

GENERAL CATALOGUE 2004/2005

Sensing & Safety



- Photoelectric Sensors
- Displacement Sensors
- Vision Systems
- Safety Sensors
- Safety Switches
- Safety Relays
- Proximity Sensors
- Rotary Encoders
- Pressure Sensors

Advanced Industrial Automation

Cat.No. F502-EN2-03A SEN

OMRON

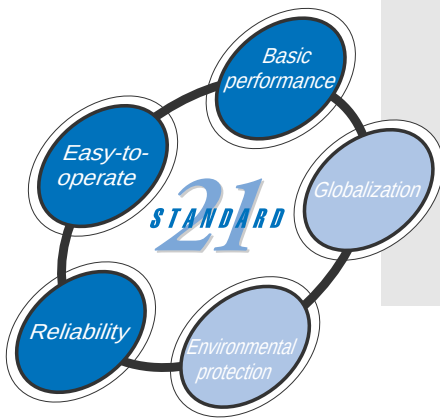
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Photoelectric Sensor with Built-in Amplifier

E3Z

For the majority of detection applications, E3Z offers a solution

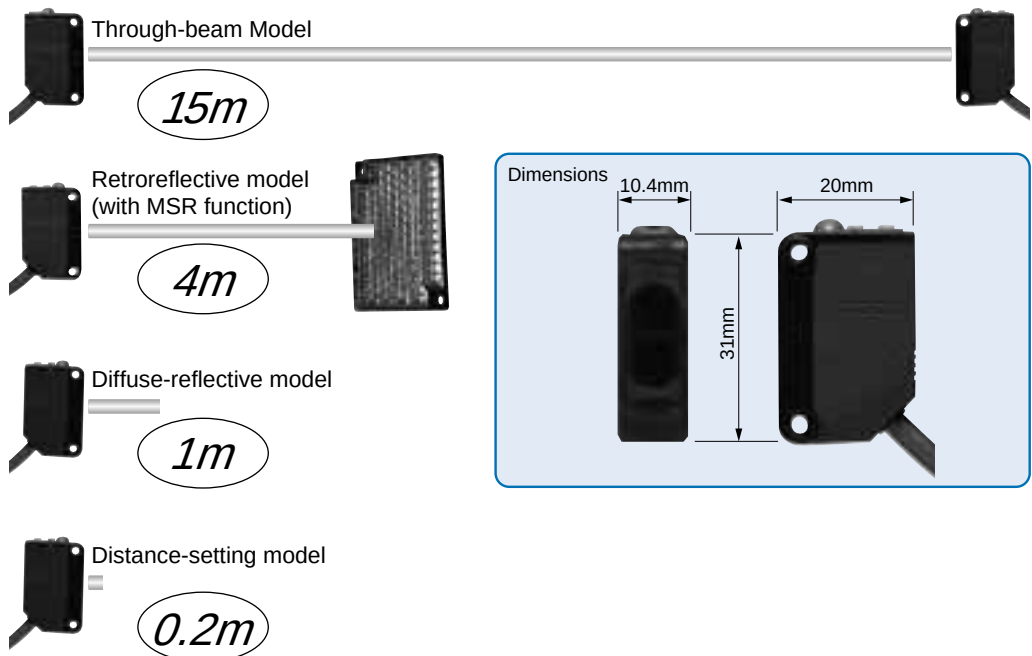


Features

Basic performance

Photoelectric Sensor with built-in amplifier is applicable to a wide variety of applications and ensures a longer sensing distance than any other model.

E3Z includes application devices, such as PET detection, narrow beam and fork sensors.



Globalization

Meets a variety of international standards, thus allowing use in any country.



Global network with 191 offices in 38 countries. M8-connector, PNP output types that meet international standards are available.

Easy-to-operate

User-friendly Photo-electric Sensor takes all installation and on-site conditions into consideration.

A general-purpose connector ensures easy on-site installation!



E3Z is compact and space-saving and can be installed in any location.



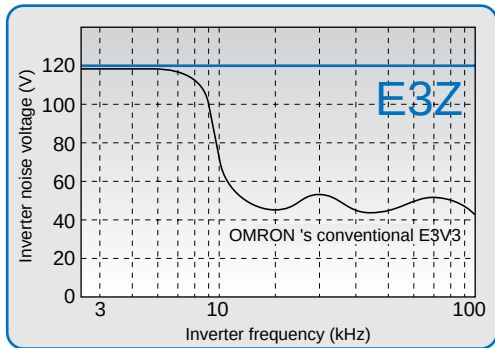
Reliability

Eliminates the influence of installation and on-site conditions, thus increasing the reliability of the line.

High protection against water and dust contaminants, ideal for arduous environment



High immunity to electrical interference, such as inverter drives.



Stability

E3Z-series reliability covers a wide range of object/background combinations, so ensuring stable detection regardless of workpiece color or reflectivity.

Foreground Suppression & Background Suppression

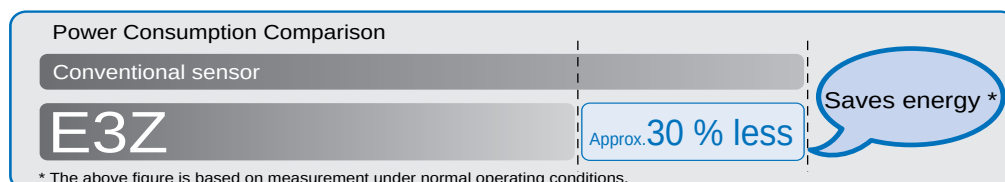


Environmental protection

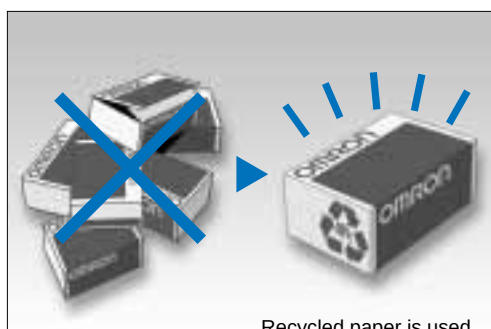
Photoelectric Sensor with Built-in Amplifier



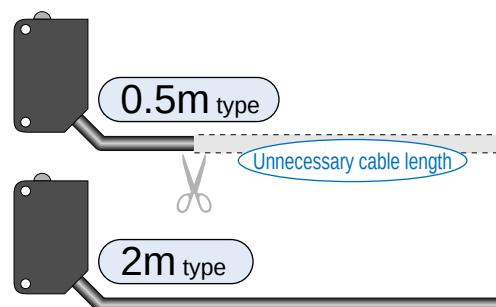
E3Z is earth-friendly, energy-saving.



10-quantity packing reduces waste cartons.



Standard models provided with a 0.5-m cable are available for the elimination of unnecessary cable length.

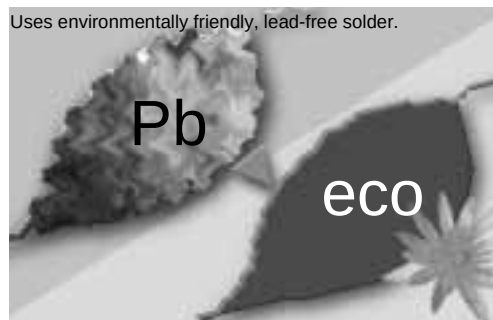


Packed in "combustible" polyethylene bags free of Styrofoam. *



On-going elimination of materials containing lead.

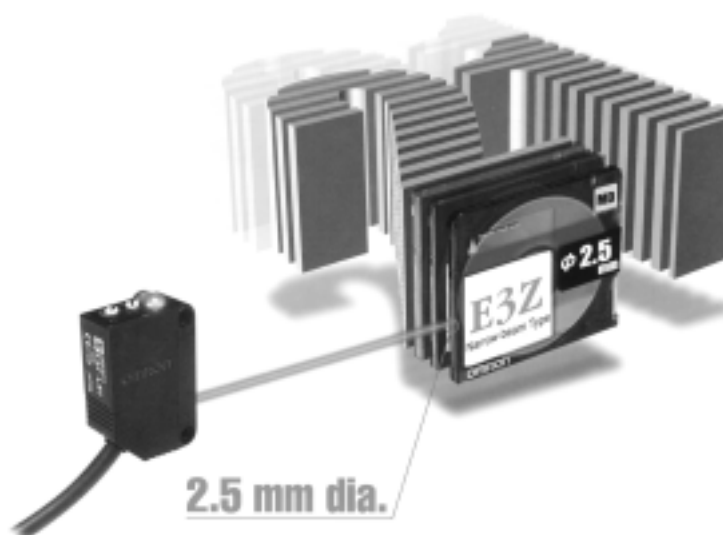
Uses environmentally friendly, lead-free solder.



Narrow Beam model

Ideal for detecting small objects with a small spot:

- Tiny objects as little as 0.1 mm in diameter can be detected with its 2.5-mm dia. spot.
- The thin beam enables detection through gaps or small holes.
- The high-intensity spot of light enables visual alignment of sensing spot position.



Transparent PET bottles

Stable detection of recyclable thin-wall PET bottles.

Standard-size transparent object sensor

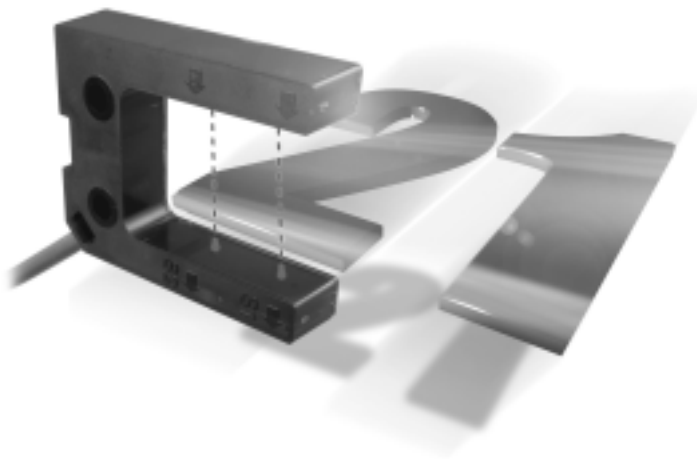
- Uses OMRON's unique optical system ("Inner View") that can detect various shapes of PET bottles and transparent objects.
- Detects a wide range of bottles regardless of size and facets



Fork Sensor, single and dual beam versions

Fork design eliminates the need for optical axis adjustment.

- Two-axis models also available.
- Ideal for limit of travel monitoring.
- Condition monitoring.
- „Flag“ identification.



Applications

E3Z-LS background and foreground suppression models

Detecting covers on cosmetic products



Detecting pastries on conveyor belts

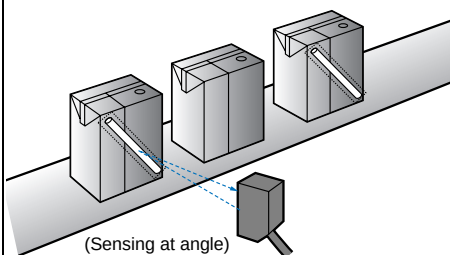


Detecting packaged chewing gum or candy

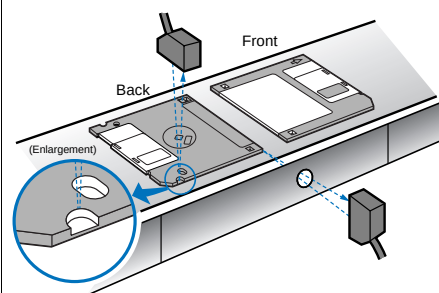


E3Z-L narrow beam models

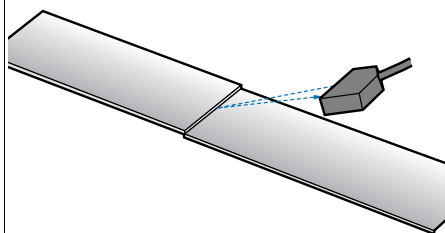
Checking for straws



Determining front/back or orientation of floppy disks

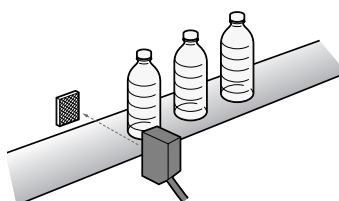


Detecting uneven joints

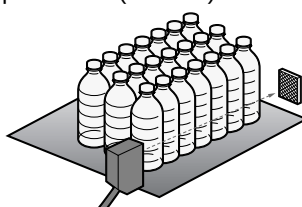


E3Z-B transparent object model

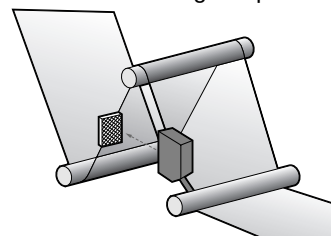
Transparent PET Bottle-related Detection
- One bottle



Transparent PET Bottle related Detection
- Multiple bottles (Stocker)

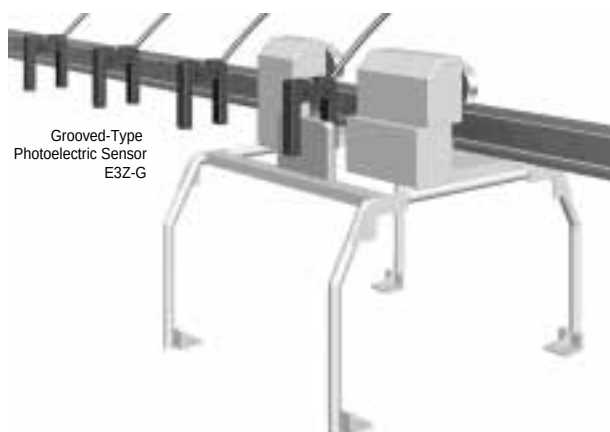


Detection of films and glass plates



E3Z-G grooved type model

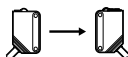
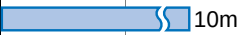
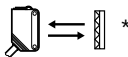
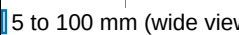
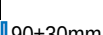
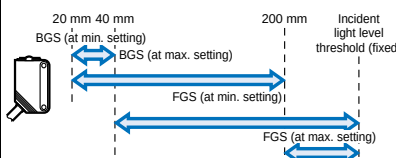
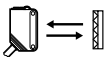
Crane and automated warehouse conveyor table passage inspection and positioning.



