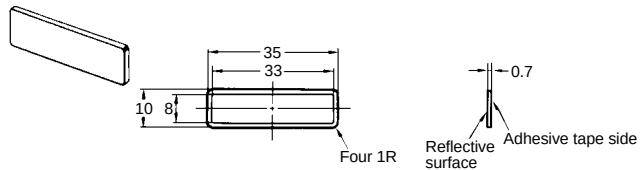
Dimensions with E39-L54 Mounting Bracket (included)



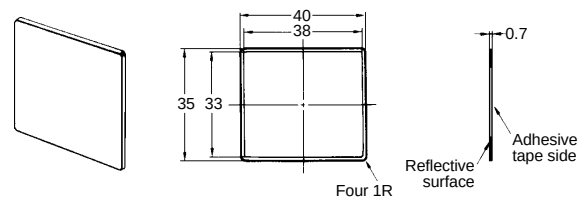
### E39-R4 Optional Mini-reflector



### E39-RSA Optional Adhesive-backed Reflector

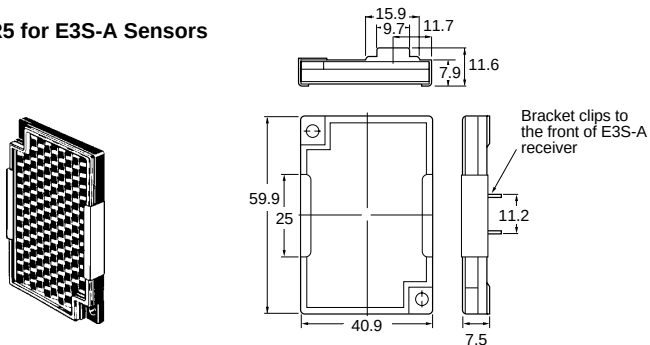


### E39-RSB Optional Adhesive-backed Reflector



## ■ OPTICAL AXIS CONFIRMATION REFLECTOR

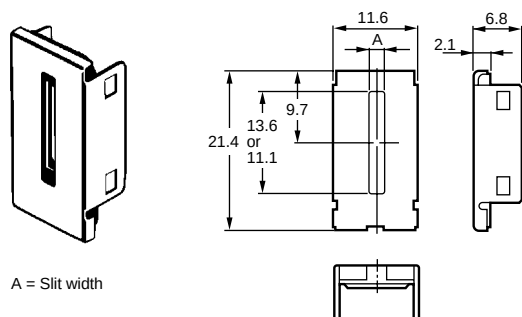
### E39-R5 for E3S-A Sensors



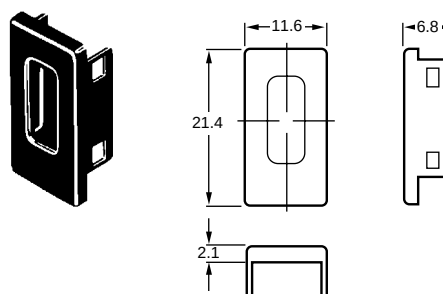
## SLITS AND FILTERS

### E39-S46 Slits

Kit for through-beam sensors contains 0.5 mm, 1 mm and 2 mm wide slits and mounting frame.

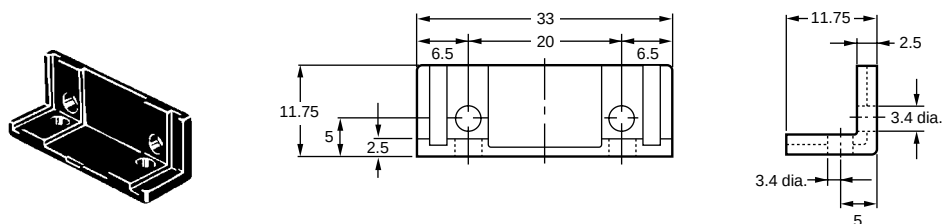


### E39-E6 Mutual Interference Filter



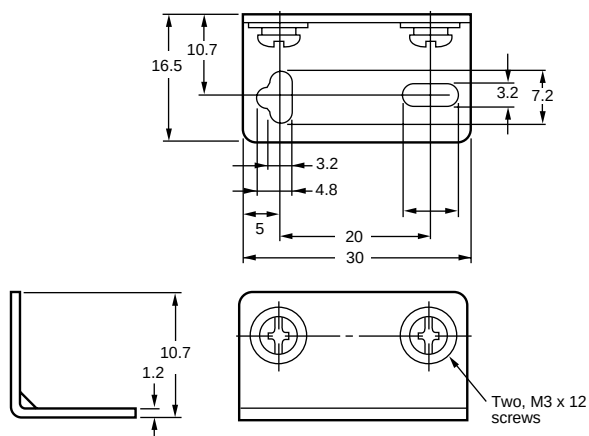
## MOUNTING SPACER FOR CONNECTOR-TYPE SENSORS

