OMRON

Built-in Amplifier Photoelectric Sensor

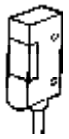
E3S-A/B

Revolutionary High-performance High-quality Sensor with Built-in Amp

- Optical axis can be adjusted in seconds because the optical axis coincides with the mounting axis.
- Highly visible spot on white paper (except 10-cm and 70-cm Diffuse Reflective Sensors).
- Two-turn sensitivity adjustment with consistent scale reading to enable setting multiple sensors without adjusting each individually (for Diffuse Reflective Sensors).
- Stable detection at a distance of from 0.2 to 70 cm (E3S-AD **j** 2).
- Washable in water (IP67, NEMA 4X enclosure rating).
- A total of 72 different modes to match essentially every need.
- Built-in mutual interference prevention function. E39-E6/E8 Filters for mutual interference prevention available.

Ordering Information

E3S-A General-purpose Sensors

Connections	Appearance	Sensing method	Sensing distance	Operating modes	Output/timer functions	Model
						NPN output
Prewired	Horizontal 	Through-beam	7 m	Light-ON Dark-ON (selectable)	---	E3S-AT11
					With timer and self-diagnostic functions	E3S-AT21
		Retroreflective	0.1 to 2 m (polarized)		---	E3S-AR11
					With timer and self-diagnostic functions	E3S-AR21
		Diffuse reflective	20 cm		---	E3S-AD11
					With timer and self-diagnostic functions	E3S-AD21
			70 cm (light source: infrared)		---	E3S-AD12
					With timer and self-diagnostic functions	E3S-AD22
Prewired	Vertical 	Through-beam	7 m		---	E3S-AT61
					With timer and self-diagnostic functions	E3S-AT71
		Retroreflective	0.1 to 2 m (polarized)		---	E3S-AR61
					With timer and self-diagnostic functions	E3S-AR71
		Diffuse reflective	20 cm		---	E3S-AD61
					With timer and self-diagnostic functions	E3S-AD71
			70 cm (light source: infrared)		---	E3S-AD62
					With timer and self-diagnostic functions	E3S-AD72

Note: Some products may not be available in certain areas. Contact your nearest OMRON office for further information.

■ E3S-B Miniature Sensors

Connections	Appearance	Sensing method	Sensing distance	Operating modes	Output/timer functions	Model NPN output
Prewired	Horizontal 	Through-beam	2 m	Light-ON Dark-ON (selectable)	---	E3S-BT11
		Retroreflective	0.1 to 1 m (polarized)			E3S-BR11
		Diffuse reflective	20 cm			E3S-BD11
	Vertical 	Through-beam	2 m			E3S-BT61
		Retroreflective	0.1 to 1 m (polarized)			E3S-BR61
		Diffuse reflective	20 cm			E3S-BD61

Note: Some products may not be available in certain areas. Contact your nearest OMRON office for further information.

■ Accessories (Order Separately)

E3S-A General-purpose Sensor Accessories

Name	Model	Remarks
Slit for Through-beam Sensor	E39-S46	2-mm, 1-mm, and 0.5-mm slits are sold in pairs, one each for the receiver and emitter of a through-beam model
Mounting Bracket for Vertical Sensor	E39-L59	Purchase two brackets for each through-beam model
	E39-L81	
Filter for Mutual Interference Prevention (for Through-beam Sensor)	E39-E6	4 filters are sold together for two through-beam models (2 filters each for the emitters and receivers)
Reflector for Optical Axis Adjustment (for Through-beam Sensor)	E39-R5	One only

Plugs (for Sensors with Connector Terminals)

Cord	Appearance		Cord length	Model
Standard	Straight (3 conductor)		2 m	XS2F-D421-DC0-A
			5 m	XS2F-D421-GC0-A
	L-shape (3 conductor)		2 m	XS2F-D422-DC0-A
			5 m	XS2F-D422-GC0-A
Robot (vibration-proof)	Straight (4 conductor)		2 m	XS2F-D421-D80-R
			5 m	XS2F-D421-G80-R
	L-shape (4 conductor)		2 m	XS2F-D422-D80-R
			5 m	XS2F-D422-G80-R

Specifications

Model	E3S-A		
	Without self-diagnostic functions		
Sensing method	**Through-beam, Retroreflective (polarized)**	**Diffuse reflective: 20 cm**	**Diffuse reflective: 70 cm**
NPN output	**E3S-AT11, -AR11 E3S-AT61, -AR61**	**E3S-AD11 E3S-AD61**	**E3S-AD12 E3S-AD62**
Wavelength of LED light source	700 nm (red)	700 nm (red)	880 nm (infrared)
Sensitivity adjustment	Two-turn (endless) sensitivity adjustor with indicator		
Self-diagnostic functions	---		
Timer	---		
Turbo function	---		
Method of connection	Prewired/connector		
Weight	Prewired type: 60 g; connector type: 11 g		
Operation mode	Dark-ON or Light-ON (switchable)		
Output	Open collector current output (NPN or PNP)		
Circuit protection	Load short-circuit protection, reverse connection protection, mutual interference prevention (except for through-beam models)		
Indicators	Light indicator (red) and stability indicator (green); emittion indicator (red) for the emitter of through-beam models		
Materials	Case: Polybutylene terephtalate Lens: Denaturated polyallylate Mounting bracket: Stainless steel (SUS304)		
Attachments	Mounting bracket, sensitivity adjustor knob, screws, sensitivity adjustor cover, close-mounting plate (only for Sensors with connector terminals) and reflector (E39-R1: only for retroreflective Sensors)		

Model	E3S-A			E3S-B
	With self-diagnostic functions (timer and turbo)			Through-beam, Retroreflective (polarized), Diffuse reflective
Sensing method	**Through-beam, Retroreflective (polarized)**	**Diffuse reflective: 20 cm**	**Diffuse reflective: 70 cm**	
NPN output	**E3S-AR21 E3S-AT71 E3S-AR71**	**E3S-AD21 E3S-AD71**	**E3S-AD22 E3S-AD72**	**E3S-BT11, –BR11 E3S-BD11, -BT61 E3S-BR61, -BD61**
Wavelength of LED light source	700 nm (red)	700 nm (red)	880 nm (infrared)	700 nm (red)
Sensitivity adjustment	Two-turn (endless) sensitivity adjustor with indicator			One-turn sensitivity adjustor with indicator
Self-diagnostic functions	Self-diagnostic output, External diagnostic input	Self-diagnostic output		---
Timer	0 to 100 ms OFF-delay variable adjustor			---
Turbo function	Yes (with turbo switch)	---		---
Method of connection	Prewired			
Weight	60 g			56 g
Operation mode	Dark-ON or Light-ON (switchable)			Dark-ON or Light-ON (wire-selectable)
Output	Open collector current output (NPN or PNP)			
Circuit protection	Load short-circuit protection, reverse connection protection, mutual interference prevention (except for through-beam models) functions			
Indicators	Light indicator (red) and stability indicator (green); emittion indicator (red) for the emitter of the through-beam model			
Materials	Case: Polybutylene terephtalate Lens: Denaturation polyallylate Mounting bracket: Stainless steel (SUS304)			
Attachments	Mounting bracket, sensitivity adjustor knob, screws, sensitivity adjustor cover, close-mounting plate (only for Sensors with connector terminals) and reflector (E39-R1: only for retroreflective Sensors)			Mounting bracket, sensitivity adjustor knob, screws, sensitivity adjustor cover, close-mounting plate and reflector (E39-R1: only for retroreflective Sensors)

■ Ratings/Characteristics

E3S-A General-purpose Sensors

Item		Through-beam	Retroreflective (polarized)	Diffuse reflective	
		E3S-AT11, 61, 71	E3S-AR11, 21, 61, 71	E3S-AD11, 21, 61, 71	E3S-AD12, 22, 62, 72
Power supply voltage		10 to 30 VDC, ripple: 10% max.			
Current consumption		40 mA max. (emitter and receiver) plus approx. 15 mA with turbo function	30 mA max. plus approx. 15 mA with turbo function	30 mA max. plus approx. 15 mA with turbo function	35 mA max.
Rated sensing distance	White mat paper	0 to 7 m	0.1 to 2 m	0.1 to 20 cm	0 to 70 cm
	Black mat paper	0 to 7 m	0.1 to 2 m	0.5 to 2.3 cm	0.15 to 33 cm
Standard sensing object (white mat paper)		7 mm min.	30 mm min.	10 x 10 cm	20 x 20 cm
Variation in sensing distance		---		$^{30\%}/_{-0\%}$ max.	
Hysteresis		---		10% max.	20% max.
Sensing distance with attachment		E39-E6: 2.4 m 2-mm slit: 2.5 m 1-mm slit: 1.1 m 0.5-mm slit: 0.5 m	E39-R3: 10 to 130 cm E39-R4: 7 to 60 cm E39-RSA: 10 to 60 cm E39-RSB: 10 to 30 cm	---	
Min. sensing object		without slit: 2.0 mm 2-mm slit: 0.8 mm 1-mm slit: 0.4 mm 0.5-mm slit: 0.2 mm	E39-R1 Reflector: 10 mm E39-R3: 3 mm E39-R4: 1.0 mm	---	
Difference in direction between optical axis and mounting direction		±2° max. (checked along extended line in the mounting direction)		±2° max.	
Response time		0.5 ms max. for both operation and release			
Control output		30 VDC, 100 mA max. (residual voltage: 1 V max.) Open collector (residual voltage: 0.4 V max. at 16 mA)			
Self-diagnostic output		Only Sensors with self-diagnostic function: 50 mA max, 30 VDC (residual voltage: 1 V max.), open collecto (residual voltage: 0.4 V max. 16 mA)			
External-diagnostic input	Input voltage	With emitter OFF: NPN: 0 V short-circuit or 1.5 V max. (push current: 1 mA max.) PNP: DC short-circuit or -1.5 VDC max. (pull current: 3 mA max.) With emitter ON: NPN/PNP Open (max. input voltage: 30 V max. with 0.1 mA current leakage)		---	
	Response time	0.5 ms max.			
Ambient illumination		Incandescent lamp: Illumination on optical spot: 5,000 □x max. Sunlight: Illumination on optical spot: 10,000 □x max.			
Ambient temperature		Operating: −25°C to 55°C (with no icing) Storage: −40°C to 70°C (with no icing)			
Ambient humidity		Operating: 35% to 85% Storage: 35% to 95%			
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 (30G) 2 hrs each in three directions			
Shock resistance		Destruction: Approx. 50G 3 times each in three directions			
Enclosure ratings		IEC: IP67; NEMA: 4X			