Ordering Information

Sensors

 Red light
  Infrared light

Sensor type	Shape	Connection method	Sensing distance				Model	
							NPN output	PNP output
Through-beam		Pre-wired models (2 m)*3					E3Z-T61	E3Z-T81
		Connector type					E3Z-T66	E3Z-T86
		Pre-wired models (2 m)*3					E3Z-T61A	E3Z-T81A
		Connector type					E3Z-T66A	E3Z-T86A
Retroreflective model (with M.S.R. function)	 *1	Pre-wired (2 m)*3					*2 E3Z-R61	E3Z-R81
		Connector type					E3Z-R66	E3Z-R86
Diffuse-reflective		Pre-wired models (2 m)*3					E3Z-D61	E3Z-D81
		Connector type					E3Z-D66	E3Z-D86
		Pre-wired models (2 m)*3, *4					E3Z-D62	E3Z-D82
		Connector type					E3Z-D67	E3Z-D87
Thin beam type reflective model		Pre-wired models (2 m)*3					E3Z-L61	E3Z-L81
		Connector type					E3Z-L66	E3Z-L86
Distance-settable		Pre-wired models (2 m)*3					E3Z-LS61	E3Z-LS81
		Connector type					E3Z-LS66	E3Z-LS86
Transparent PET bottle type Retro-reflective model (without M.S.R. function)	 *1	Pre-wired (2 m)*3					*2 E3Z-B61	E3Z-B81
		Connector type					E3Z-B66	E3Z-B86
		Pre-wired models (2 m)*3					*2 E3Z-B62	E3Z-B82
		Connector type					E3Z-B67	E3Z-B87
Grooved type through-beam model		1 Pre-wired models (2 m)*3					E3Z-G61	E3Z-G81
		2					E3Z-G62	E3Z-G82
		1					E3Z-G61-M3J	E3Z-G81-M3J
		2					E3Z-G62-M3J	E3Z-G82-M3J

*1. Not attached. Please purchase the optional reflector (9 types) according to your application.

*2. The sensing distance specified is possible when the E39-R1S used. Figure in parentheses indicate the minimum required distance between the Sensor and Reflector.

*3. Models provided with a 0.5-m cable are available. When ordering, specify the cable length by adding the code "0.5M" to the model number (e.g., E3Z-T61 0.5M).

*4. The connector joint type is available M12. Its model ends with -M1. (Example: E3Z-T61-M1J)

Accessories (Order Separately)

Slits

Slit width	Sensing distance (typical)		Minimum sensing object (typical)	Model	Quantity
	E3Z-T□□	E3Z-T□□A			
0.5 mm dia.	50 mm	35 mm	0.2 mm dia.	E39-S65A	One set (contains slits for both the emitter and receiver)
1-mm dia.	200 mm	150 mm	0.4 mm dia.	E39-S65B	
2-mm dia.	800 mm	550 mm	0.7 mm dia.	E39-S65C	
0.5 x 10 mm	1 m	700 mm	0.2 mm dia.	E39-S65D	
1 x 10 mm	2.2 m	1.5 m	0.5 mm dia.	E39-S65E	
2 x 10 mm	5 m	3.5 m	0.8 mm dia.	E39-S65F	

Reflectors

Not provided with retroreflective models

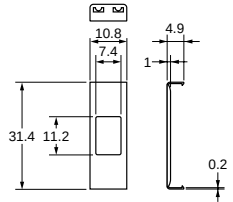
Name	Sensing distance (typical) *	Model	Quantity	Remarks
Reflectors	3 m [100 mm] (Rated value)	E39-R1	1	for E3Z-B□1/6 for E3Z-B□2/7
	4 m [100 mm] (Rated value)	E39-R1S	1	
	500 mm [80 mm]	E39-R1S	1	
	2 m [100 mm]			
	5 m [100 mm]	E39-R2	1	
	2.5 m [100 mm]	E39-R9	1	
	3.5 m [100 mm]	E39-R10	1	
Fog preventing	500 mm [80 mm]	E39-R1K	1	for E3Z-B□1/6
	2 m [100 mm]			for E3Z-B□2/7
Small reflector	1.5 m [50 mm]	E39-R3	1	
Tape Reflector	700 mm [150 mm]	E39-RS1	1	
	1.1 m [150 mm]	E39-RS2	1	
	1.4 m [150 mm]	E39-RS3	1	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Note: 1. When using the reflector of other than the rated value, set the sensing distance to about 0.7 times of the typical example as a guideline.

2. For details, refer to the "Reflector list".

Mutual interference prevention filter

Sensing distance	Shape/dimensions	Model	Quantity	Remarks
3 m		E39-E11	2 sets each for emitters and receivers (total of 4 pcs.)	Can be used with the through-beam E3Z-T□□A. The arrow represents the polarizing direction. Changing the polarizing direction of the two adjacent emitters and receivers prevents mutual interference.

Mounting Brackets

Shape	Model	Quantity	Remarks	Shape	Model	Quantity	Remarks
	E39-L153	1	Mounting Brackets		E39-L150	One set	Sensor adjuster Easy mounting to aluminum frame/rail of conveyor or like, easy adjustment. For left-to-right adjustment
	E39-L104	1					
	E39-L43	1	Horizontal type mounting bracket		E39-L151	One set	
	E39-L142	1	Horizontal type protective cover bracket		E39-L93□	One set	Sensor adjuster Easy mounting to aluminum frame/rail of conveyor or like, easy adjustment. For vertical angle adjustment
	E39-L44	1	Rear mounting bracket				
	E39-L98	1	Protective cover bracket		E39-L144	1	Vertical protective cover bracket

Note: 1. If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

2. For details, refer to the "Mounting bracket list".

Sensor I/O Connectors

Size	Cable type	Shape	Cable length		Model
M8	Standard cable	Straight	2 m	4-wire type	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A
M12 (for -M1J)		Straight	2 m	3-wire type	XS2F-D421-DC0-A
			5 m		XS2F-D421-GC0-A
		L-shaped	2 m		XS2F-D422-DC0-A
			5 m		XS2F-D422-GC0-A

Rating/performance

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)	Diffuse-reflective		
Model	NPN output	E3Z-T61/T66	E3Z-T61A/T66A		E3Z-R61/R66	wide-beam	E3Z-D61/D66
Item	PNP output	E3Z-T81/T86	E3Z-T81A/T86A	E3Z-R81/R86	E3Z-D81/D86	E3Z-D82/D87	
Sensing distance		15 m	10 m	4 m (100 mm) * (When using the E39-R1S) 3 m (100 mm) * (When using the E39-R1)	100 mm (White paper 100 x 100 mm)	1 m (White paper 300 x 300 mm)	
Setting range		---					
Reflectivity characteristic		---					
Spot Diameter		---					
Standard sensing object		Opaque: 12-mm dia. min.		Opaque: 75-mm dia. min.	---		
Min. sensing object		---					
Differential distance		---			20% max. of sensing distance		
Directional angle		Both emitter and receiver: 3° to 15°	Both emitter and receiver: 3° to 5°	2° to 10°	---		
Light source (wave length)		Infrared LED (860 nm)	Red LED (700 nm)	Red LED (680 nm)	Infrared LED (860 nm)		
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) : 10% max.					
Current consumption		emitter: 15 mA receiver: 20 mA		30 mA max.			
Control output		Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable					
BGS / FGS selection		---					
Protective circuits		Protection from load short-circuit and reversed power supply connection		Reverse polarity protection, output short-circuit protection, mutual interference prevention			
Response time		Operation or reset: 1 ms max.					
Sensitivity adjustment		Single-turn adjustment					
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.					
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)					
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
Insulation resistance		20 M Ω min. at 500 VDC					
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute					

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Rating/performance

Diffuse-reflective narrow-beam	Distance-settable	Retro-reflective for PET bottles (without MSR function)		Grooved-type	
			wide-beam		
E3Z-L61/66	E3Z-LS61/66	E3Z-B61/66	E3Z-B62/67	E3Z-G61	E3Z-G62
E3Z-L81/86	E3Z-LS81/86	E3Z-B81/86	E3Z-B82/87	E3Z-G81	E3Z-G82
90 ± 30 mm (White paper 100 x 100 mm)	BGS: White or black paper (100 x 100 mm): 20 mm to set distance FGS: White paper (100 x 100 mm): Set distance to 200 mm min. Black paper (100 x 100 mm): Set distance to 160 mm min.	500 mm (80 mm) * (When using the E39-R1S)	2 m (100 mm) * (When using the E39-R1S)	25 mm 1 optical axis 2 optical axis	
---	White paper (100 x 100 mm): 40 to 200 mm Black paper (100 x 100 mm): 40 to 160 mm	---			
Refer to the diagram „Hysteresis Difference vs. Sensing Distance“	Black/white-error: 10% of set distance max.	---			
2.5 mm dia. (when sensing distance is 90 mm)	---				
---		Transparent round PET bottle 500 ml (65 mm dia.)		---	
0.1 mm dia. (copper wire)					

Red LED (660 nm)	Red LED (680 nm)	Red LED (680 nm)		Infrared LED (860 nm)	
12 to 24 VDC ±10%, ripple (p-p) : 10% max.					
30 mA max				25 mA max.	40 mA max.
Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable					
---	BGS: Open or connected to GND FGS: Connected to Vcc	---			
Reverse polarity protection, output short-circuit protection, mutual interference prevention					
Operation or reset: 1 ms max.					
Single-turn adjustment	five-turn endless adjuster	Single-turn adjustment		---	
Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.					
Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)					
Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
20 MΩ min. at 500 VDC					
1,000 VAC at 50/60 Hz for 1 minute					

Rating/performance

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)	Diffuse-reflective	
					wide-beam	
Model	NPN output	E3Z-T61/T66	E3Z-T61A/T66A	E3Z-R61/R66	E3Z-D61/D66	E3Z-D62/D67
Item	PNP output	E3Z-T81/T86	E3Z-T81A/T86A	E3Z-R81/R86	E3Z-D81/D86	E3Z-D82/D87
Vibration resistance		10 to 55 Hz, 1.5-mm or 300m/s ² double amplitude for 2 hours each in X, Y, and Z directions				
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions				
Protective structure		IEC 60529 IP67				
Connection method		Pre-wired (standard length: 2 m/500 mm)/M8 connector				
Indicator lamp		Operation indicator (orange), stability indicator (green) [Note that the emitter has the power indicator (orange) only]				
Weight (Packed state)	Pre-wired models (with 2-m cable)	Approx. 120 g		65 g		
	Connector type	30 g		Approx. 20 g		
Material	Case	PBT (polybutylene terephthalate)				
	Lens	Methacrylate resin				
Accessories		Instruction manual (The Reflector or Mounting Bracket is not provided with any of the above models.)				

Rating/performance

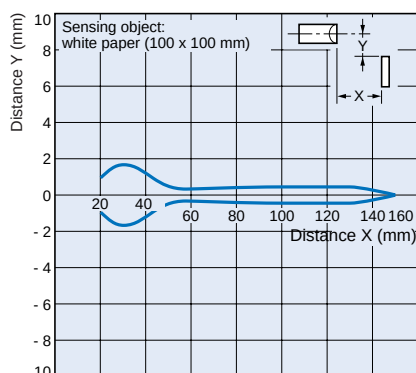
Diffuse-reflective	Distance-settable	Retro-reflective for PET bottles (without MSR function)		Grooved-type	
			wide-beam		
narrow-beam					
E3Z-L61/66	E3Z-LS61/66	E3Z-B61/66	E3Z-B62/67	E3Z-G61	E3Z-G62
E3Z-L81/86	E3Z-LS81/86	E3Z-B81/86	E3Z-B82/87	E3Z-G81	E3Z-G82
10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions					
Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions					
IEC 60529 IP67				IEC 60529 IP64	
Pre-wired (standard length: 2 m/500 mm)/M8 connector				Pull-out cable type (standard cable length: 2 m/500 mm) / connector relay type (standard cable length: 300 mm)	
Operation indicator (orange), stability indicator (green)				Operation indicator (orange)	
Approx. 65 g		65 g			
Approx. 20 g				30 g	
PBT (polybutylene terephthalate)				ABS	
Methacrylate resin	Denaturated polyallylate	Methacrylate resin			
Instruction manual (The Reflector or Mounting Bracket is not provided with any of the above models.)					