### E39-L60 Spacer

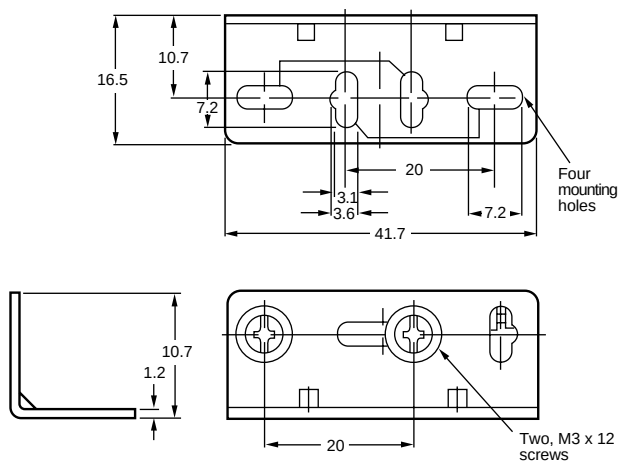


## MOUNTING BRACKETS (supplied with sensors)

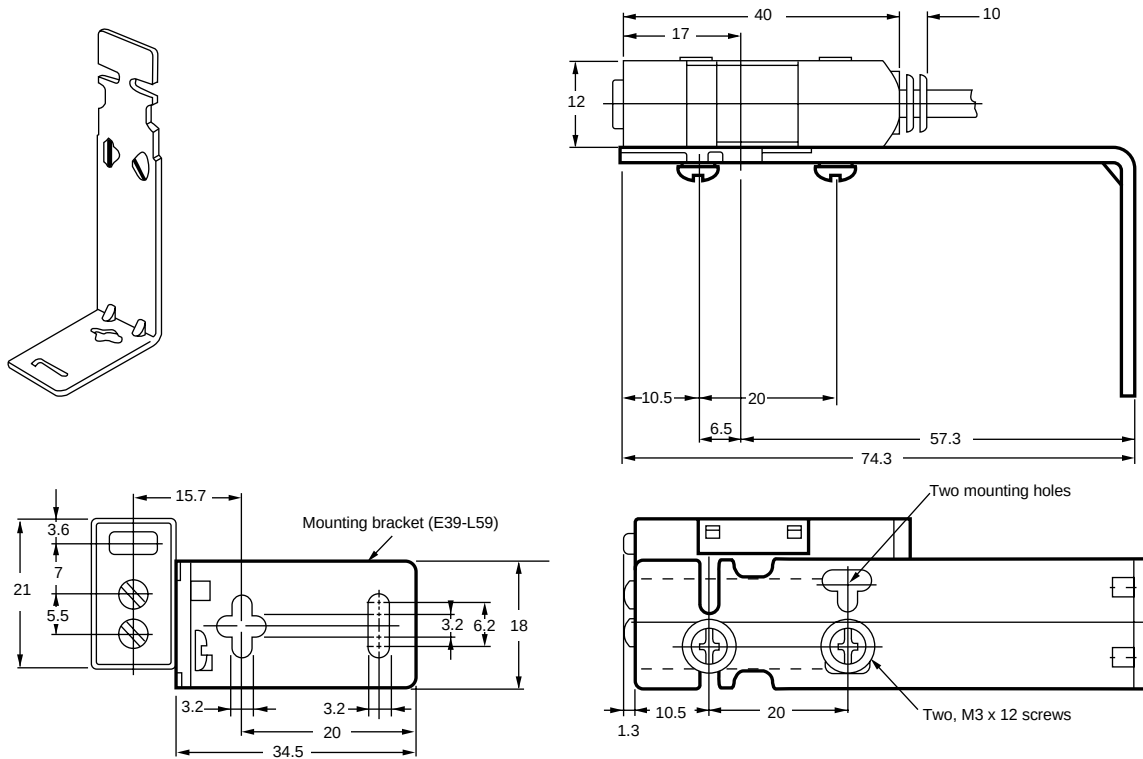
### E39-L69 Mounting Bracket



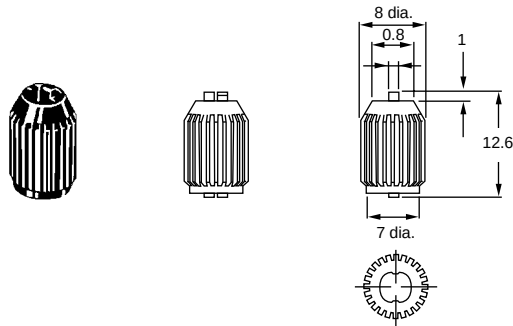
### E39-L70 Mounting Bracket



## ■ E39-L59 OPTIONAL VERTICAL MOUNTING BRACKET

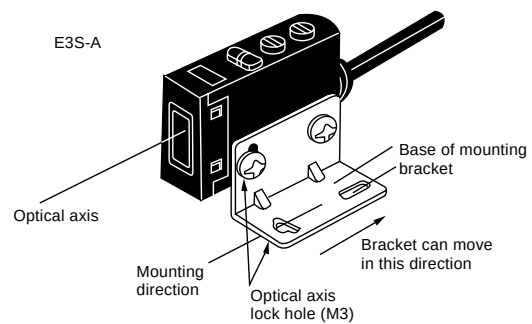


## ■ E39-G2 SENSITIVITY ADJUSTER KNOB



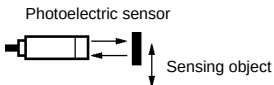
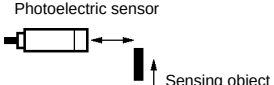
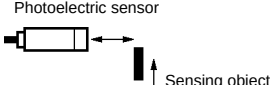
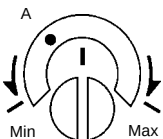
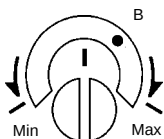
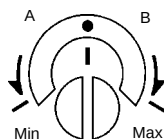
## ■ MOUNTING BRACKET NOTCH

Each mounting bracket slot has a notch to provide a center position for aligning the sensor parallel to the bracket. This ensures that the beam is aligned with the mounting surface.



# Installation

## ■ SENSITIVITY ADJUSTMENT

| Steps                | Step 1                                                                                                                                                                                                                                                                                                        | Step 2                                                                                                                                                                                                                                                                    | Step 3                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function             | Determine Position A                                                                                                                                                                                                                                                                                          | Determine Position B                                                                                                                                                                                                                                                      | Adjust to optimum setting                                                                                                                                                                                                                                                                                                                                                                  |