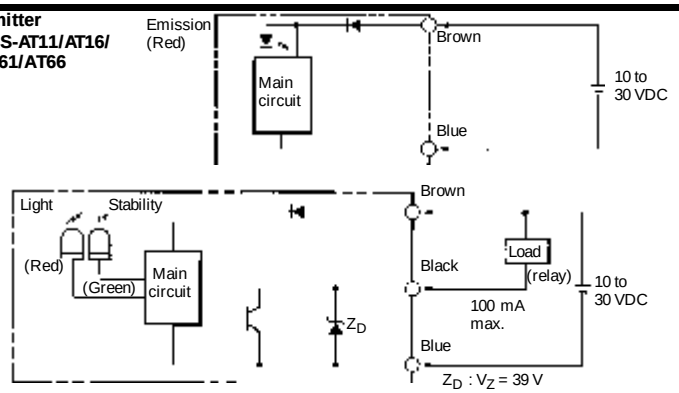
E3S-B Miniature Sensors

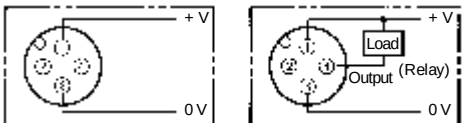
Item		Through-beam	Refloreflective (polarized)	Diffuse reflective
		E3S-BT11, 61,	E3S-BR11, 61	E3S-BD11, 61
Power supply voltage		12 to 24 VDC±10%; ripple: 10% max.		
Current consumption		35 mA max. (emitter and receiver)	25 mA max.	
Rated sensing distance	White mat paper	0 to 2 m	0.1 to 1 m	0 to 20 cm
	Black mat paper	0 to 2 m	0.1 to 1 m	0.2 to 6 cm
Standard sensing object (white mat paper)		5.5 mm min.	3 cm min.	10 x 10 cm
Variation in sensing distance		---		$^{30\%}/_{-0\%}$ max.
Hysteresis		---		20% max.
Sensing distance with attachment		E39-E8: 0.6 m 2-mm slit: 1 m 1-mm slit: 0.5 m 0.5-mm slit: 0.25 m 2-mm dia. slit: 0.6 m 1-mm dia. slit: 0.17 m 0.5-mm dia. slit: 0.04 m	E39-R3: 10 to 60 cm E39-R4: 7 to 35 cm E39-RSA:10 to 20 cm E39-RSB:10 to 30 cm	---
Min. sensing object		without slit: 2 mm 2-mm slit: 0.8 mm 1-mm slit: 0.4 mm 0.5-mm slit: 0.25 mm 2-mm dia. slit: 0.7 mm 1-mm dia. slit: 0.4 mm 0.5-mm dia. slit: 0.2 mm	E39-R1: 9 mm E39-R3: 2.5 mm E39-R4: 1.0 mm	---
Difference in direction between optical axis and mounting direction		±2° max. (checked along the extended line in the mounting direction)		±2° max.
Response time		0.5 ms max. for both operation and release		
Control output		26.4 VDC, 100 mA max. (residual voltage: 1 V max.); Open collector (residual voltage: 0.4 V max. at 16 mA)		
Ambient illumination		Incandescent lamp: Illumination on optical spot: 5,000 □x max. Sunlight: Illumination on optical spot: 10,000 □x max.		
Ambient temperature		Operating: −25°C to 55°C (with no icing) Storage: −40°C to 70°C (with no icing)		
Ambient humidity		Operating: 35% to 85% Storage: 35% to 95%		
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 (30G) 2 hrs each in three directions		
Shock resistance		Destruction: Approx. 50G 3 times each in three directions		
Enclosure ratings		IEC: IP67; NEMA: 4X		

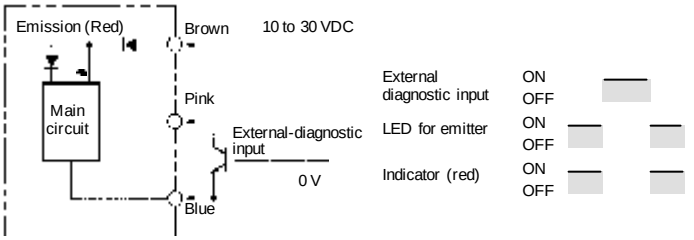
Operation

■ Output Circuits

E3S-A

<table>
<tr><th>Type</th><th>Model</th><th>Mode switch</th><th>Output transistor</th><th>Output circuit</th></tr>
<tr><td rowspan="4">NPN</td><td rowspan="2">E3S-AT11
E3S-AT61
E3S-AR11
E3S-AR61
E3S-AD11
E3S-AD61
E3S-AD12
E3S-AD62</td><td>Light ON</td><td>ON when light is received.</td><td rowspan="2">Emitter
E3S-AT11/AT16/
AT61/AT66
 

Connector Type
Emitter
Reflective/Receiver
 

Pin No. 2 is open.</td></tr>
<tr><td>Dark ON</td><td>ON when light is not received.</td></tr>
<tr><td rowspan="2">E3S-AT71
E3S-AD21
E3S-AD71
E3S-AD22
E3S-AD72</td><td>Light ON</td><td>ON when light is received.</td><td>Emitter E3S-AT21/AT71
 
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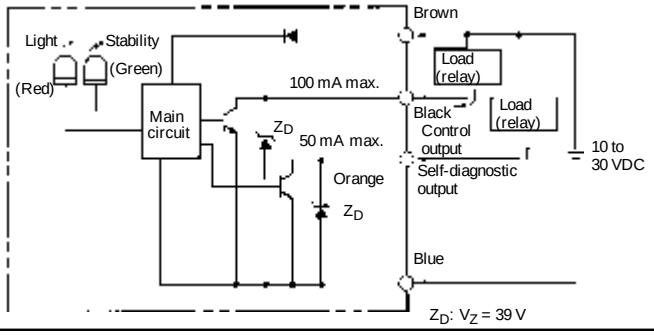
<tr><td>Dark ON</td><td>ON when light is not received.</td><td> 
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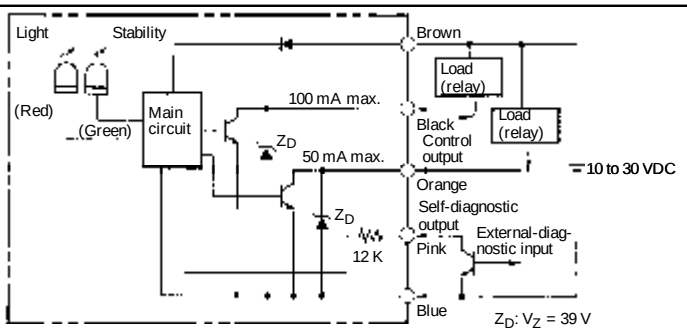
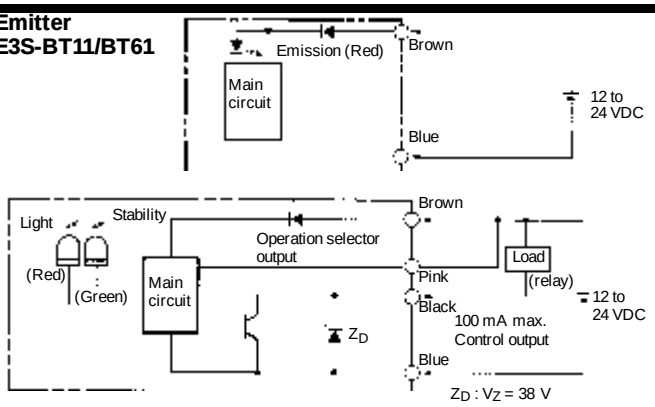
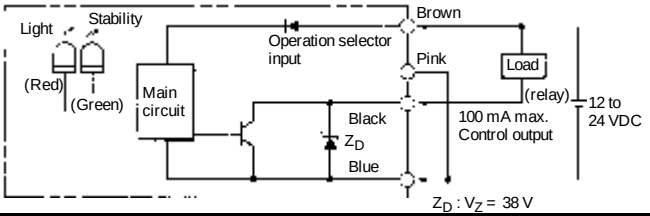
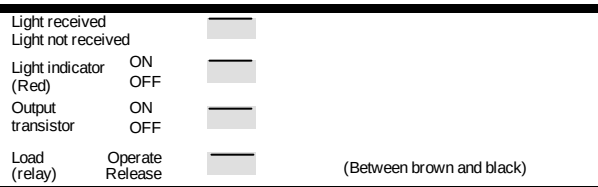
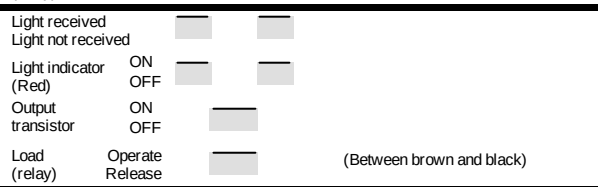
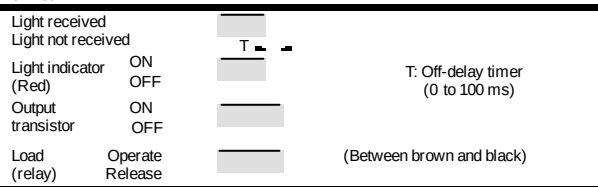
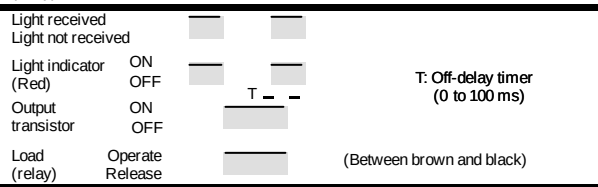
<tr><td rowspan="2">E3S-AR21
E3S-AR71</td><td>Light ON</td><td>ON when light is received.</td><td rowspan="2"> 
</td></tr>
<tr><td>Dark ON</td><td>ON when light is not received.</td></tr>
</table>

E3S-B

Type	Model	Connection method	Output transistor	Output circuit
NPN	**E3S-BT11** **E3S-BT61** **E3S-BR11** **E3S-BR61** **E3S-BD11** **E3S-BD61**	Short-circuit the pink and the brown cords	ON when light is received.	**Emitter E3S-BT11/BT61** 
		Short-circuit the pink and the blue cords, or open the pink cord	ON when light is not received.	

■ Timing Charts

E3S-A

Type	Model	Mode switch	Output transistor	Timing chart
NPN	**E3S-AT11** **E3S-AT61** **E3S-AR11** **E3S-AR61** **E3S-AD11** **E3S-AD61** **E3S-AD66** **E3S-AD12** **E3S-AD62**	Light ON	ON when light is received.	
		Dark ON	ON when light is not received.	
	E3S-AT71 **E3S-AD21** **E3S-AD22** **E3S-AD72** **E3S-AR21** **E3S-AR71**	Light ON	ON when light is received.	
		Dark ON	ON when light is not received.	