Characteristic data (typical)

Operating Range

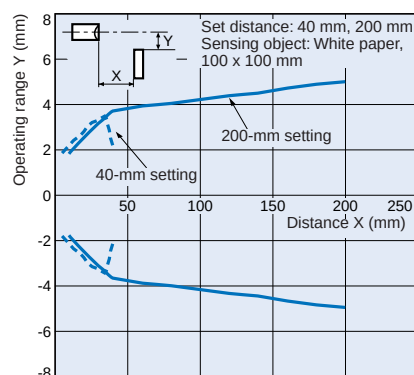
Narrow-beam

E3Z-L



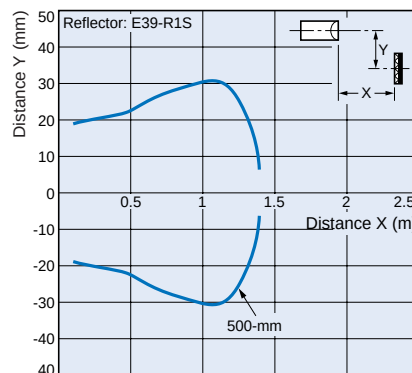
Distance-setting

E3Z-LS [BGS]

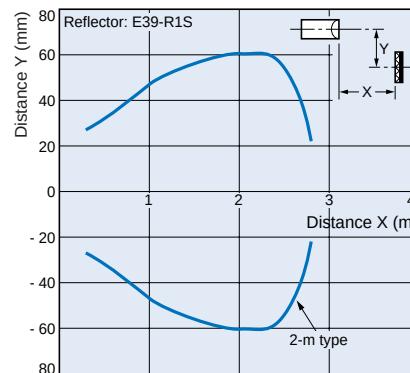


Retroreflective Models for transparent objects

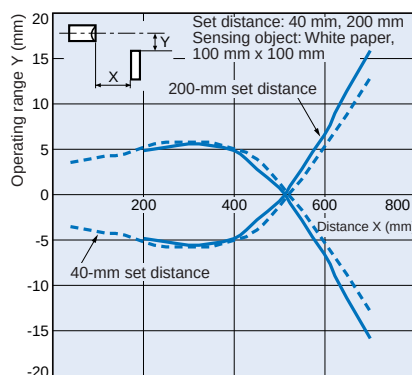
E3Z-B□1/B□6 + E39-R1S (optional reflector)



E3Z-B□2/B□7 + E39-R1S (optional reflector)



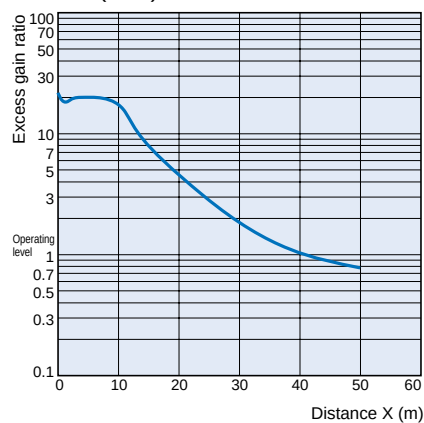
E3Z-LS [FGS]



Excess Gain vs. Distance

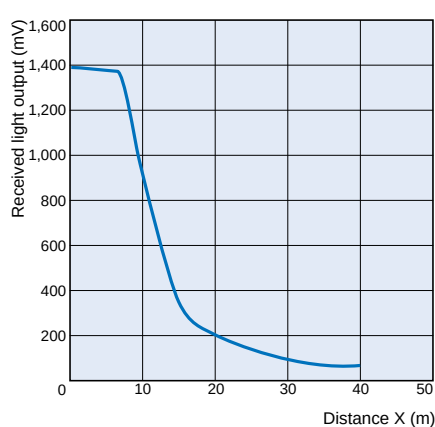
Through-beam

E3Z-T□1(T□6)



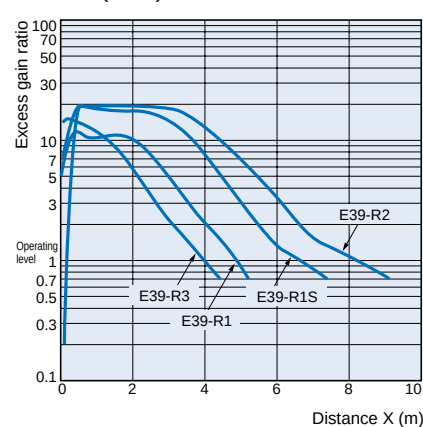
Through-beam

E3Z-T□A

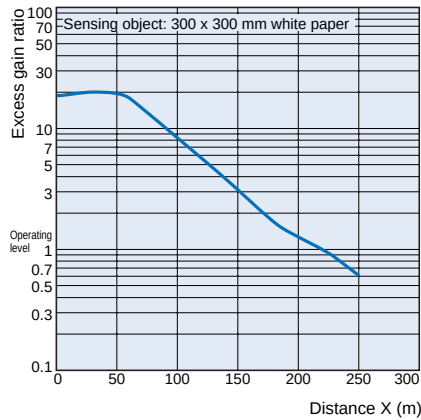


Retroreflective Models

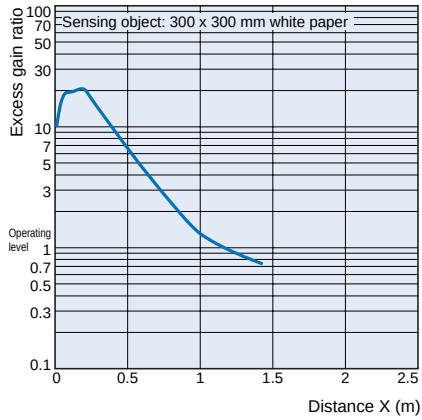
E3Z-R□1(R□6) + Reflectors



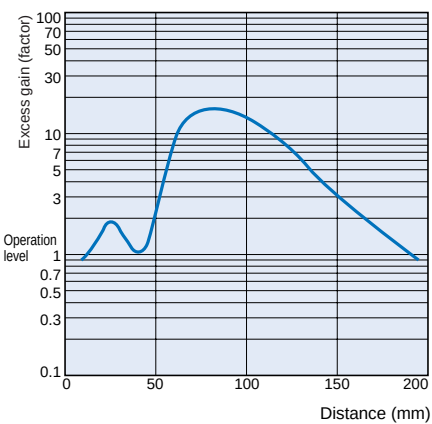
Diffuse-reflective
E3Z-D□1(D□6)



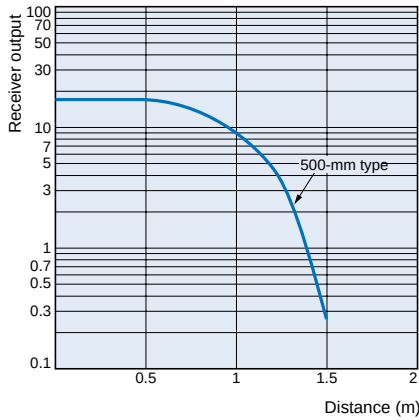
Diffuse-reflective
E3Z-D□2(D□7)



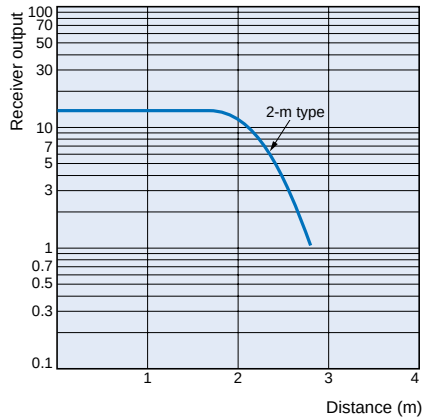
Narrow-beam
E3Z-L



Retro-reflective for transparent objects
E3Z-B□1/B□6 + E39-R1S
(optional reflector)

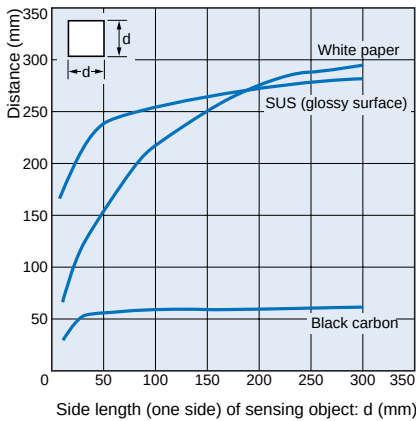


E3Z-B□2/B□7 + E39-R1S
(optional reflector)

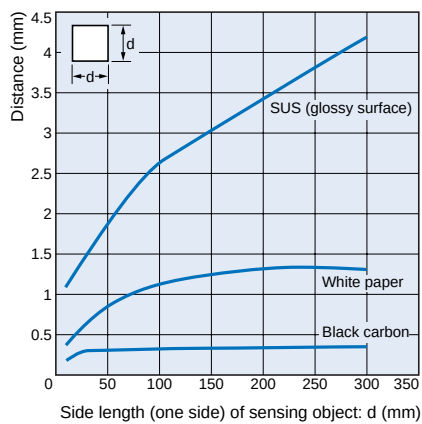


Distance vs. Size

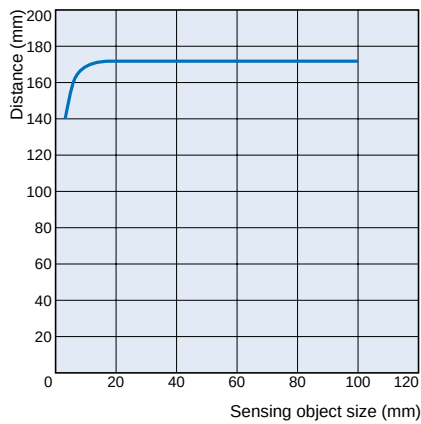
Diffuse-reflective
E3Z-D□1(D□6)



Diffuse-reflective
E3Z-D□2(D□7)