| Sensing Condition    |                                                                                                                                                                                                                              |                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                         |
| Sensitivity adjuster |                                                                                                                                                                                                                              |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                         |
| Indicators           | OFF  STABILITY (green)<br>ON  LIGHT (red)                                                                                                   | OFF  STABILITY (green)<br>OFF  LIGHT (red)                                                              | ON  STABILITY (green)<br>OFF  LIGHT (red)                                                                                                                                                                            |
| Procedure            | Place target at the desired sensing distance. Set sensitivity adjuster to the minimum scale position, and gradually increase sensitivity by turning the sensitivity adjuster clockwise until the Light Incident indicator (red LED) turns ON. Position A designates the point at which the LED has turned ON. | Remove the target. Starting from the maximum scale position, gradually decrease sensitivity by turning the sensitivity adjuster counterclockwise until the Light Incident indicator (red LED) turns OFF. Position B designates the point at which the LED has turned OFF. | Set the sensitivity indicator to the position between Positions A and B (in some cases, Positions A and B are opposite of the above example). The photoelectric sensor will then work normally if the stability indicator (green) is lit with and without the target. If it is not lit, stable operation cannot be expected, in which case a different detection method should be applied. |

Unlike conventional photoelectric sensors, the variation in the sensitivity of E3S photoelectric sensors is minimal. This means the sensitivity can be adjusted on only a single photoelectric sensor, and then the adjusters on the other photoelectric sensors can be set to the same scale position. There is no need to adjust the sensitivity of each photoelectric sensor individually.

## ■ TIMER AND TURBO SWITCH

E3S Sensors equipped with the self-diagnostic feature incorporate an OFF-delay timer that can be adjusted within range of 0 to 100 ms.