E3S-B

Type	Model	Connection method	Output transistor	Timing chart
NPN	**E3S-BT11 E3S-BT61 E3S-BR11 E3S-BR61 E3S-BD11 E3S-BD61**	Short-circuit the pink and the brown cords	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)
		Short-circuit the pink and the blue cords, or open the pink cord	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 brown and black)

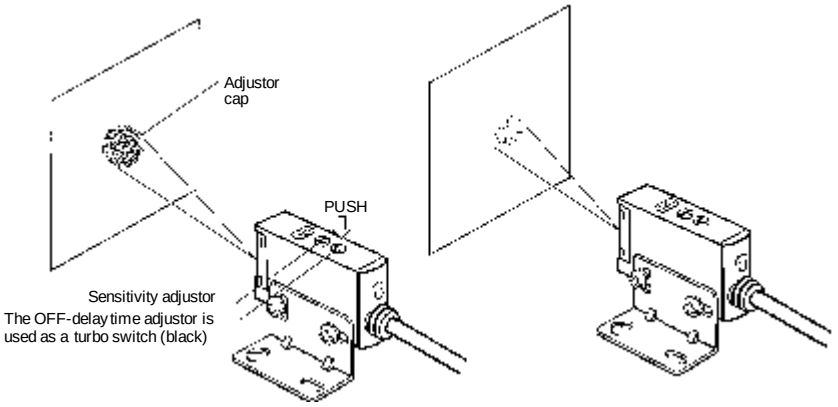
■ Turbo Function (Turbo Switch)

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

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

With Turbo Switch ON ← **Normal Operating Condition**

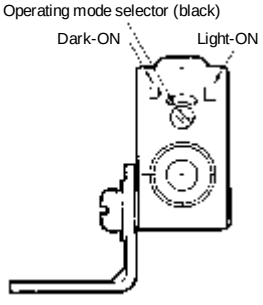
The turbo function is effective with the turbo switch pressed, and the function is reset automatically when released.



■ Operating Mode Selection

E3S-A

As shown in the following illustration, the E3S-A has an operating mode selector on the panel where the Receiver connector is located. With this operating mode selector, the E3S-A is in either dark-ON or light-ON mode.



E3S-B

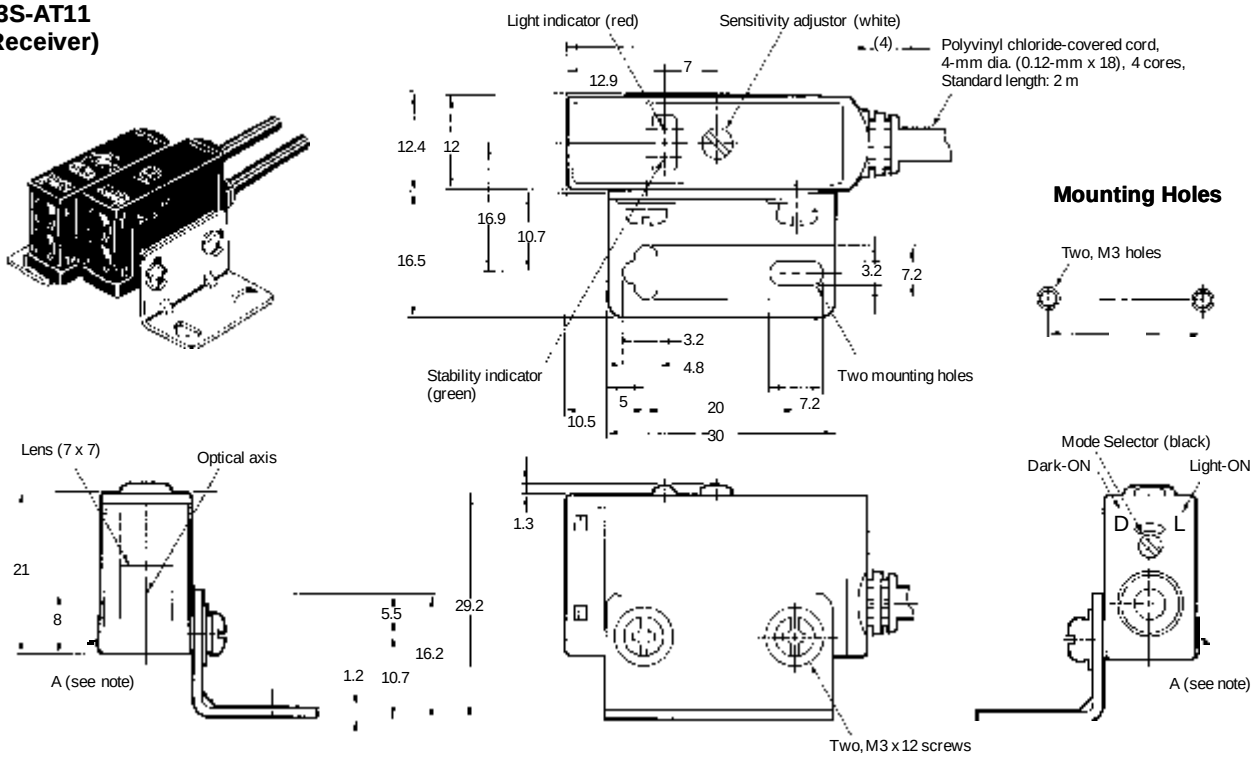
The operating mode of the E3S-B is determined with the connecting method of the Receiver cords.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

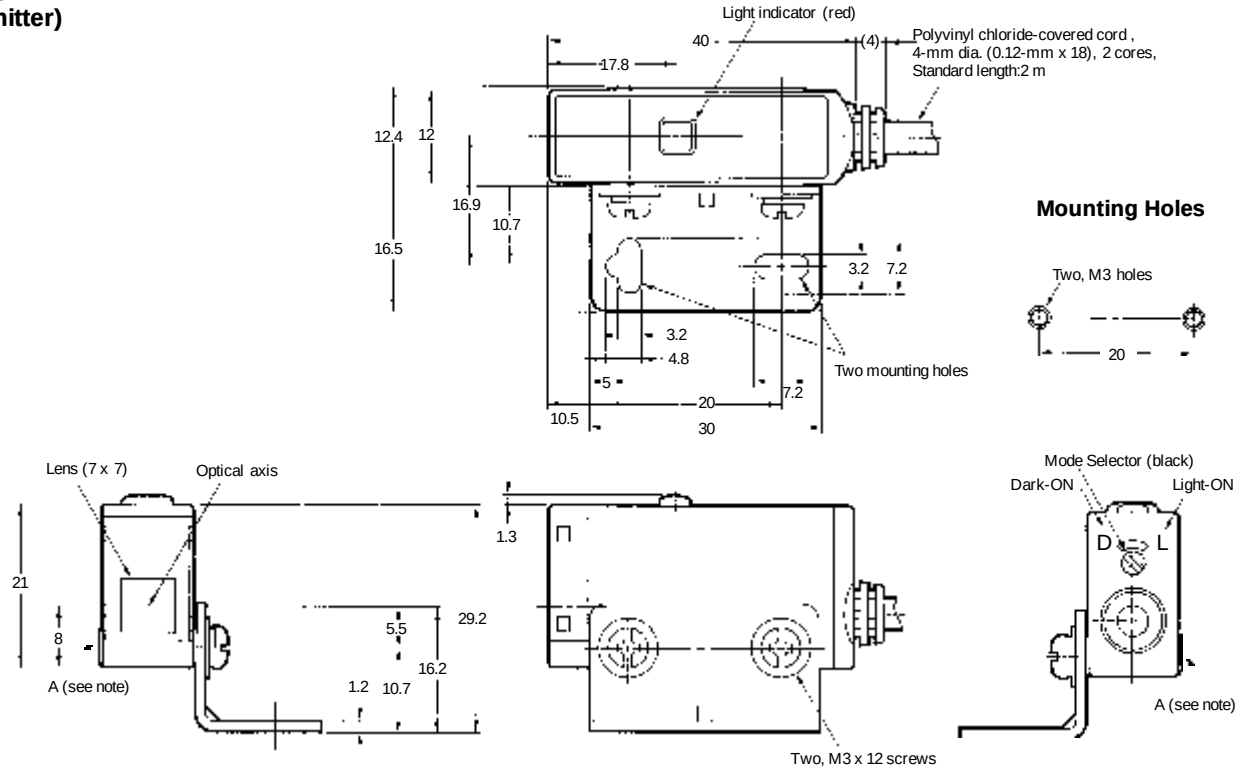
■ E3S-A Prewired Sensors

E3S-AT11
(Receiver)



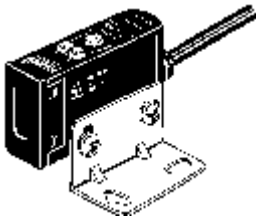
Note: The mounting bracket can be attached to side A.

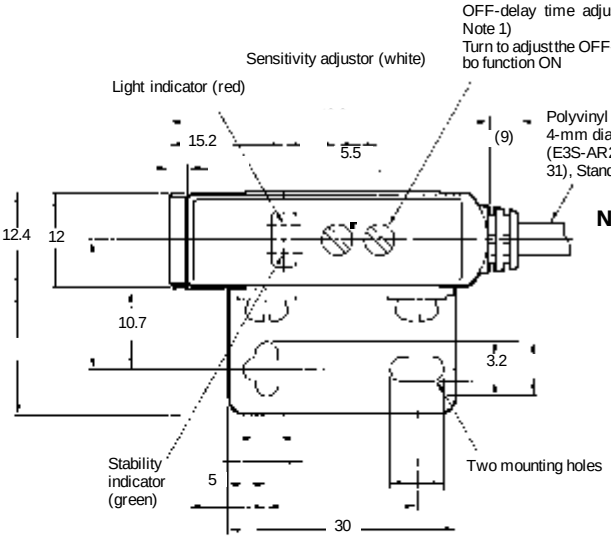
E3S-AT11
(Emitter)



Note: The mounting bracket can be attached to side A.

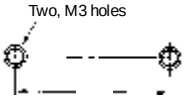
E3S-AR11, E3S-AR21

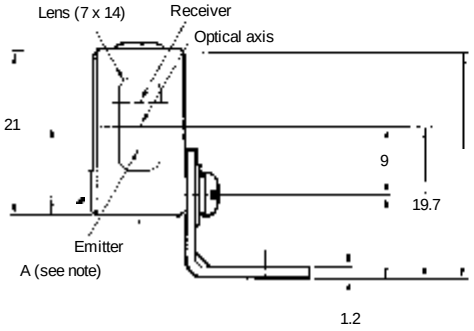


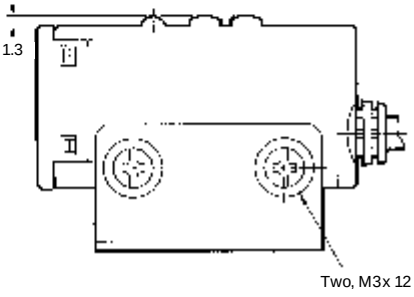


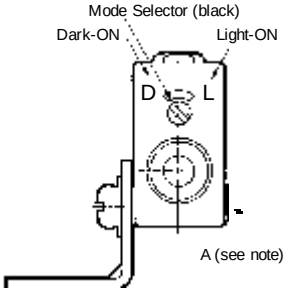
Note: 1. For E3S-AR21 and E3S-AR41 only.
2. 9 mm for E3S-AR21 and E3S-AR41

Mounting Holes



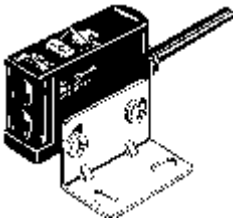


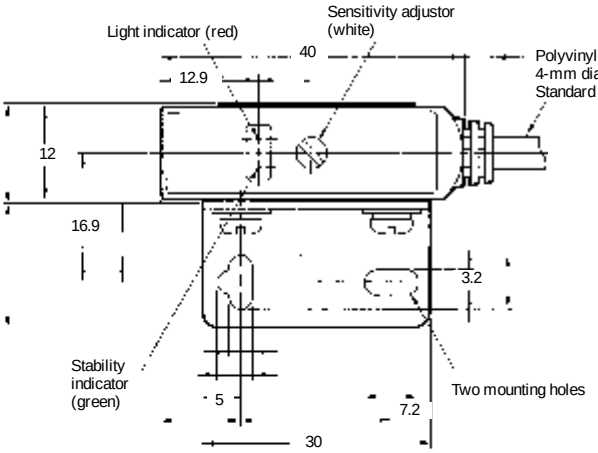




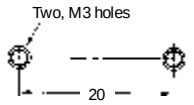
Note: The mounting bracket can be attached to side A.