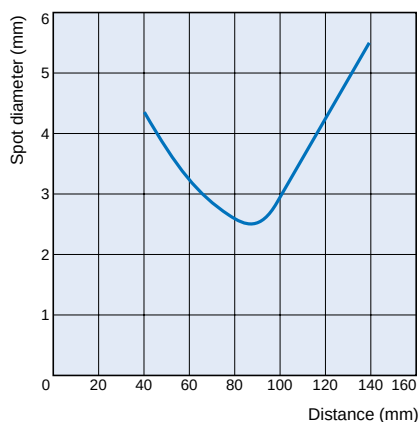
Narrow-beam
E3Z-L



Spot diameter vs. Distance

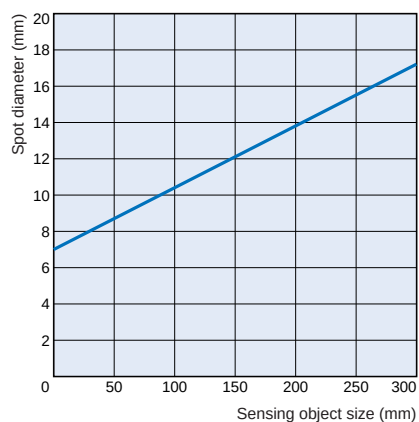
Narrow-beam

E3Z-L



Distance setting

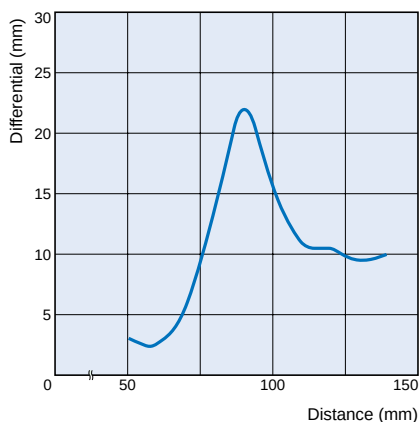
E3Z-LS



Differential travel / Hysteresis vs. Distance

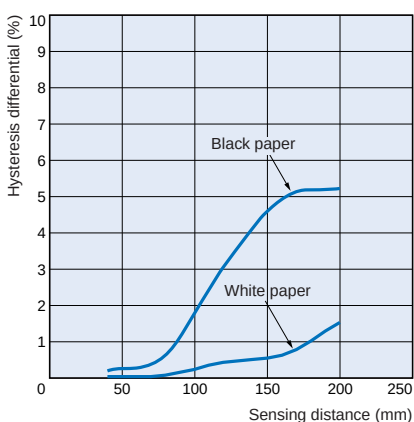
Narrow-beam

E3Z-L



Distance setting

E3Z-LS

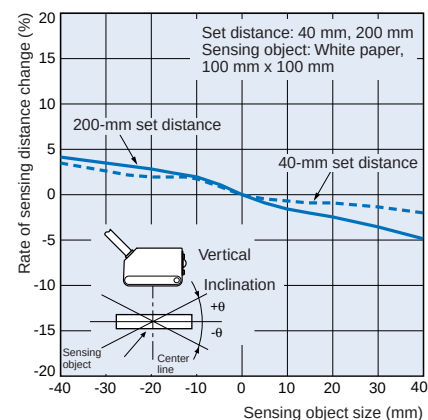


Inclination Characteristics

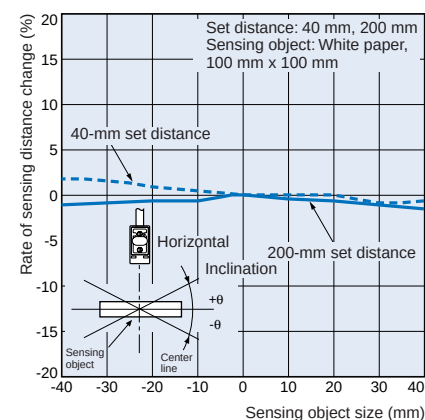
Distance setting

E3Z-LS

Vertical



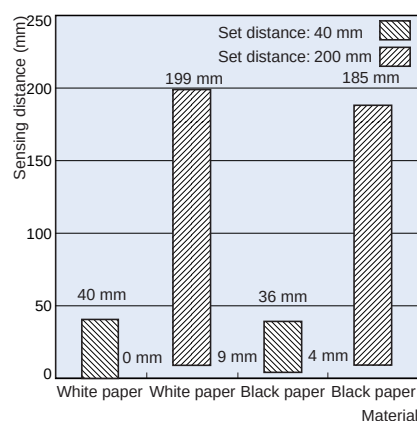
Horizontal



Short-distance Characteristics

Distance setting

E3Z-LS

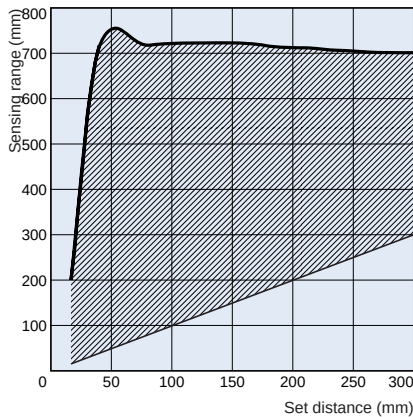


FGS Mode Set Distance vs. Sensing Range

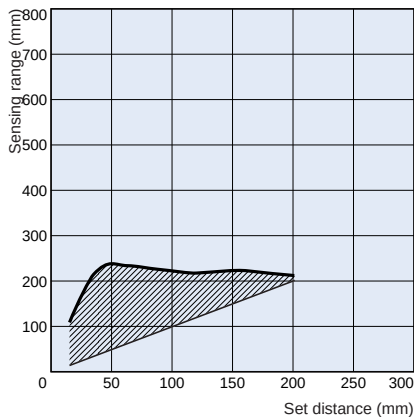
Distance setting

E3Z-LS

White Paper



Black Paper

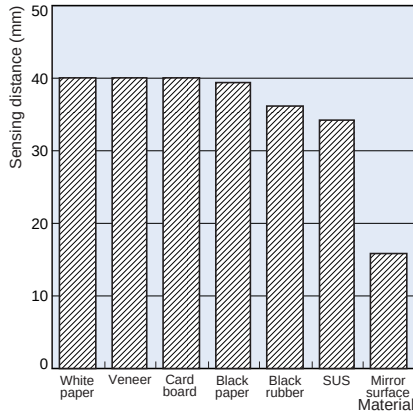


Sensing Distance vs. Material

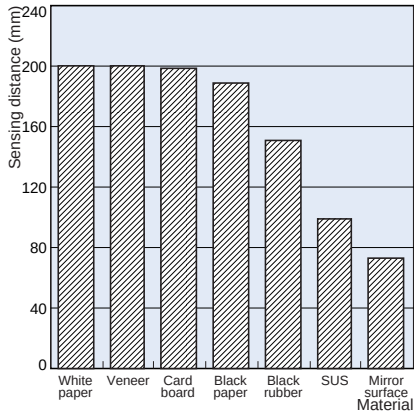
Distance setting

E3Z-LS

At Set Distance of 40 mm



At Set Distance of 200 mm



Output Circuit Diagram

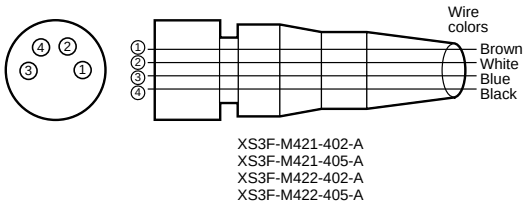
NPN output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3Z-T61 E3Z-T66 E3Z-T61A E3Z-T66A E3Z-R61 E3Z-R66 E3Z-D61 E3Z-D66 E3Z-D62 E3Z-D67 E3Z-L61 E3Z-L66 E3Z-B61 E3Z-B62 E3Z-B66 E3Z-B67 E3Z-G61	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	
	Through-beam emitter			
E3Z-LS61 E3Z-LS66	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	
	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	
E3Z-G62	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3Z-T81 E3Z-T86 E3Z-T81A E3Z-T86A E3Z-R81 E3Z-R86 E3Z-D81 E3Z-D86 E3Z-D82 E3Z-D87 E3Z-L81 E3Z-L86 E3Z-B81 E3Z-B82 E3Z-R86 E3Z-B87 E3Z-G81	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between blue and black)	L•ON (LIGHT ON)	Through-beam receiver Retroreflective model Diffuse-reflective model
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between blue and black)	D•ON (DARK ON)	Connector Pin Arrangement Note: Terminal 2 is not used.
	Through-beam emitter			Connector Pin Arrangement Note: Terminal 2 and 4 are not used.
E3Z-LS81 E3Z-LS86	Light ON	Operation indicator (orange) ON OFF Output transistor ON OFF Load (e.g. relay) ON OFF (Between blue and black)	L•ON (LIGHT ON)	
	Dark ON	Operation indicator (orange) ON OFF Output transistor ON OFF Load (e.g. relay) ON OFF (Between blue and black)	D•ON (DARK ON)	
	Light ON	Operation indicator (orange) ON OFF Output transistor ON OFF Load (e.g. relay) ON OFF (Between blue and black)	L•ON (LIGHT ON)	
	Dark ON	Operation indicator (orange) ON OFF Output transistor ON OFF Load (e.g. relay) ON OFF (Between blue and black)	D•ON (DARK ON)	
E3Z-G82	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Control output ON OFF Load (Relay) Operate Reset (Between brown and black (white))	L•ON (LIGHT ON)	
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Control output ON OFF Load (Relay) Operate Reset (Between brown and black (white))	D•ON (DARK ON)	

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application		
			Standard	E3Z-LS	E3Z-G62/82
For DC	Brown	①	Power supply (+V)		
	White	②	---	BGS / FGS selection	Output 2 (S2)
	Blue	③	Power supply (0 V)		
	Black	④	Output		Output 1 (S1)

Nomenclature:

Through-beam

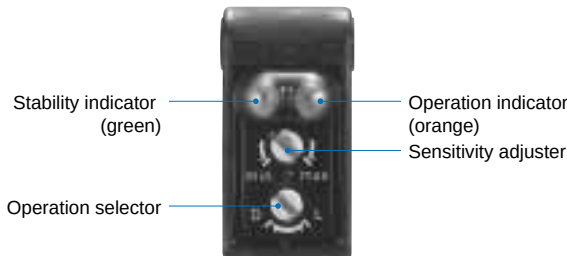
E3Z-T□□ Receiver
E3Z-T□□A Receiver

Diffuse-reflective

E3Z-D□□
E3Z-L□□

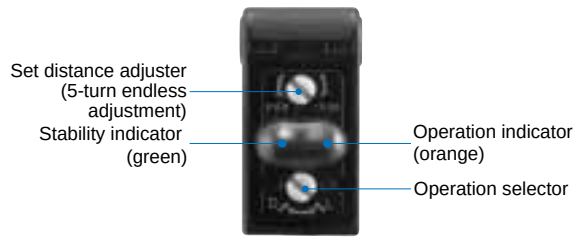
Retroreflective Models

E3Z-R□□
E3Z-B□□



Distance-setting

E3Z-LS□□



Operation

Slit for through-beam model (Optional accessory:
E39-S65A/B/C/D/E/F)

(Slit)

Hook

Protruding portion

Slit

Lower mounting dent portion

(Sensor)

Upper indented mounting portion

Sensor

Mounting method

1. Hook the upper protruding portions of the Slit to the upper indented mounting portion of the Sensor and adjust the position of the Slit so that the Slit will be parallel to the lens surface.
2. Press the lower protruding portion of the Slit onto the indented mounting portion of the Sensor until the Slit snaps in.

Mounting condition

Side view

Front view

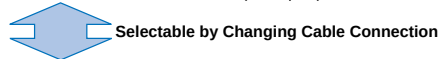
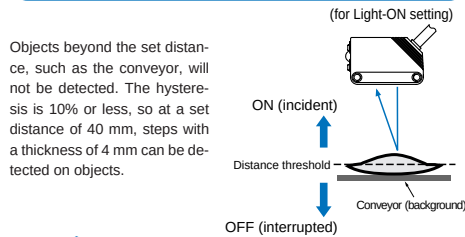
Demounting method

1. Press the upper portion of the Slit.
2. Disconnect the lower protruding portion of the Slit from the Sensor and remove the Slit.

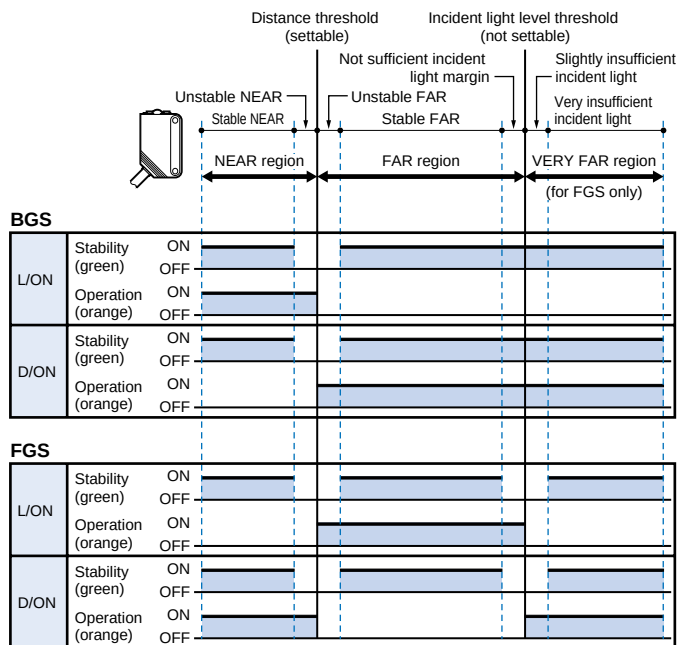
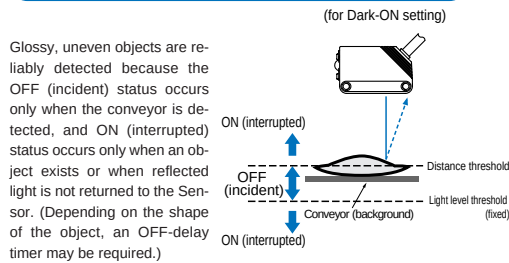
BGS / FGS Application for distance setting E3Z-LS

Simple Detection of Glossy, Uneven Objects

BGS (Background Suppression)



FGS (Foreground Suppression)



Precautions

Caution

Do not connect an AC power supply to the Sensor. If AC power (100 VAC or more) is supplied to the Sensor, it may explode or burn.

Be sure to abide by the following precautions for the safe operation of the Sensor.

Wiring

Power Supply Voltage and Output Load Power Supply Voltage

Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

Load Short-circuiting

Do not short-circuit the load, otherwise the Sensor may be damaged.

Connection without Load

Do not connect the power supply to the Sensor with no load connected, otherwise the internal elements may explode or burn.

Operating Environment

Do not use the Sensor in locations with explosive or flammable gas.

Correct Use

Design

Power Reset Time

The Sensor is ready to operate 100 ms after the Sensor is turned ON. If the load and Sensor are connected to independent power supplies respectively, be sure to turn ON the Sensor before supplying power to the load.

Wiring

Avoiding Malfunctions

If using the Photoelectric Sensor with an inverter or servomotor, always ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

- If Sensors are mounted face-to-face, make sure that the optical axes are not in opposition to each other. Otherwise, mutual interference may result.
- Always install the Sensor carefully so that the aperture angle range of the Sensor will not cause it to be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.