The emitter of the through-beam sensor with the self-diagnostic feature incorporates a turbo switch. When this switch is on, the intensity of the red LED light source can be increased to make a brighter spot. The OFF-delay time adjuster of the retroreflective and the 20-cm diffuse reflective sensor is used as a turbo switch. When the adjuster is pressed, it functions as a turbo switch to automatically increase the power of the light source to create a brighter light spot. Do not press the adjuster when turning it.

### Turbo Function (Turbo Switch)

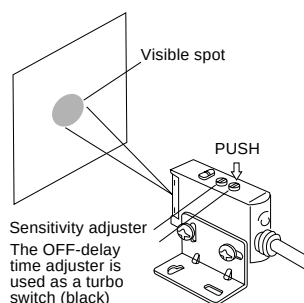
With the turbo function switched ON, the light spot is visible even at a distance of 20 cm (7.87 in), making it easy to check the sensing position and the angle of the optical axis.

- After using the turbo function, readjust the OFF-delay time that had been set, since the OFF-delay time could have been changed when the turbo switch (which is on the OFF-delay time adjuster) was pressed.

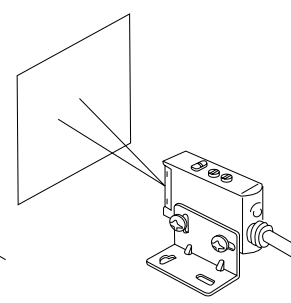
- Press the OFF-delay time adjuster to switch ON the turbo function with a maximum force of 1 kg and within a maximum period of 3 minutes. (The photoelectric sensor, however, will not malfunction even if the turbo function is switched on for more than 3 minutes.)

The turbo function is effective with the turbo switch pressed, and the function is reset automatically when released.

### With Turbo Switch ON

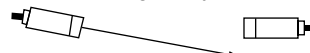
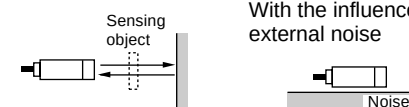


### Normal Operating Condition



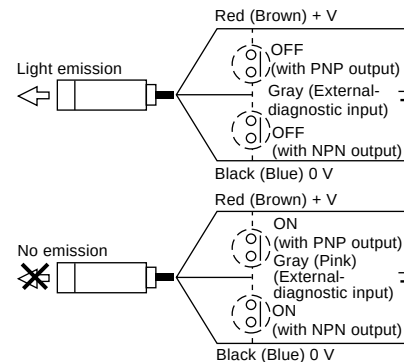
### Self-Diagnostic Function

With this function, the E3S-A sensor checks changes in environmental conditions (especially a change in the ambient temperature) and self-diagnoses the resistance against the changes. The result is shown by the indicators or an output signal.

| Amount of incident light | Incident light indicator (red)              | Indicator                                                                                        | Green Indicator                                                                                                                                               | Self-diagnostic function                                                                  | Self-diagnostic example                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2 or more              | With light incident (red indicator: ON)     | <br>Green Red   | Stable operating state with incident light: Stable operation is expected in the rated temperature range with the green indicator ON.                          | —                                                                                         | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1.0 to 1.2               |                                             | <br>Green Red   | Conditional operating state with incident light: Stable operation is expected if the temperature fluctuation is within $\pm 10\%$ of the primary temperature. | The self-diagnostic alarm output alerts the user to this state if it continues for 0.3 s. | <p>The optical axis misaligned by vibration.</p>                                                                                                                                                                                                                                                                                                                                 |
|                          |                                             |                                                                                                  |                                                                                                                                                               |                                                                                           | <p>Light decreased by dust.</p>                                                                                                                                                                                                                                                                                                                                                  |
| 0.8 to 1.0               | Without light incident (red indicator: OFF) | <br>Green Red   |                                                                                                                                                               |                                                                                           | <p>With light leakage (through-beam and retroreflective sensors)</p>  <p>Light reflected from the floor or the background (diffuse reflective sensors)</p>  <p>With the influence of external noise</p>  |
| 0.8 or less              |                                             | <br>Green Red | Stable operating state with no incident light: Stable operation is expected in the rated temperature range with the green indicator ON.                       | —                                                                                         | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### EXTERNAL DIAGNOSTIC INPUT FUNCTION

To switch the emission off, short-circuit the gray (pink) and the black (blue) cords of the emitter of the E3S-AT□ or the E3S-AR□ with the NPN output feature. For the E3S-AR□ with the PNP output feature, short-circuit the gray (pink) and the red (brown) cords.



NOTE: IEC colors are shown in parentheses.