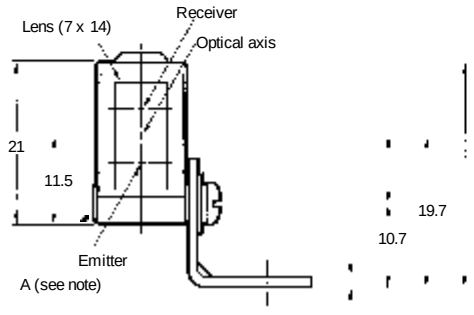
E3S-AD11, E3S-AD12

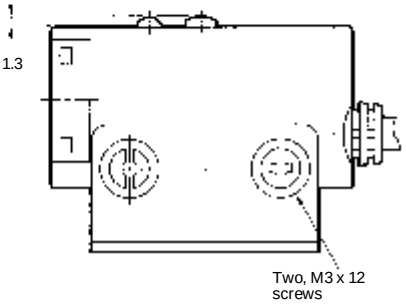


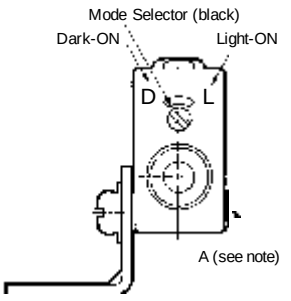


Mounting Holes



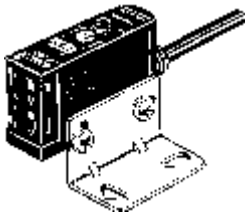


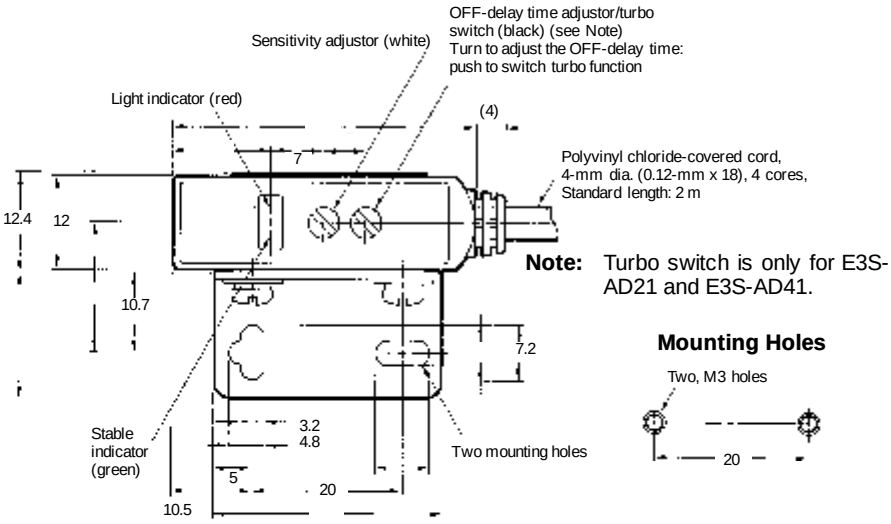




Note: The mounting bracket can be attached to side A.

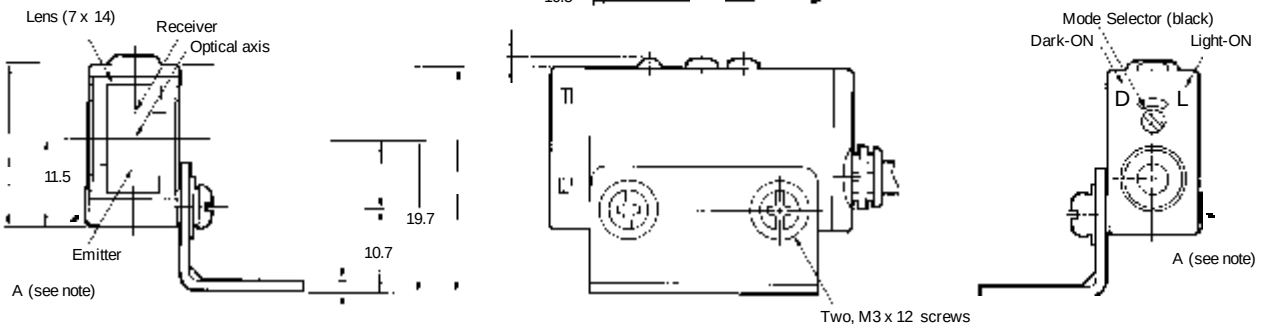
E3S-AD21, E3S-AD22





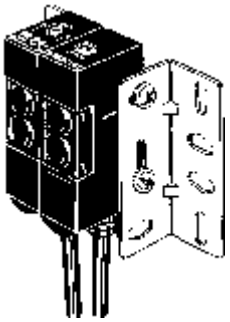
Note: Turbo switch is only for E3S-AD21 and E3S-AD41.

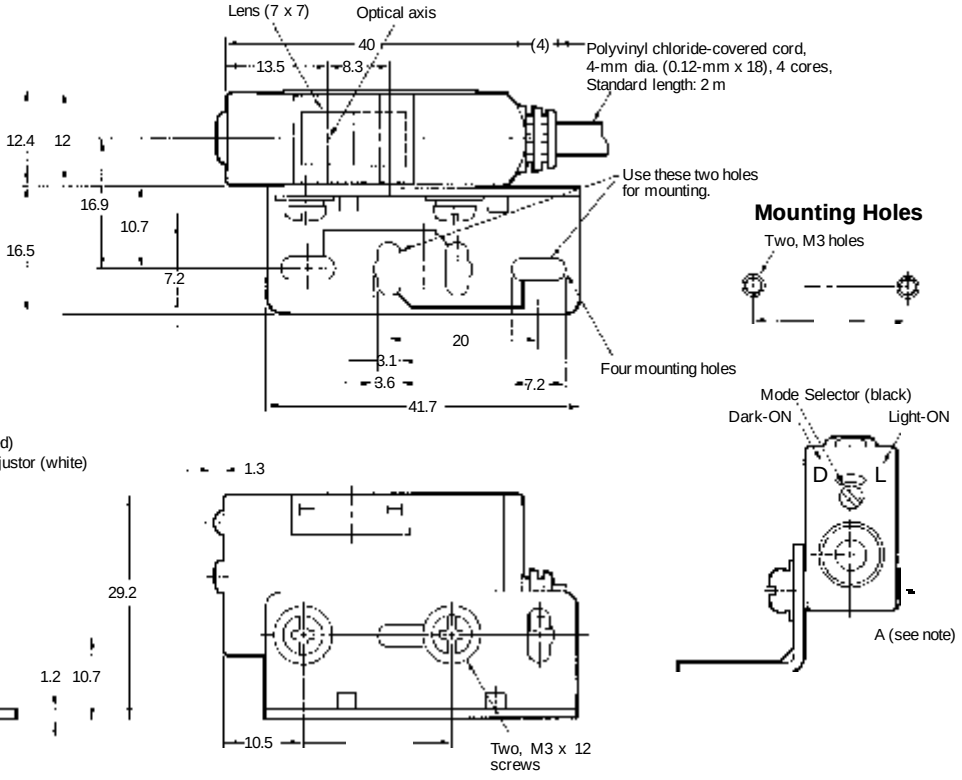
Mounting Holes



Note: The mounting bracket can be attached to side A.

E3S-AT61 (Receiver)