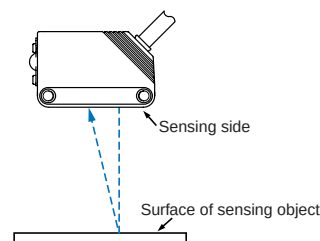
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistive properties.
- Use M3 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

M8 Connector

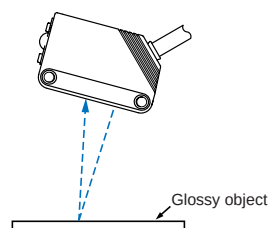
- Always turn OFF the power supply to the Sensor before connecting or disconnecting the metal connector.
- Hold the connector cover to connect or disconnect it.
- Secure the connector cover by hand. Do not use pliers, otherwise the connector may be damaged.
- If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

Distance setting models E3Z-LS

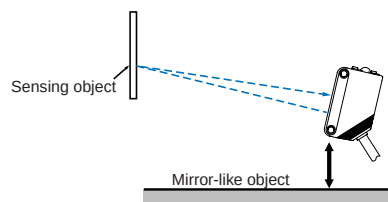
- Make sure that the sensing side of the Sensor is parallel with the surface of the sensing objects. Normally, do not incline the Sensor towards the sensing object.



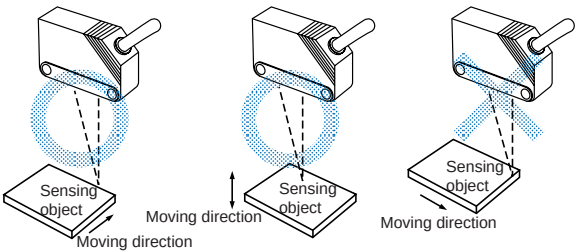
If the sensing object has a glossy surface, however, incline the Sensor by 5° to 10° as shown in the illustration, provided that the Sensor is not influenced by background objects.



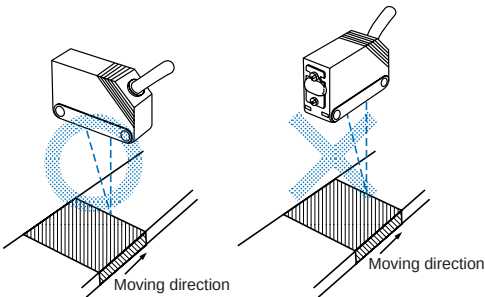
- If there is a mirror-like object below the Sensor, the Sensor may not operate stably. Therefore, incline the Sensor or separate the Sensor from the mirror-like object as shown below.



- Do not install the Sensor in the wrong direction. Refer to the following illustration.



Install the Sensor as shown in the following illustration if each sensing object greatly differs in color or material.



before using the Sensor.

Mounting

Sensor Mounting

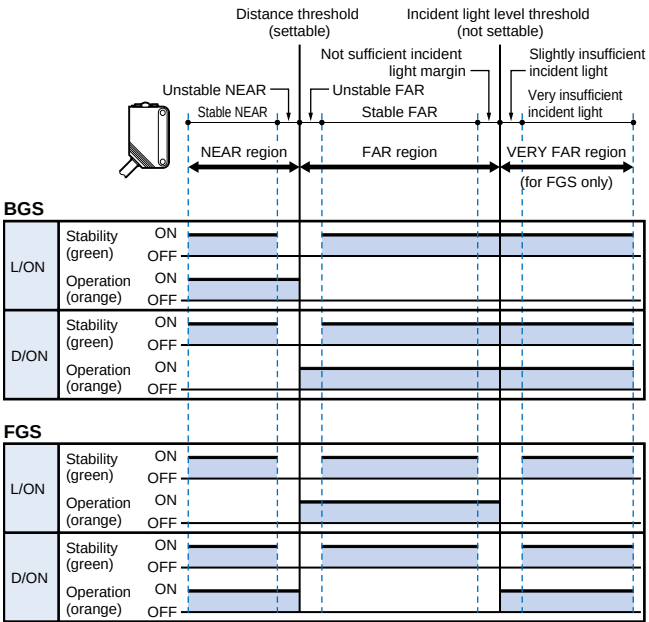
If the Sensor fails to provide stable detection due to the shape of bottles, adjust the location and inclination of the Sensor.

Inspection and Maintenance

Cleaning

Never use paint thinners or other organic solvents to clean the surface of the product.

Adjustments-indicator operation



Note: 1. If the stability indicator is lit, the detection/no detection status is stable within the rated ambient operating temperature (-25 to 55°C).
2. The VERY FAR region is supported only for FGS. The incident light threshold is fixed and cannot be set. The distance to the incident light threshold depends on the color and gloss of the sensing object's surface.

Retro-reflective for transparent objects E3Z-B

Design

Bottles

The Sensor may be unable to achieve stable detection depending on the shape of bottles. Be sure to verify stable detection

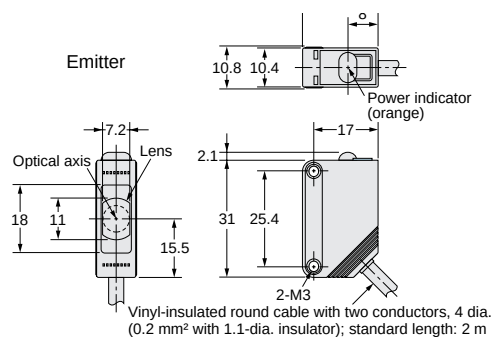
Dimensions (Unit: mm)

Sensors

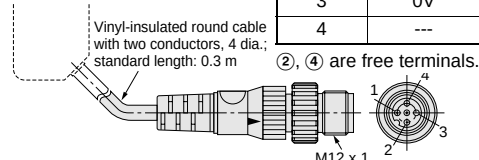
Through-beam

Pre-wired

E3Z-T61
E3Z-T81
E3Z-T61A

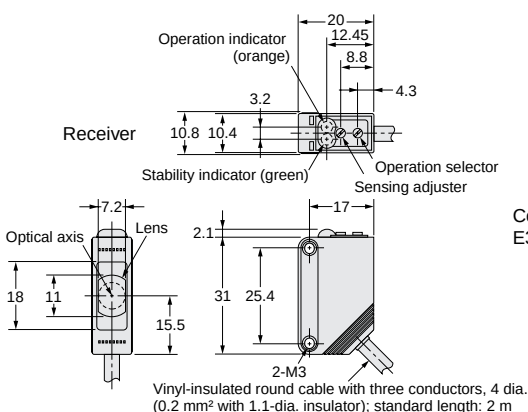


Connector relay models E3Z-T61-M1J

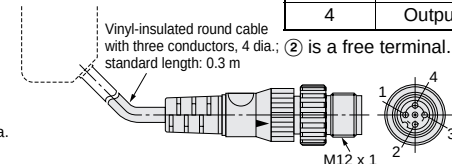


Model	CAD file
E3Z-T61-L E3Z-T81-L	E3Z_01

Termi- nal No.	Specifica- tions
1	+V
2	---
3	0V
4	---



Connector relay models E3Z-T61-M1J



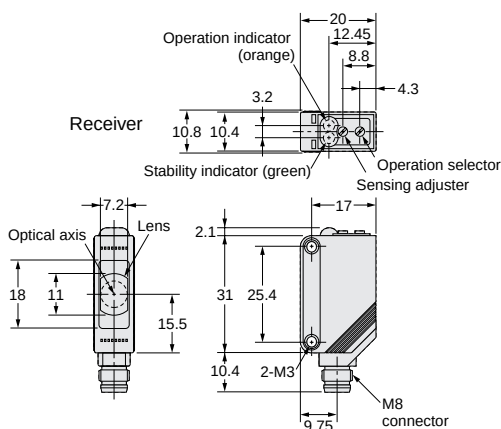
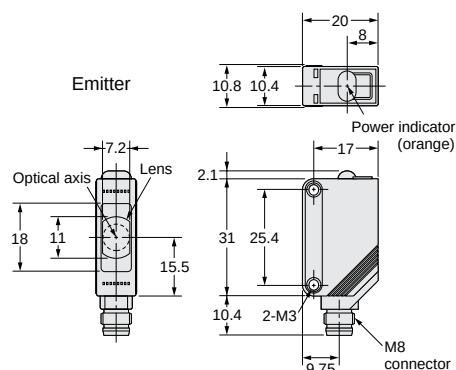
Model	CAD file
E3Z-T61-L E3Z-T81-L	E3Z_02

Termi- nal No.	Specifica- tions
1	+V
2	---
3	0V
4	Output

Through-beam

Connector type

E3Z-T66
E3Z-T86
E3Z-T66A



Model	CAD file
E3Z-T66-L E3Z-T86-L	E3Z_04

Model	CAD file
E3Z-T66-D E3Z-T86-D	E3Z_05

Retroreflective Models

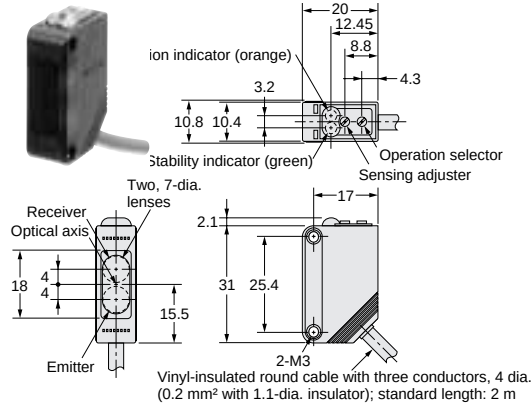
Pre-wired

- E3Z-B61
- E3Z-B62
- E3Z-B81
- E3Z-B82
- E3Z-R61
- E3Z-R81

Diffuse-reflective

Pre-wired

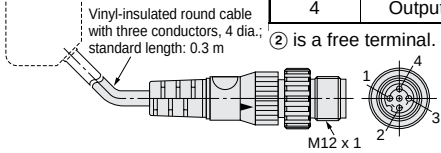
- E3Z-D61
- E3Z-D81
- E3Z-D62
- E3Z-D82
- E3Z-L61
- E3Z-L81



CAD file E3Z_03

Terminal No.	Specifications
1	+V
2	---
3	0V
4	Output

Connector relay models (E3Z-□□-M1J)