## ■ SLITS FOR THROUGH-BEAM SENSORS

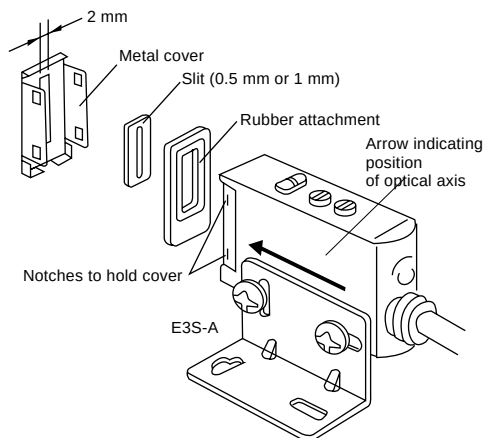
### E39-S46 Slit Set

Using slits allows smaller objects to be detected and reduces the sensing distance.

| Slit width | Sensing distance | Min. object size |
|------------|------------------|------------------|
| 0.5 mm     | 0.5 m (1.64 ft)  | 0.5 mm (0.02 in) |
| 1 mm       | 1.1 m (3.61 ft)  | 1 mm (0.04 in)   |
| 2 mm       | 2.4 m (8.20 ft)  | 2 mm (0.08 in)   |

Use the rubber attachment with the metal cover if a slit width of 2 mm is required. Insert the 0.5- or 1-mm slit between the metal cover and rubber attachment if a slit width of 0.5 or 1 mm is desired. These slits fit into the rubber attachment.

NOTE: Apply the slit to the lens of the photoelectric sensor marked with an arrow indicating the position of the optical axis (apply it to the bottom lens of horizontal sensors and the top lens of vertical sensors).



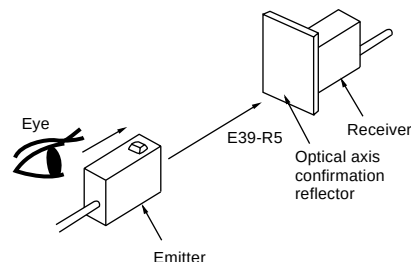
## ■ OPTICAL AXIS CONFIRMATION REFLECTOR E39-R5

Use this attachment when the set distance is long and adjustment is mechanically difficult with a sensing object.

Attach the reflector to the receiver (refer to the figure).

Look at the reflector from right behind the emitter. The reflector should be bright with red light when the optical beam strikes the reflector. If the emitter has a turbo function, the reflector looks brighter with the function switched on.

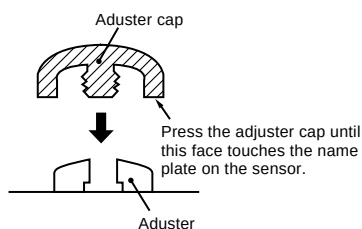
When the reflector is removed, the light beam strikes the receiver.



## ■ ADJUSTER CAP AND OPTIONAL E39-G2 SENSITIVITY ADJUSTER KNOB

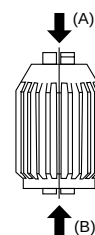
### Adjuster Cap (Supplied with each sensor)

In order to prevent the sensitivity or OFF-delay time that has been set from changing accidentally, cover the adjusters with the adjuster cap (enclosed).



### E39-G2 Adjuster Knob

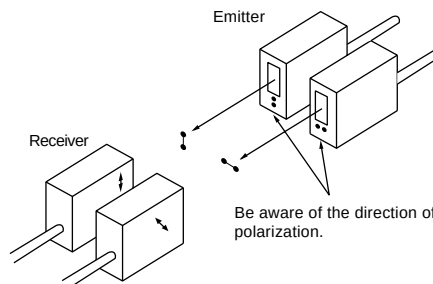
To temporarily use the knob to adjust the sensitivity of the photoelectric sensor, insert side A into the shaft of the sensitivity adjuster. To snap the adjuster onto the sensor, push side B onto the sensitivity knob.



## ■ E39-E6 MUTUAL INTERFERENCE FILTER

A set of 4 filters are sold together for two through-beam models (for 2 each of emitters and receivers).

The arrow printed on the cover indicates the direction of polarization. By attaching the filters opposite to each other in polarization to the emitters and the receivers (refer to the figure) in rows, mutual interference can be prevented (in any case, the filter attached to an emitter and to the corresponding receiver must be the same in direction of polarization or the photoelectric sensor will not function).





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