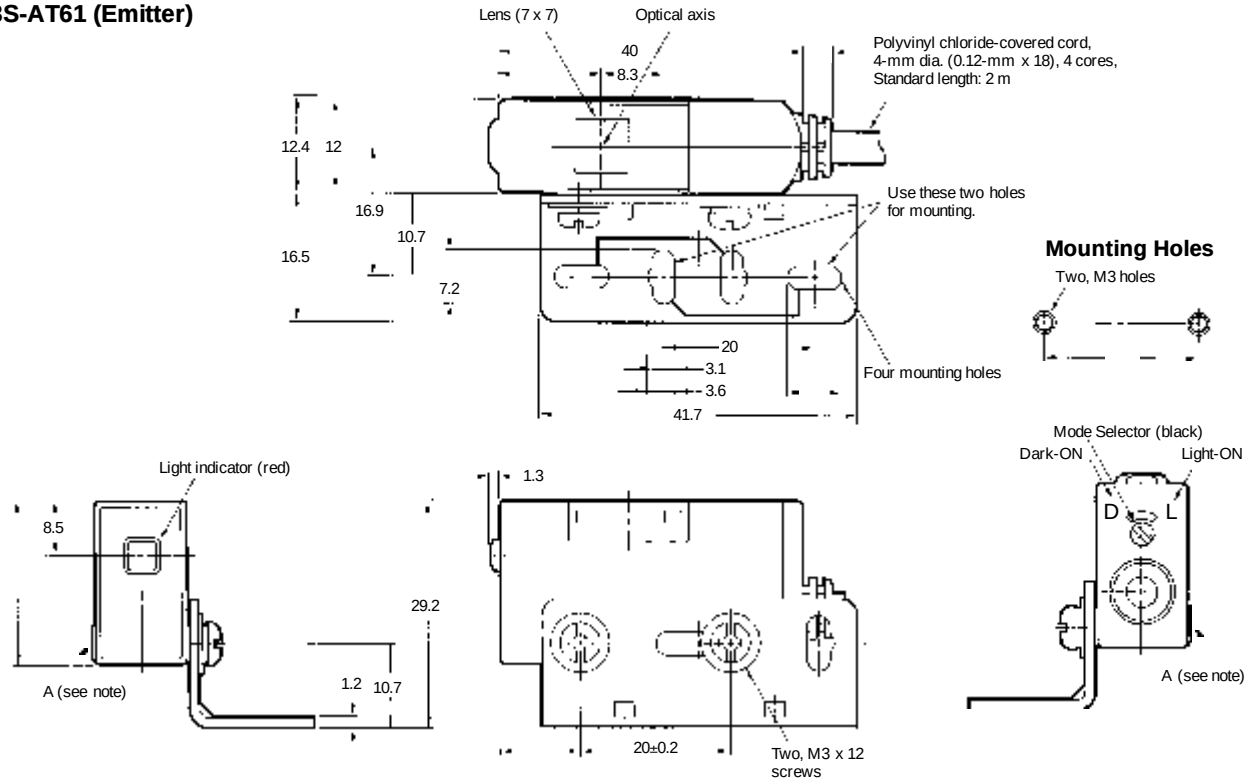




Mounting Holes

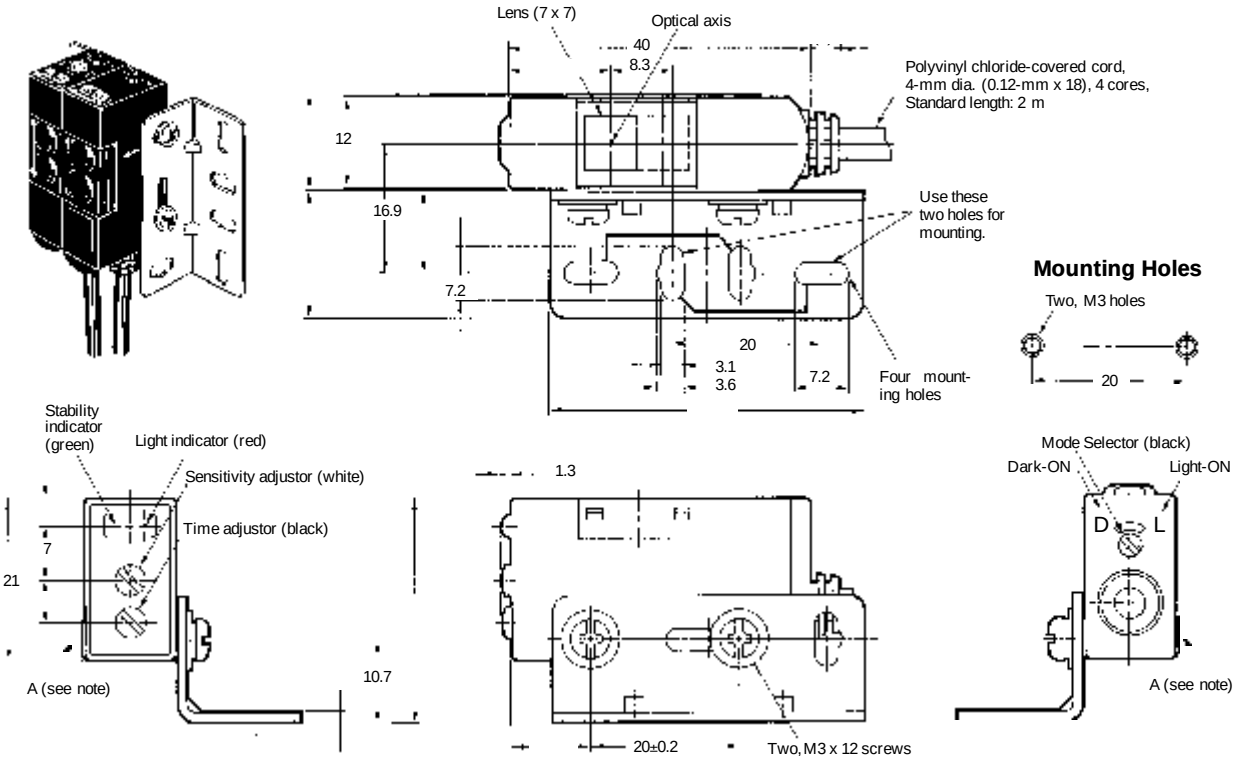
Note: The mounting bracket can be attached to side A.

E3S-AT61 (Emitter)



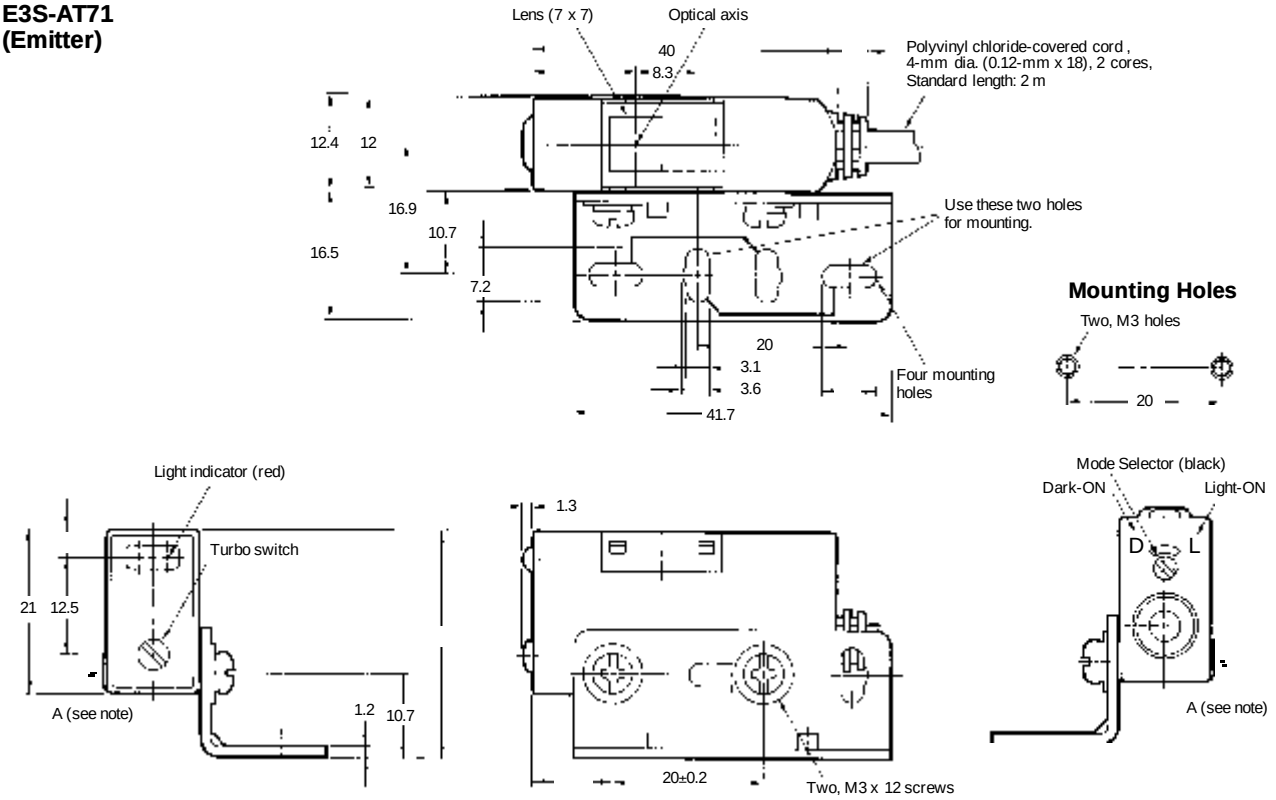
Note: The mounting bracket can be attached to side A.

E3S-AT71 (Receiver)



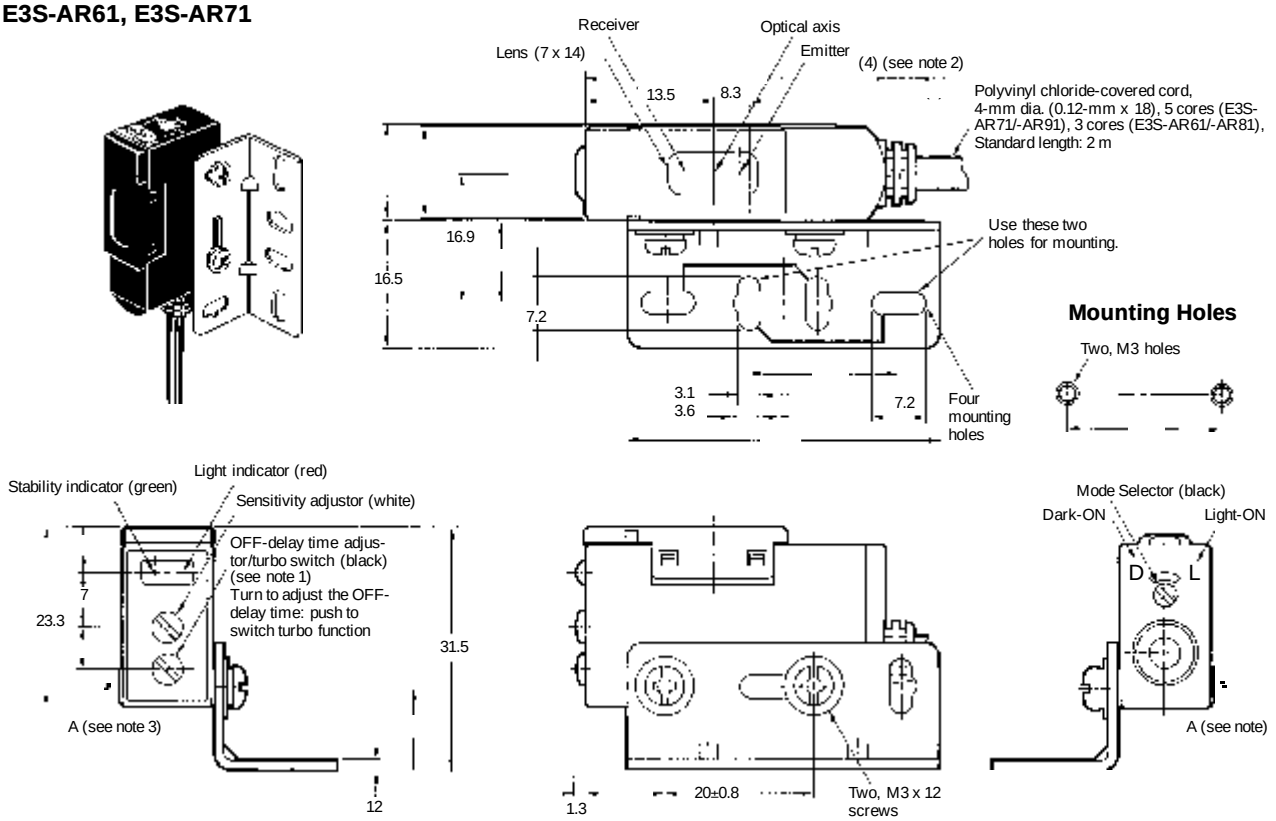
Note: The mounting bracket can be attached to side A.