Retroreflective Models

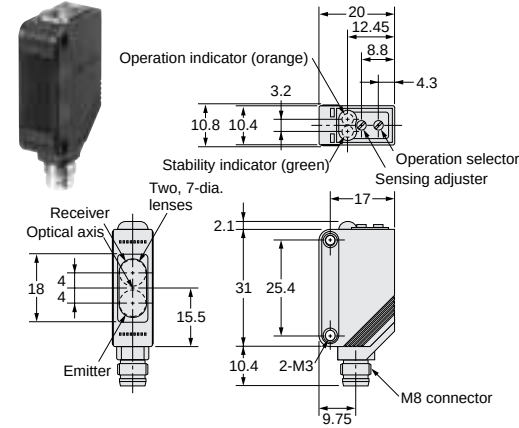
Connector type

- E3Z-B66
- E3Z-B67
- E3Z-B86
- E3Z-B87
- E3Z-R66
- E3Z-R86

Diffuse-reflective

Connector type

- E3Z-D66
- E3Z-D86
- E3Z-D67
- E3Z-D87
- E3Z-L66
- E3Z-L86

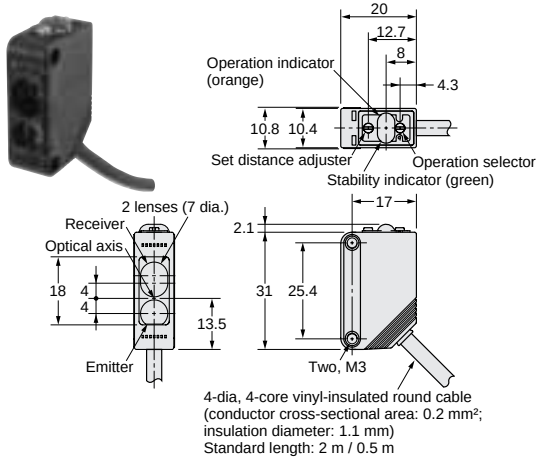


CAD file E3Z_06

Distance-settable Models

Pre-wired models

- E3Z-LS61
- E3Z-LS81



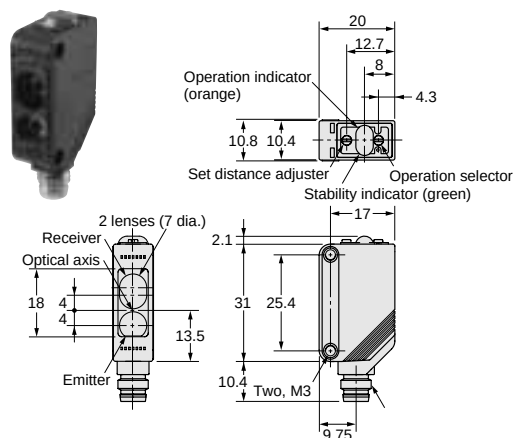
CAD file E3Z_11

Distance-settable Models

Connector type

E3Z-LS66

E3Z-LS86

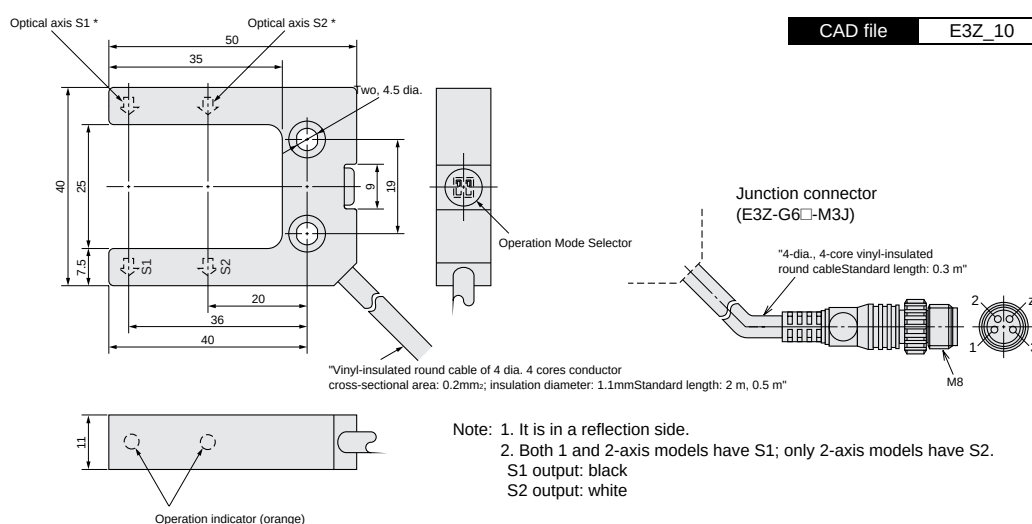


CAD file

E3Z_12

Grooved-type Models

E3Z-G



CAD file

E3Z_10

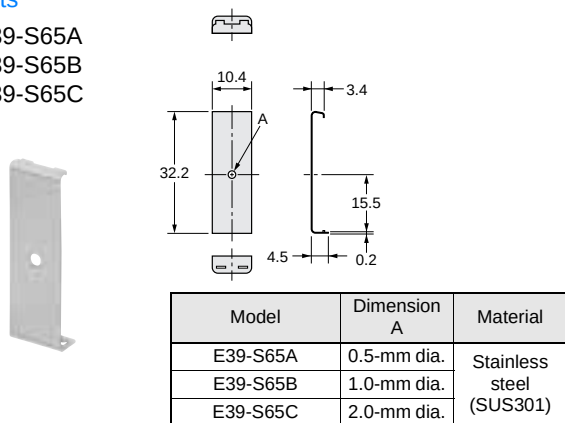
Accessories (Order Separately)

Slits

E39-S65A

E39-S65B

E39-S65C

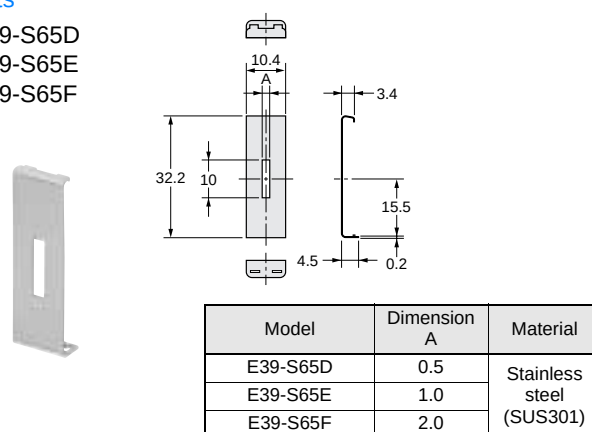


Slits

E39-S65D

E39-S65E

E39-S65F



MEMO

Mini Photoelectric Sensor

E3T

With its built-in, ultra-small amplifier, this photoelectric sensor has achieved long, 1 m distance detection. Line-ups of 4 types are available for selection according to applications

**Features**

4 detection methods for selection according to work and space

Through-beam model

The side-view type has realized long, 1 m distance detection. Furthermore, it can detect a small, 0.5 mm or less dia. work with a pin-point beam (when slit is fitted). The visible light spot and narrow-visibility beam ensure a stable detection of lead frames and chip parts.

Diffuse reflective model

3.5 mm thin size and can be installed to a gap etc. The pin-point beam makes sensing position check easy, and the sensor is insensitive to the background and surrounding metal, ensuring stable detection.

Limited reflective model

Having the smallest size, this type can detect a merely 0.15 mm small object. In addition to this, it is insensitive to the background and surrounding metal, thus, ensuring a stable detection. The pin-point beam allows a clear vision of a red light spot, facilitating a sensing position check.

Retroreflective model

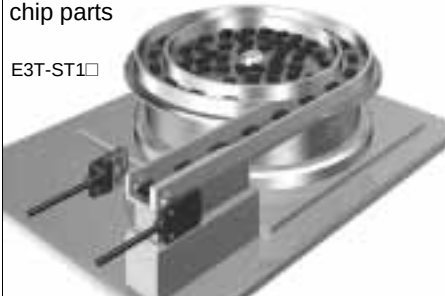
The world first coaxial Retroreflective type in this size. When used with a small reflector, this sensor completes 2 mm dia. small work detection and 200 mm sensing distance. The switch detects small works, such as IC chips on tape, and the pin-point beam makes optical axis adjustment easy, achieving stable detection.

Application

Through-beam

Detection of passing/staying parts on parts feeder
Stable detection of small works such as chip parts

E3T-ST1□



Limited reflective

Detection of chip parts on tape (Taping machine)
Can detect small parts on 1 mm dia. small spots.

E3T-SL1□
E3T-SL2□



Diffuse-reflective

Detection of seated wafer cassette
Thin size. Can be mounted to a gap or like.

E3T-FD1□



Retroreflective Models

Detection of stick full of ICs (IC handler/DIP.SOP)
Retroreflection halves wiring man-hours.

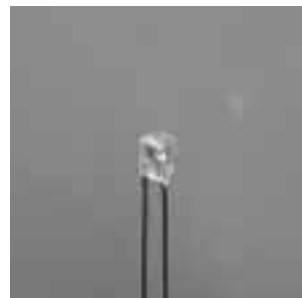
E3T-SR1□



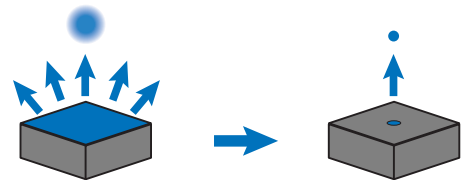
Features

The hyper LED issues a 0.8 mm dia. pin-point beam (E3T-SL1□) Small works can be detected

The hyper LED performs a high-output narrow-visibility beam of 0.8 mm spot diameter (E3T-SL1□). A red spot can be seen clearly and optical axis alignment and detection position check become easy. Besides, the LED is insensitive to the work color and background and can detect a small work securely.



High output pin-point light source
LED (wave length: 670 nm)



The conventional LED emits light from its surface. It has a large degree of light dispersion, increasing the loss when creating a small beam.

The hyper LED emits light from a small point. It has a small degree of light dispersion, achieving a loss-free, high-output, narrow-visibility beam.

E3S-ST	A diagram showing the beam spread of an E3S-ST sensor. The emitter has a diameter of 150-μm. The beam spreads over a distance of 50mm, creating a visible spot with a diameter of 6-mm.
Conventional through-beam type	A diagram showing the beam spread of a conventional through-beam sensor. The beam spreads over a distance of 15 mm, creating a visible spot with a maximum diameter of 15 mm.

One-chip photo IC ensures high reliability.

The incident photo diode and analog/digital signal processing circuit are integrated densely into the one-chip fully customized IC in use. This photoelectric sensor has high reliability in the ultra small size.

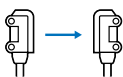
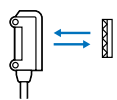
Loaded with OMRON's original FAO, this photoelectric sensor has achieved the world's first coaxial retroreflective type.

The FAO (FREE ANGLE OPTICS), or special beam splitter having multiple layers of dielectric films on a glass, has implemented the ultra small coaxial retroreflection. It can detect a small 2 mm dia. work, provides sensing position accuracy equivalent to that of the through-beam type, reducing wiring man-hours.

Ordering Information

Sensors

 Red light

Sensor type	Shape		Connection method	Sensing distance			Output form	Model		
								NPN output *1	PNP output	
Through-beam	Side-view		Pre-wired models	 1m			Light ON	E3T-ST11	E3T-ST13	
							Dark ON	E3T-ST12	E3T-ST14	
	Flat			 500mm				Light ON	E3T-FT11	E3T-FT13
								Dark ON	E3T-FT12	E3T-FT14
Retroreflective	Side-view			 200mm [10mm] *2				Light ON	E3T-SR11	E3T-SR13
								Dark ON	E3T-SR12	E3T-SR14
Diffuse reflective	Flat			 5 to 30 mm				Light ON	E3T-FD11	E3T-FD13
								Dark ON	E3T-FD12	E3T-FD14
Limited reflective	Side-view			 5 to 15 mm				Light ON	E3T-SL11	E3T-SL13
								Dark ON	E3T-SL12	E3T-SL14
				 5 to 30 mm				Light ON	E3T-SL21	E3T-SL23
								Dark ON	E3T-SL22	E3T-SL24

*1. The robot cable type is available. Its type ends with "R". (Example: E3T-ST11R)

*2. Values in parentheses indicate the minimum required distance between the sensor and reflector.

Accessories (Order Separately)

Slits

Slit width	Sensing distance (typical)	Minimum sensing object (typical)	Model	Quantity	Remarks
0.5 mm dia.	100 mm	0.5 mm dia.	E39-S63	One each for Emitter and Receiver; common with Slit widths of 1 dia. and 0.5 dia.	(Plug-in type round slit) Can be used with the through-beam E3T-ST1□.
1 mm dia.	300 mm	1 mm dia.			
0.5 mm dia.	50 mm	0.5 mm dia.	E39-S64		(Plug-in type round slit) Can be used with the through-beam E3T-FT1□.
1 mm dia.	100 mm	1 mm dia.			

Reflectors

Name	Sensing distance (typical)	Minimum sensing object (typical)	Model	Quantity	Remarks
Small reflector	200 mm [10 mm] * (rated value)	2 mm dia.	E39-R4	1	Attached to the E3T-SR1□ Retroreflective model.
	100 mm (10 mm)*		E39-R37		---

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

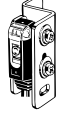
Note: 1. When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

2. Refer to the "Reflector list".

Sensitivity Adjustment Unit

Shape	Sensing distance (typical)	Model	Quantity	Remarks
	300 to 800 mm	E39-E10	1	For E3T-ST1□

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L116	1	Can be used with the side-view E3T-S□□□.
	E39-L117		
	E39-L118		
	E39-L119		Can be used with the flat E3T-F□□□.
	E39-L120		

Note: 1. If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.
2. For details, refer to "Mounting bracket list".