E3S-AT71 (Emitter)



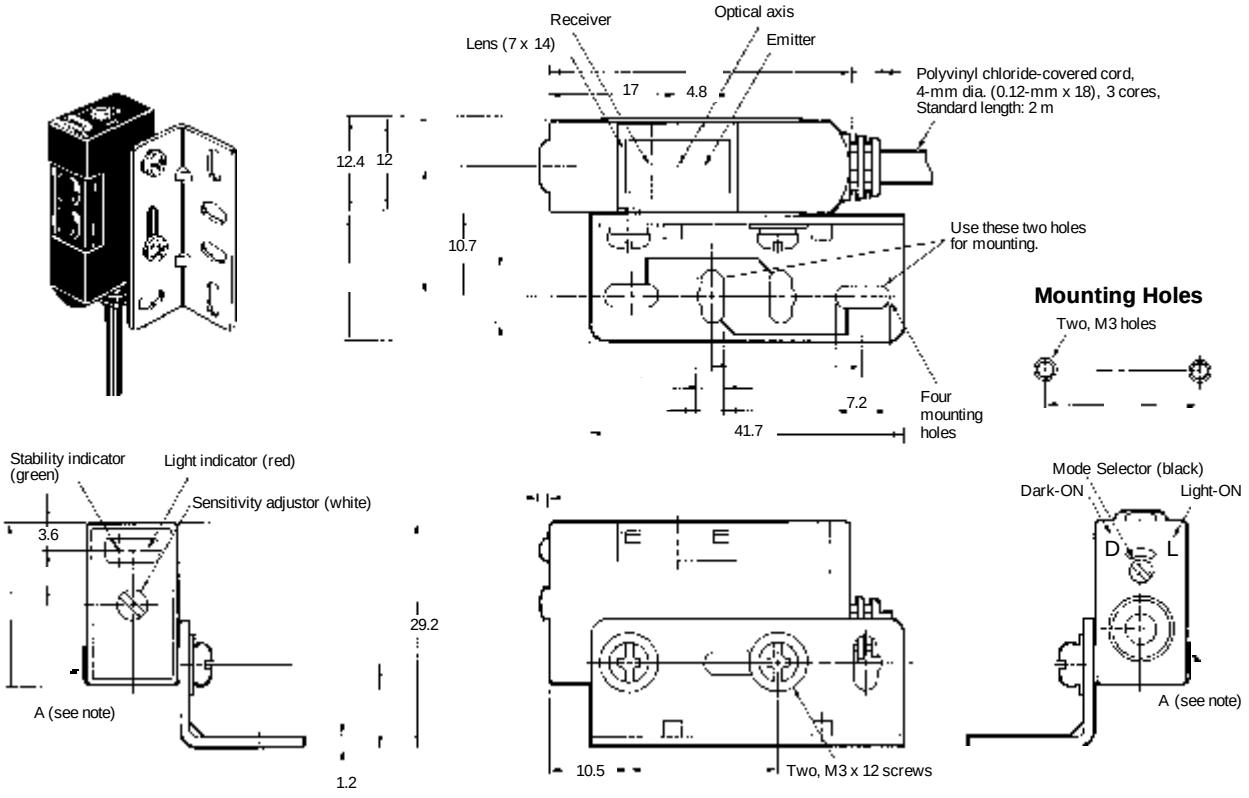
Note: The mounting bracket can be attached to side A.

E3S-AR61, E3S-AR71



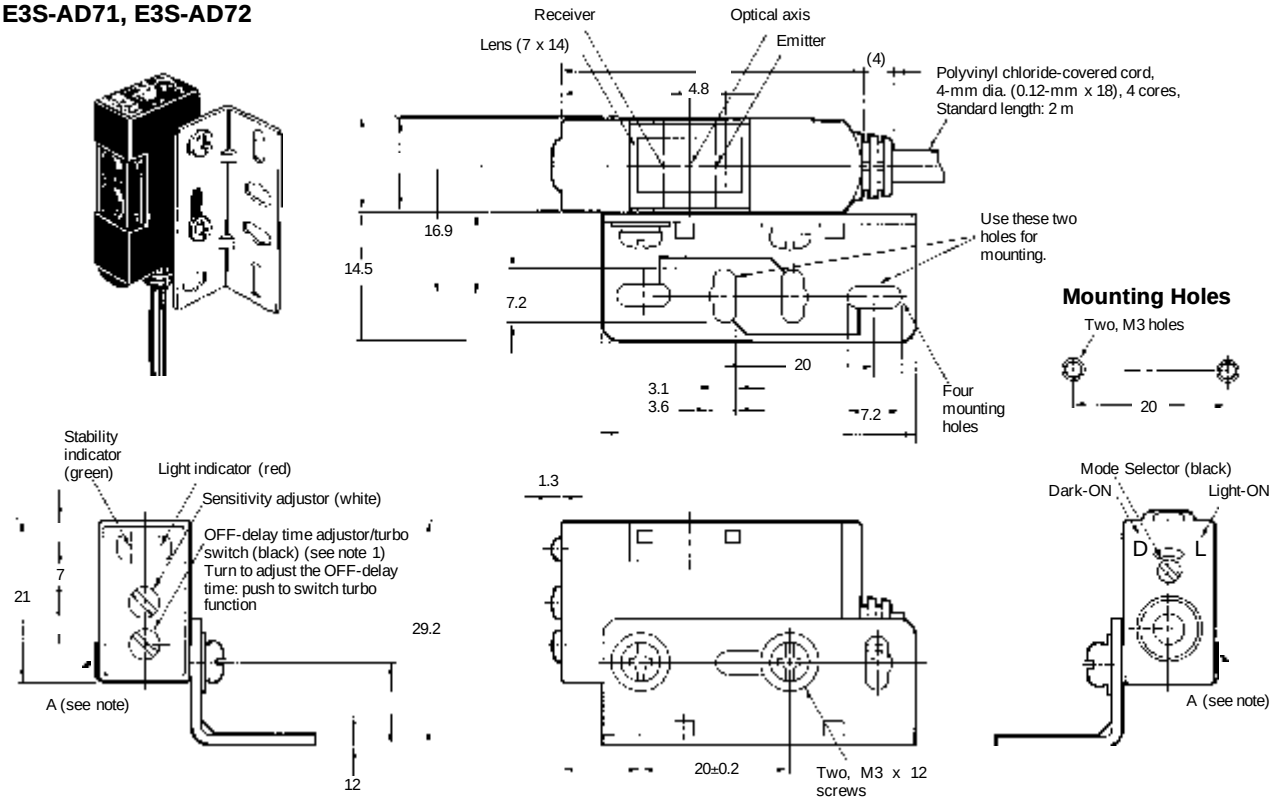
Note: 1. Turbo switch is only for E3S-AR71 and E3S-AR91.
2. 9.7 mm for E3S-AR71/-AR91.
3. The mounting bracket can be attached to side A.

E3S-AD61, E3S-AD62



Note: The mounting bracket can be attached to side A.

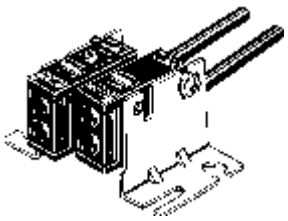
E3S-AD71, E3S-AD72

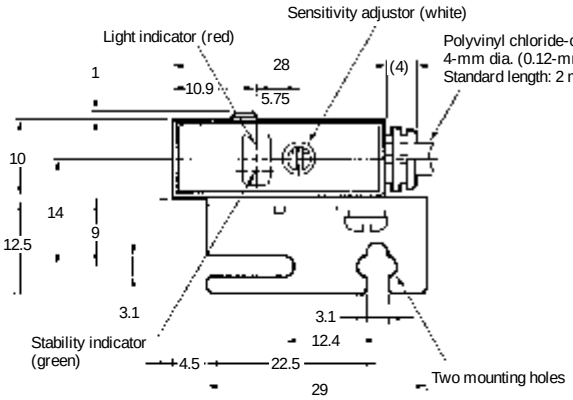


Note: 1. Turbo switch is only for E3S-AD71 and E3S-AD91.
2. The mounting bracket can be attached to side A.

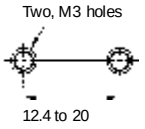
■ E3S-B Lead Wire Output Type

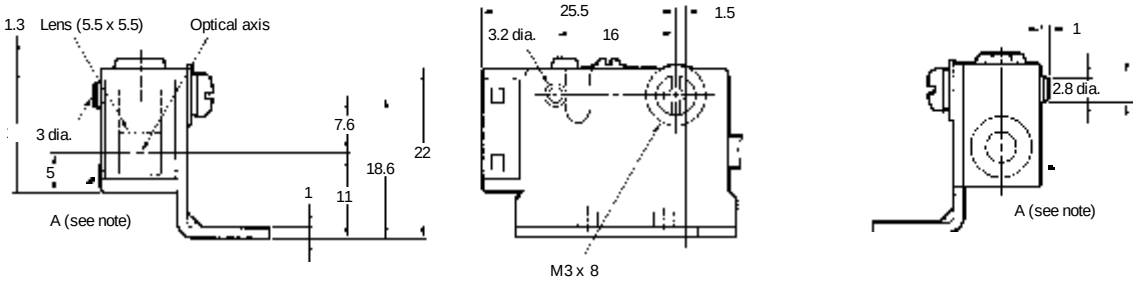
E3S-BT11 (Receiver)





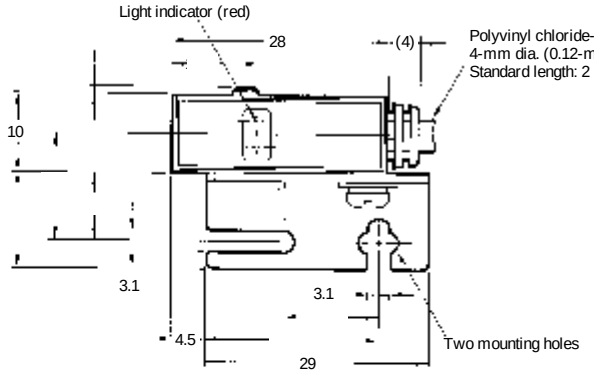
Mounting Holes



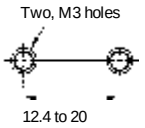


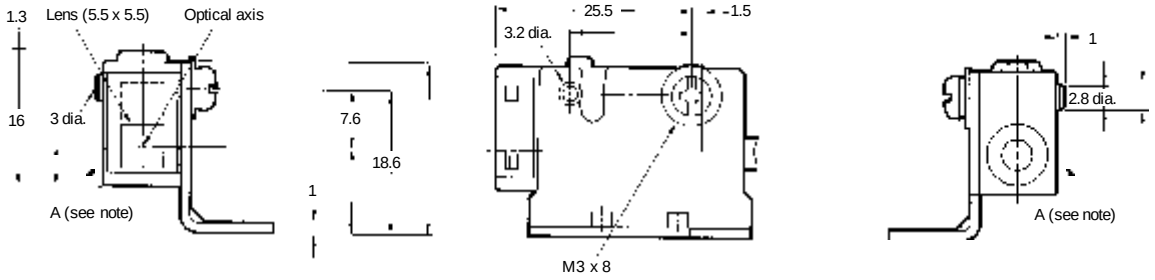
Note: The mounting bracket can be attached to side A.