Rating/performance

Sensor type	Shape	Through-beam				Retroreflective Models		Diffuse-reflective		Limited reflective			
		Side-view		Flat		Side-view		Flat		Side-view			
		NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
		Light-ON	E3T-ST11	E3T-ST13	E3T-FT11	E3T-FT13	E3T-SR11	E3T-SR13	E3T-FD11	E3T-FD13	E3T-SL11	E3T-SL13	E3T-SL21
Mod- el Item	Dark-ON	E3T-ST12	E3T-ST14	E3T-FT12	E3T-FT14	E3T-SR12	E3T-SR14	E3T-FD12	E3T-FD14	E3T-SL12	E3T-SL14	E3T-SL22	E3T-SL24
	Sensing distance	1 m (sensitivity adjustment unit usable)		500 mm		200 mm [10 mm] * (When E39-R4 is used)		5 to 30 mm (white paper 50x50 mm)		5 to 15 mm (white paper 50x50 mm)		5 to 30 mm (white paper 50x50 mm)	
	Standard sensing object	Opaque, 2dia. min.		Opaque, 1.3dia. min.		Opaque, 27dia. min.		---					
	Minimum sensing object (typical)	Opaque, 2dia. min.		Opaque, 1.3dia. min.		2 dia. (Sensing distance 100 mm)		0.15 dia. (Sensing distance 10 mm)					
	Differential distance	---						6 mm max.		2 mm max.		6 mm max.	
	Directional angle	Emitter: 2° to 20° Receiver: 2° to 70°		Emitter: 3° to 20° Receiver: 3° min.		2° to 20°		---					
	Light source (wave length)	Red light emitting diode (pin-point light source LED) (670 nm)											
	Power supply voltage	12 to 24 VDC ±10%, ripple (p-p) : 10% max.							24 VDC ±10%	12 to 24 VDC ±10%, ripple (p-p) : 10% max.			
	Current consumption	Emitter/Receiver:12 mA max.				20 mA max.							
	Control output	Load power supply voltage 26.4 VDC max., load current 50 mA max. (residual voltage 1 V max.) Open collector output type Light-ON/Dark-ON depends on the format											
	Protective circuits	Protection from reversed power supply connection and output short-circuit				Reverse polarity protection, output short-circuit protection, mutual interference prevention							
	Response time	Operation or reset: 1 ms max.											
	Ambient illuminance	(on Receiver lens) Incandescent lamp: 5,000 lux max. Sunlight: 10,000 lux max.											
	Ambient temperature	Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)											
	Ambient humidity	Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)											
	Insulation resistance	20 M Ω min. at 500 VDC											
	Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute											
	Vibration resistance	Destruction:10 to 2,000 Hz,1.5 mm double amplitude or 300 m/s ² (approx. 30G) for 0.5 hrs each in x, y, and Z directions											
	Shock resistance	1000 m/s ² (approx. 100G) 3 times each in X, Y, and Z directions											
	Protective structure	IEC 60529 IP67											
	Connection method	Pre-wired models (standard length: 2 m)											
	Weight (Packed state)	Approx.40g				Approx. 20 g							

Mod- el Item	Sensor type	Through-beam				Retroreflective Models		Diffuse-reflective		Limited reflective			
	Shape	Side-view		Flat		Side-view		Flat		Side-view			
	Output system	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
	Light-ON	E3T-ST11	E3T-ST13	E3T-FT11	E3T-FT13	E3T-SR11	E3T-SR13	E3T-FD11	E3T-FD13	E3T-SL11	E3T-SL13	E3T-SL21	E3T-SL23
Ma- terial	Dark-ON	E3T-ST12	E3T-ST14	E3T-FT12	E3T-FT14	E3T-SR12	E3T-SR14	E3T-FD12	E3T-FD14	E3T-SL12	E3T-SL14	E3T-SL22	E3T-SL24
	Case	PBT (polybutylene terephthalate)											
Accessories	Lens, display window	Polycarbonate											
		Cross-shaped recess screw (side view: M2x14, flat type: M2x8), nut, spring washer, flat washer, instruction manual, reflector (Retroreflective type only)											

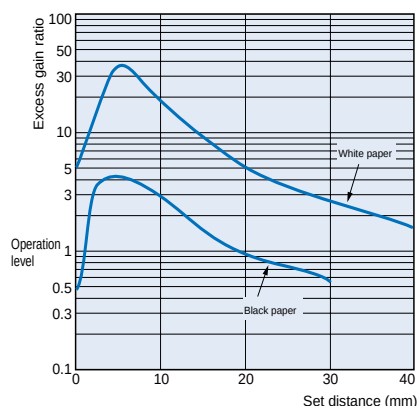
* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Characteristic data (typical)

Operating Range

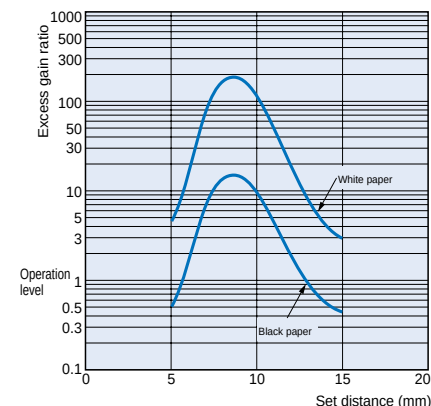
Diffuse-reflective

E3T-FD1□



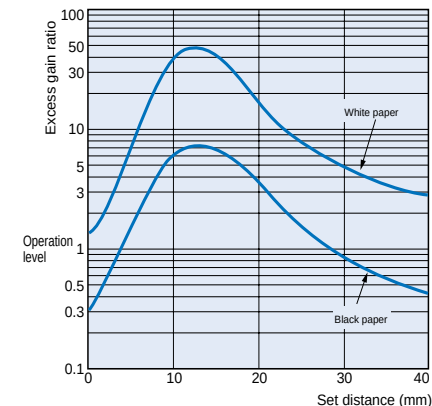
Limited reflective

E3T-SL1□



Limited reflective

E3T-SL2□



Output Circuit Diagram

NPN output

Model	Operating status of output transistor	Timing chart	Output circuit
E3T-□□□1	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Release (Between brown and black)	Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models
E3T-□□□2	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Release (Between brown and black)	Emitter (Through-beam Models)

PNP output

Model	Operating status of output transistor	Timing chart	Output circuit
E3T-□□□3	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Release (Between brown and black)	Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models Note: E3T-FD13/14 is power supply voltage 12 to 24 VDC ± 10%
E3T-□□□4	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load (Relay) Operate Release (Between brown and black)	Emitter (Through-beam Models)

Precautions

Warning

Do not connect to the AC power supply.
Doing so can cause burst.



Correct Use

Wiring Considerations

The maximum power supply voltage is 24 VDC+10%. Before switching power on, make sure that the power supply voltage is not more than the maximum voltage.

Load short-circuit protection

This model has load short-circuit protection. If load short-circuit or like has occurred, the output turns OFF. Therefore, re-examine the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 2.4 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 2.4 times of the rated load current.

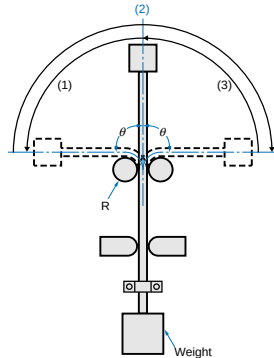
Mounting

Note that for the installation of the photoelectric sensor, hammering it will damage the water resistance function. Tighten the sensor with M2 screws via flat washers or spring washers. (Tightening torque: 0.15 Nm max.)

Ideal for mounting on moving sections

For mounting of the photoelectric sensor to a moving section such as a robot hand, examine the model that uses a flexing-resistant cable (robot cable).

While the flexing resistance of the standard cable is about 14 thousand times, that of the robot cable is as excellent as about 400 thousand times.



Cable bending rupture test

(tough wire breaking test)

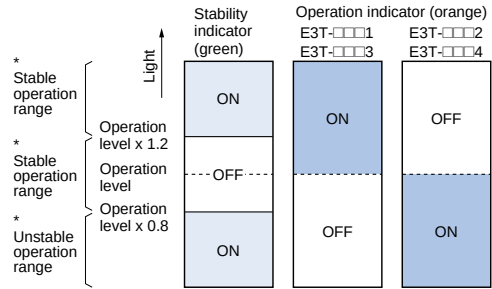
With a current flowing, "bending" is repeated to check the "number of bendings" until the current is shut off.

Specimen		Standard cable 2.4 mm dia. (7/0.127 mm dia.), 3 cores	Robot cable 2.4 mm dia. (20/0.08 mm dia.), 3 cores
Test			
Contents/conditions	Bending angle (θ)	90° each to left and right	
	Bending speed	50 times/min	
	Load	200 g	
	Operation per bending	Once in 1 to 3 in the figure	
	Curvature radius of support point (R)	5 mm	
Result		About 14,000 times	About 400,000 times

For adjustment

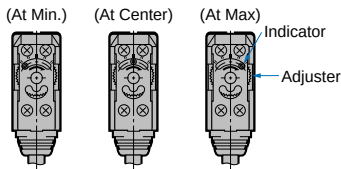
Display

- The following graphs indicate the status of each operation level.
- Be sure to use the E3T within the stable operating range.



Note: If the E3T's operation level is set to the stable operation range, the E3T will be in most reliable operation without being influenced by temperature change, voltage fluctuation, dust, or setting change. If the operation level cannot be set to the stable operation range, pay attention to environmental changes while operating the E3T.

Use of E39-E10 Sensitivity Adjustment Unit (Dark ON: E3T-ST12)



- Install the Unit on the Receiver.
- Set the adjustment dial of the sensitivity adjustment unit to Max. (Factory set to the Max. position)
- After Sensor installation adjust the optical axis and secure the Sensor.
- Place a work between the emitter and receiver, gradually turn the adjustment dial of the sensitivity unit to the Min position (CCW), and stop turning it when the operation indicator is turned ON and the stability indicator (green) is turned ON.
- Remove the work and confirm that the operation indicator is turned OFF and the stability indicator (green) is turned ON. This completes the adjustment.

Note: If the light attenuation rate due to a work is 40% or less, the stability indicator is not turned ON whether or not light is received. When the variation of light is small (e.g. when sensing semi-transparent works), carefully perform preliminary testing.

Others

Do not install the E3T in the following places.

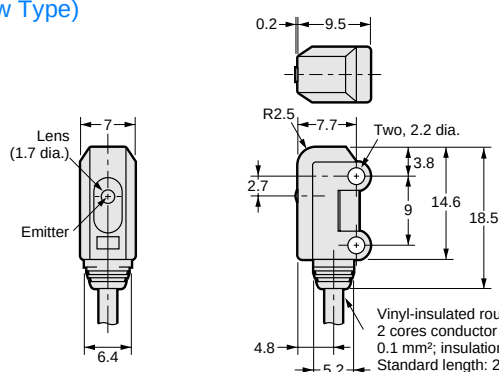
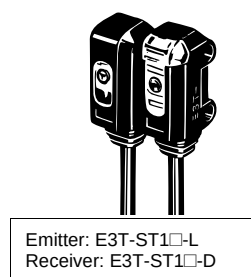
- Places where the E3T is exposed to direct sunlight.
- Places with high humidity and where condensation may result.

Dimensions (Unit: mm)

Sensors

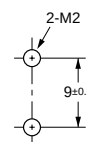
Through-beam Models (Side-view Type)

E3T-ST1□ (Emitter)

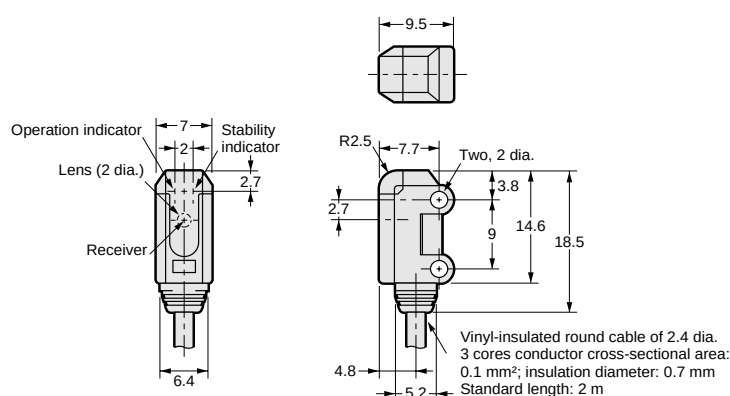


CAD file E3T_04

Mounting Holes

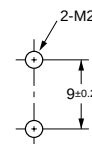


E3T-ST1□ (Receiver)



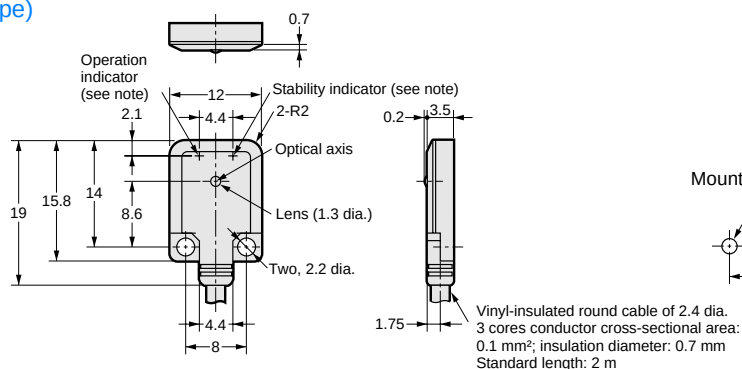
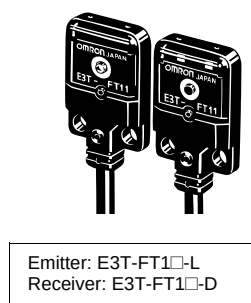
CAD file E3T_03

Mounting Holes



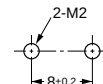
Through-beam Models (Flat Type)

E3T-FT1□ (Emitter, Receiver)



Type	CAD file
Emitter	E3T_07
Receiver	E3T_06

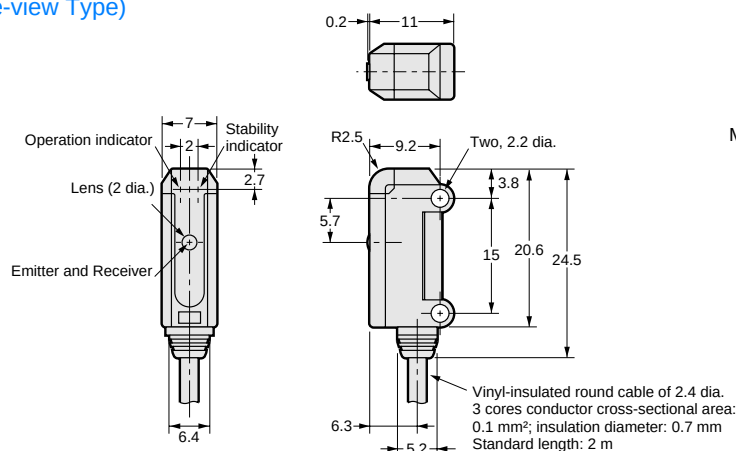
Mounting Holes



Note: For E3T-FT11/FT13 and E3T-FT12/14 Receivers only.