E3S-BT11 (Emitter)



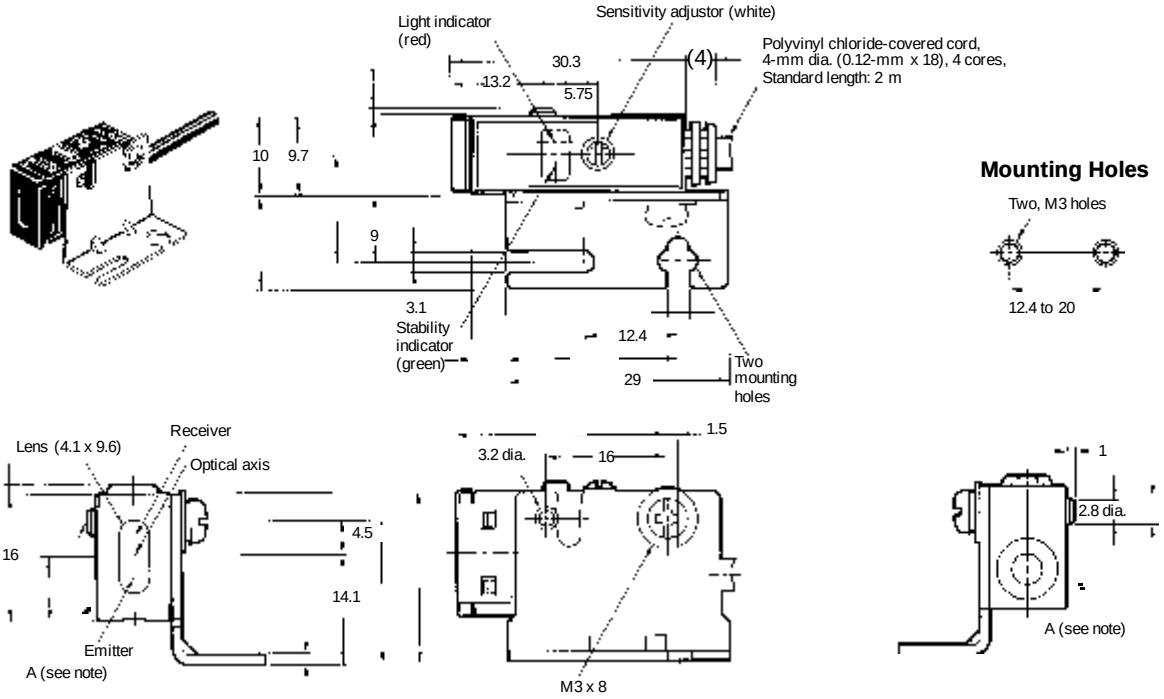
Mounting Holes





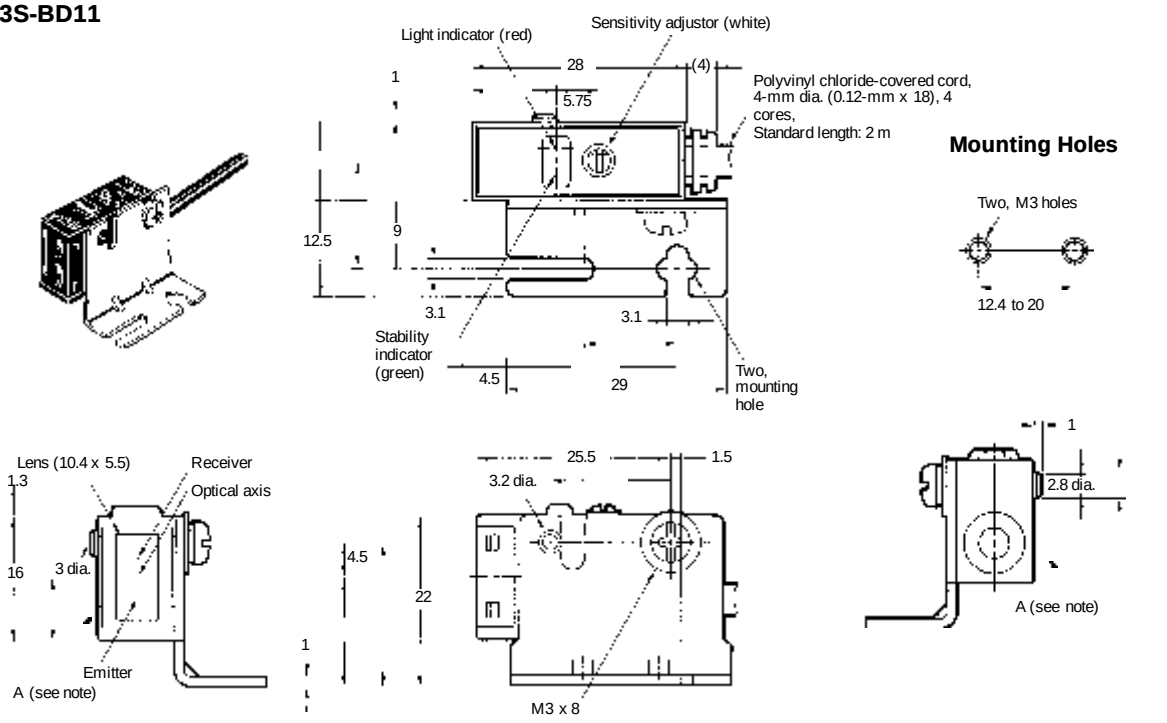
Note: The mounting bracket can be attached to side A.

E3S-BR11



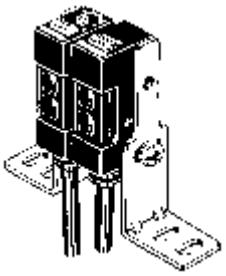
Note: The mounting bracket can be attached to side A.

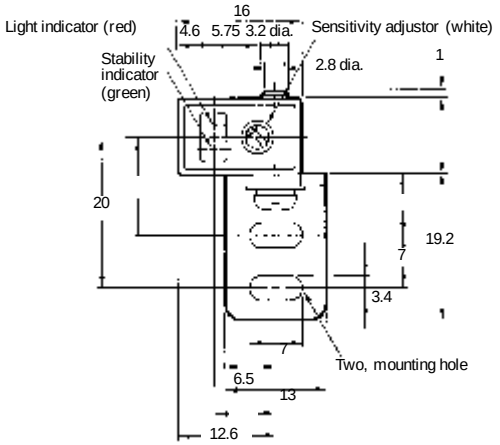
E3S-BD11



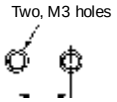
Note: The mounting bracket can be attached to side A.

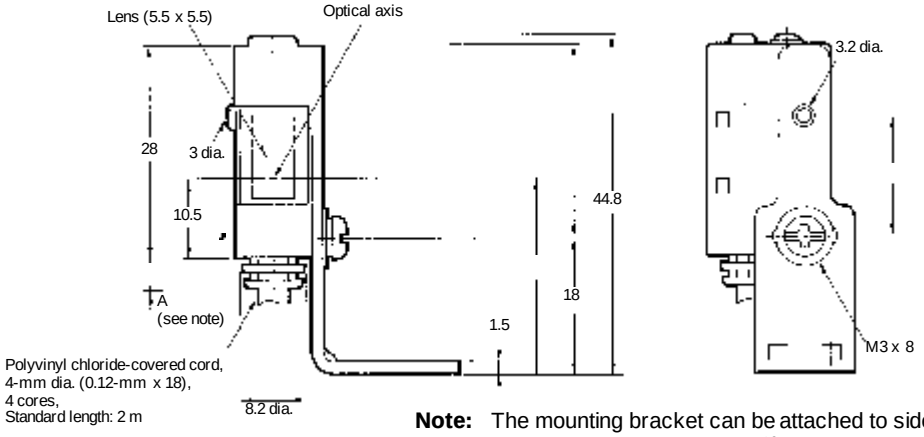
E3S-BT61 (Receiver)





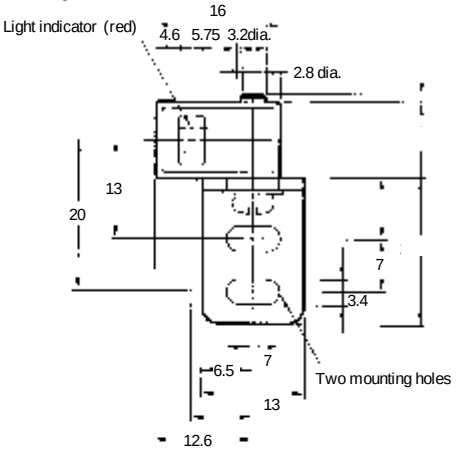
Mounting Holes



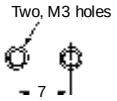


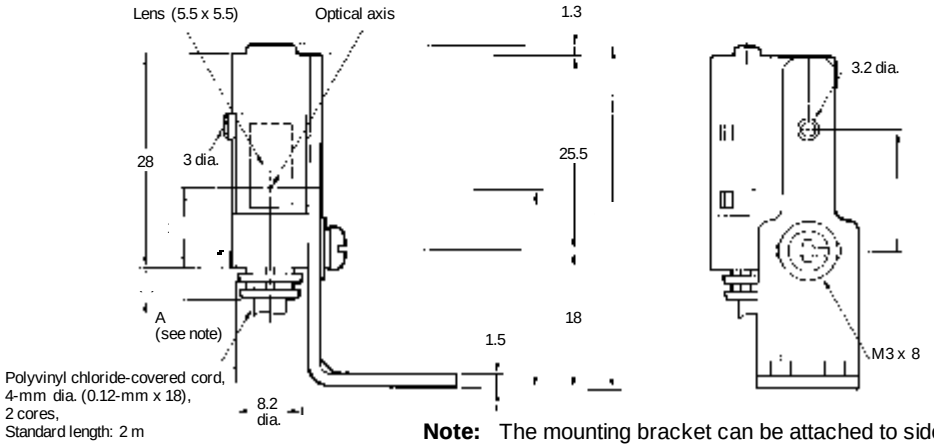
Note: The mounting bracket can be attached to side A.

E3S-BT61 (Emitter)



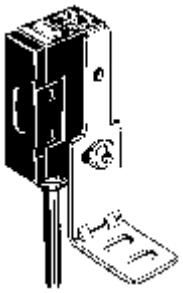
Mounting Holes

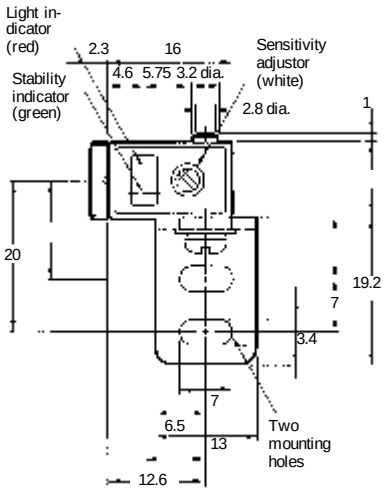


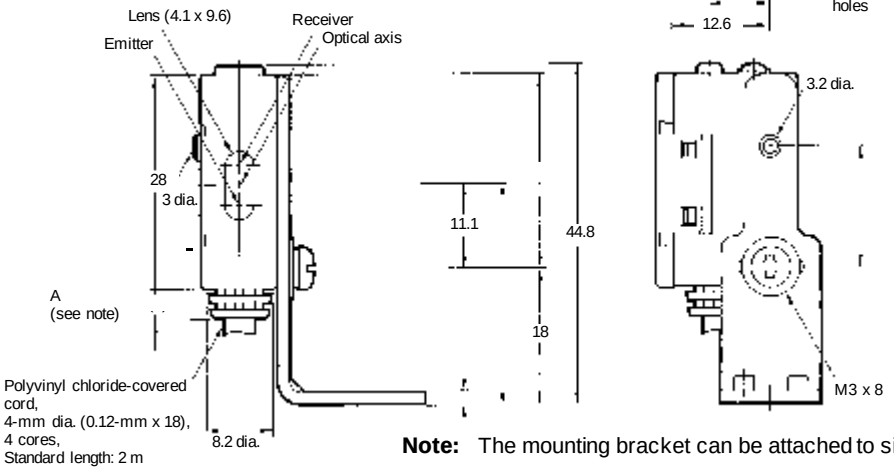


Note: The mounting bracket can be attached to side A.

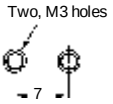
E3S-BR61





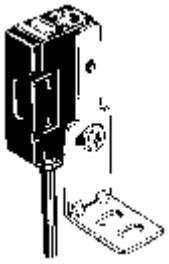


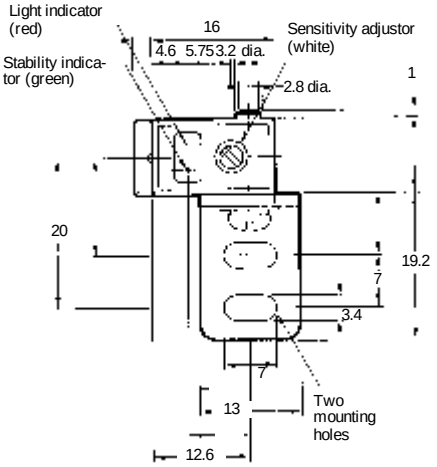
Mounting Holes

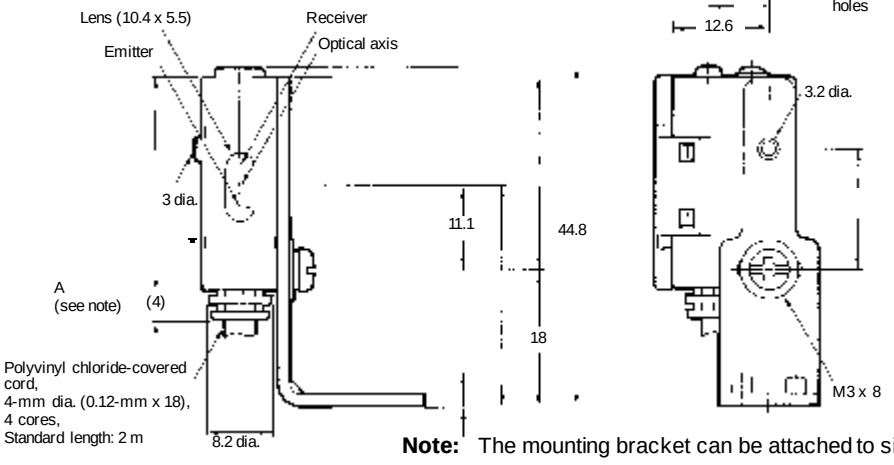


Note: The mounting bracket can be attached to side A.

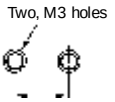
E3S-BD61







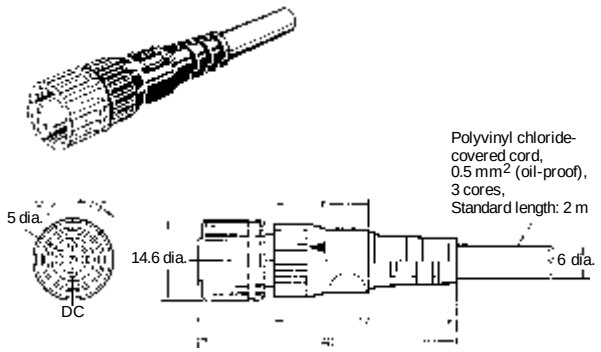
Mounting Holes



Note: The mounting bracket can be attached to side A.

■ Plug (for E3S-A Connector Type)

Straight Type
XS2F-D421-DC0-A



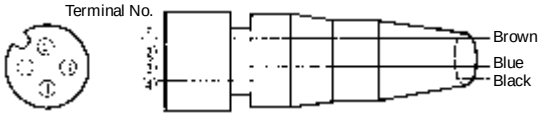
The XS2F-D421 Straight Cable Connector is also available. Refer to the output circuit diagram on page NO TAG.

Cable drawing direction	No. of conductors	Cord length	Model
Straight	3	2 m	XS2F-D421-DC0-A
	4		XS2F-D421-D80-A
	3	5 m	XS2F-D421-GC0-A
	4		XS2F-D421-G80-A

Installation

■ Plug (for E3S-A with Connector)

Internal Connection

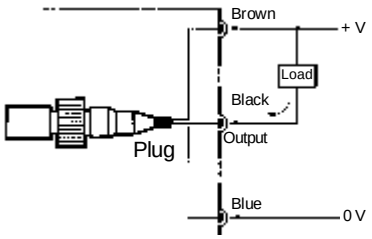


Item	Color of cord	Coonection pin No.	Application
For DC	Brown	1	Power supply (+V)
	Black	4	Output
	Blue	3	Power supply (0 V)

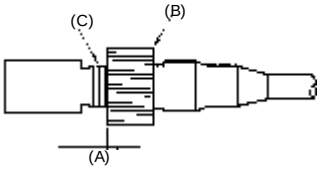
Note: Pin No. 2 and 4 are connected internally.

External Connections

NPN Output



Tightening the Plug



Turn part B by hand (do not use a pliers or the plug will be damaged) and tighten it with part C so that length A is nearly zero. Part B must be tightened properly with part C, or otherwise part B could be loosen by vibration and the sensor will not maintain the specified enclosure ratings.

Note: Use the spacer (sold together) to mount the photoelectric sensor with or without the enclosed mounting bracket (refer to *Dimensions*).

Precautions

■ E3S-A/B

The supplied voltage must be within the rated voltage range. Unregulated full-or half-wave rectifiers must not be used as power supplies.

If the input/output lines of the photoelectric sensor are placed in the same conduit or duct as power lines or high-voltage lines, the photoelectric sensor could be induced to malfunction, or even be damaged, by electrical noise. Either separate the wiring, or use shielded lines as input/output lines to the photoelectric sensor.

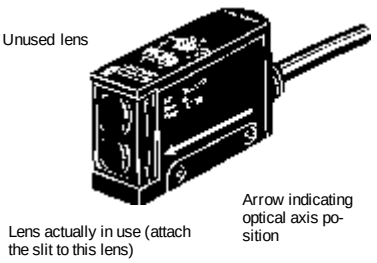
Do not use a hammer to hit the amplifier when mounting or the amplifier will loose watertightness.

Note the following when using the E39-R3, E39-RSA, or E39-RSB reflector (tape):

1. Before applying adhesive tape to the reflector, make sure that the reflector is free from oil or dust, or otherwise the adhesive tape will not stick to the reflector properly.
2. Do not cut the reflector or the reflector will loose watertightness.
3. Do not press the reflector with a metal object or a nail, or otherwise the reflector will not function properly.

Position of Optical Axis of Through-beam Model

Unlike conventional through-beam models, the E3S Through-beam Photoelectric Sensor incorporates 2 lenses. But the lens actually in use is the one marked with an arrow indicating the position of the optical axis. When using a slit, attach it to the lens marked with the arrow.



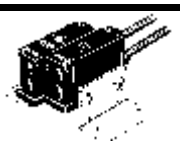
Replacement Information

■ Replacing the E3S with the E3S-A

The following is the conversion table for when replacing the E3S with the E3S-A.

Old models	New models
E3S-2E4 E3S-2C4	E3S-AT11
E3S-2E41 E3S-2C41	E3S-AT61
E3S-2B41	E3S-AT81
E3S-DS10E4 E3S-DS10C4	E3S-AD12
E3S-DS10E41 E3S-DS10C41	E3S-AD62
E3S-DS10B41	E3S-AD82

Comparison

Item		E3S (old model with plastic casing)	E3S-A
Appearance			
Sensing distance		Through-beam: 2 m Retroreflective: --- Diffuse reflective: 10 cm	Through-beam: 7 m Retroreflective: 2 m (MSR) Diffuse reflective: 70 cm (infrared) 20 cm (red)
Response time		Reflective: 1 ms max. Through-beam: 3 ms max.	0.5 ms max.
Enclosure rating		IP65 (mounting bracket: iron)	IP67 (mounting bracket: stainless steel)
Vertical operating panel with sensitivity adjustor (see note 1)		The sensitivity adjustor, indicators, and lenses are located on the same panel. 	The sensitivity adjustor and indicators are located on top of the model. 
Output		Voltage and current outputs	Open collector
Power supply voltage		12 to 24 VDC ±10%	10 to 30 VDC
LED for emitter		Infrared	Red (except for 70-cm type)
Sensitivity dispersion of diffuse reflective model		Not specified (approx. 150% max.)	30% max.
Difference in direction between optical axis and mounting direction		Not specified (approx. 12° max.)	±2° max.
Selection of operation mode* (see note 1)		Dark-ON and light-ON selectable by changing the polarity of the power cable.	Dark-ON and light-ON selectable with a selector.
Dimensions * (see note 1)		Through-beam: 18.8 x 15.4 x 40 mm Diffuse reflective: 21 x 15.4 x 40 mm	21 x 12 x 40 mm
Dimensions with Mounting Bracket * (see note 1)	**Through-beam**	Horizontal: The same as the height of the model (25.1 mm) Vertical: From the mounting holes of the mounting bracket (16 mm)	Horizontal: 29.2 mm (+4.1 mm) Vertical: 21.8 mm (+5.8 mm)
	Diffuse reflective	Horizontal: The same as the height of the model (27.3 mm) Vertical: From the mounting holes of the mounting bracket (16 mm)	Horizontal: 29.2 mm (+1.9 mm) Vertical: 21.8 mm (+5.8 mm)
Mounting Bracket		Iron	Stainless steel
Material (lens)		Polycarbonate	Deuaturalized polyallyate (U polymer)

Note: 1. The items marked with an asterisk are particularly important when replacing the E3S with the E3S-A.

2. When connecting the E3S-A to a timer or counter with voltage input terminals, be sure to connect a resistor between the output and positive power supply terminals (e.g., 4.7-kΩ resistor that withstands 1/4 W for a supply voltage of 12 VDC and 10-kΩ resistor that withstands 1/4 W for a supply voltage of 24 VDC), in which case the sensor may output a pulse signal the moment power is supplied to the E3S-A.

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ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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Note: Specifications subject to change without notice.

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