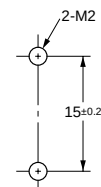
Retroreflective Models (Side-view Type)

E3T-SR1□



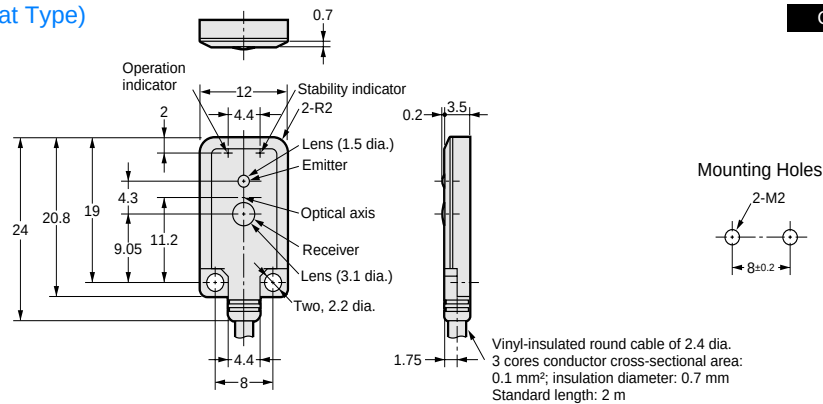
CAD file E3T_02

Mounting Holes



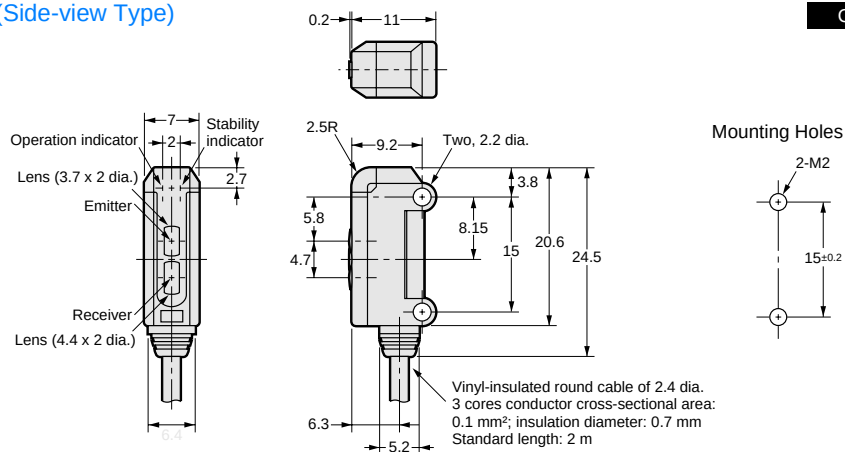
Diffuse Reflective Models (Flat Type)
E3T- FD1□

CAD file E3T_05



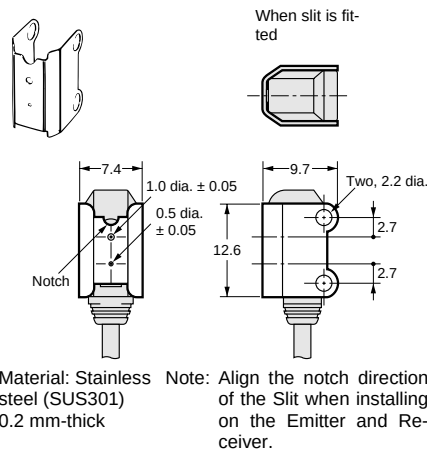
Limited Reflective Models (Side-view Type)
E3T-SL1□
E3T-SL2□

CAD file E3T_01

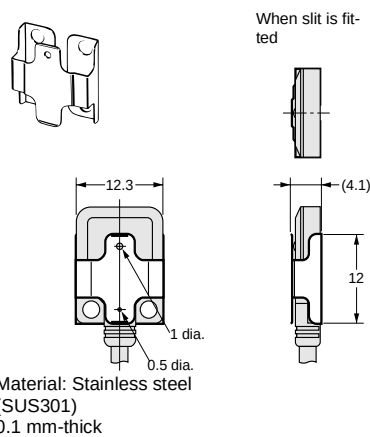


Accessories (Order Separately)

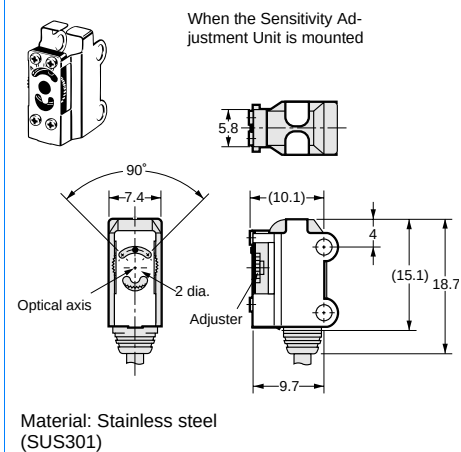
(for Through-beam E3T-FT1□)
With Slit mounted
E39-S63



(for Through-beam E3T-FT1□)
With Slit mounted
E39-S64



Sensitivity Adjustment Unit (for E3T-ST1□)
E39-E10



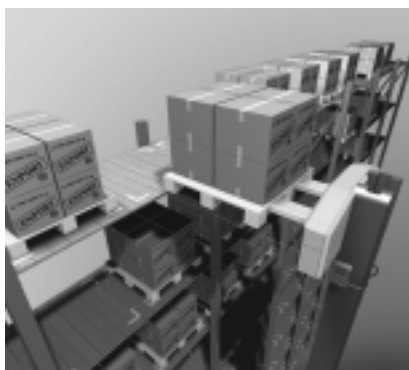
Distance-setting photoelectric Sensor

E3NT-L

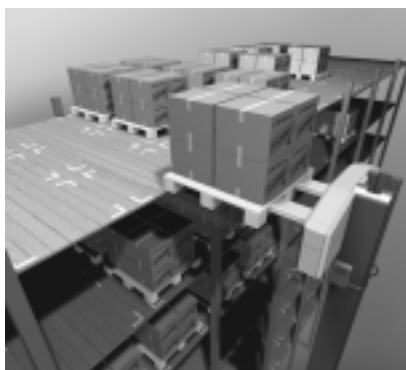
"Teach & play" in combination with a user friendly display and a large sensing distance

CE

Application



The E3NT-L can check if there is shelf-space free for a pallet.



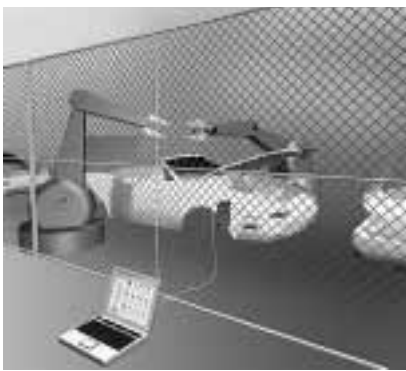
Two outputs can distinguish whether there is one, two or even more pallets in the storage location.



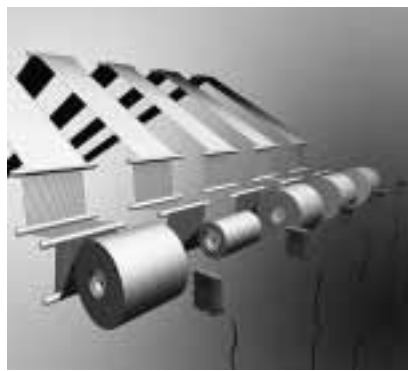
This robust sensor is ideal for operation in the harshest of environments.



Machines in the food industry need to be cleaned frequently. With rapid temperature changes, and lots of water and steam, a completely sealed sensor with window heating is essential.



Thanks to the optic link, the sensor can be remotely set and checked while it is operating in an area where access is restricted.



A version of the E3NT-L with a analogue output is available, making it ideal for winding/unwinding applications.

Features

One of the most advanced sensors in the world.

Omron's E3NT-L is a distance-setting photoelectric sensor whose ease-of-use, robustness and intelligence make it one of the most advanced sensors on the market. The E3NT-L has a detection range of up to 2000 mm, and features background and foreground suppression. Its patented optic design enables this innovative sensor to reliably detect objects regardless of their direction.

It is teachable and can be operated via just three keys. It is fully digital for stable, reliable information, and can be adapted to operate in the harshest of environments. These features make the E3NT-L suitable for applications in the material warehousing and food processing industries, where long yet precise distance sensing is required.



Built for every environment

The E3NT-L is a sealed unit. Its robust aluminium housing and smooth body design prevents dirt from easily attaching to it. This makes the E3NT-L ideal for use in the food processing industry. An optional coating enables it to operate in environmentally aggressive conditions, and an anti-condensation option with heated glass window enables it to cope in very low temperature environments.

Patented optic design for reliable sensing

The E3NT-L sensor's optics are specially arranged so that distance is evaluated using the 'double triangulation' principle. This patented optic design enables the E3NT-L to reliably detect objects regardless of their direction. It also enables the rotary position of the E3NT-L to be selected freely about its optical axis, which makes this sensor ideal for multiaxis handling equipment. The E3NT-L's background and foreground suppression features means that objects are detected only within the predefined sensing zone. Objects in the background or foreground of that zone are ignored.

'Teach & play' manually...

Setting up the E3NT-L is fast and easy via external pushbuttons. Its 'teach & play' design concept enables you to teach the sensor the distance of the detectable object simply by pressing one push-button. The built-in 3 pushbutton keypad and a 4-digit display enable you to set and monitor parameters via a user-friendly menu.



Or via computer!

The E3NT-L can also be remotely configured using Omron's PC configuration Sensor Support Software package, whose features include teaching, operation and mode set-up, I/O configuration and distance monitoring via a trend graph. This software not only saves you configuration time, it also makes field exchange, firmware upgrading and remote troubleshooting easy.

Multi-purpose bracket

Omron's specially designed multi-purpose bracket enables the E3NT-L to be installed in a wide variety of positional choices for optimal sensing performance.

Optical link adapter

Omron's E3NT-AL232 optical link adapter clips to fit the E3NT sensor's communication head for connector-less data transfer between the sensor and your PC. This is ideal when the E3NT-L is installed in an area where access is restricted. Via this link and your PC you can continuously monitor the sensor's operation from the comfort of a remote area.

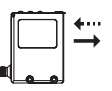
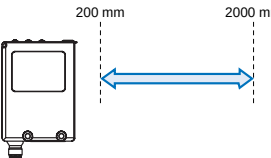
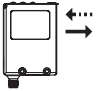
Sensor Support Software (S³)

With Omron's Sensor Support Software (S³) package you can enjoy the benefits of copying multiple customised sensor settings, monitoring for more detailed analysis, setting up parameters much more easily, and tracing.



Ordering Information

Sensors

Sensing method	Appearance	Connection method	Setting distance	Model	
				Digital output	Digital and analog output
Distance setting (BGS/FGS)		M12 Connector (5-pole)	0.2 m .. 2.0 m 	E3NT-L17	E3NT-L27
Window heating				E3NT-LH17	
Window heating				E3NT-L37	E3NT-L47
				E3NT-LH37	

Accessories (order separately)

[Optical data link](#)

Communication method to sensor	Appearance	Communication method to PC	Model
IR data interface		RS232	E3NT-AL232 2M

[Mounting brackets](#)

Appearance	Model	Qty.	Remarks
	E39-EL1	1	Universal mounting bracket
	E39-EL2	1	Adapter bracket (for use of the universal mounting bracket for not matching holes)

[Sensor I/O connectors](#)

Size	Cable type	Shape	Cable length	Model
M12	Standard 5-pole	Straight 	2m	XS2F-D521-DG0-A
			5m	XS2F-D521-GG0-A
		L-shape 	2m	XS2F-D522-DG0-A
			5m	XS2F-D522-GG0-A

Rating/performance

Sensors

Item	Model		
	E3NT-L17 E3NT-L37	E3NT-L27 E3NT-L47	E3NT-LH17 E3NT-LH37
Sensor type	Diffuse reflective sensor with background suppression respectively foreground suppression		
Signal evaluation	Double triangulation method		
Configuration	By push button on the sensor or with a PC connected via the optical data link E3NT-AL232 2m		
Operating modes	Background suppression, foreground suppression, background and foreground suppression (2-point window evaluation)		
Light source	Infrared LED 850 - 880 nm		
Rated sensing distance	2 m		
Setting distance S_r	Distance – setting possible between 0.2 ... 2.0 m (90 % remission) 0.2 ... 1.7 m (6% remission)		
Standard measured object	Kodak gray card 90% (white), size: 200 x 200 mm		
Blind zone	< 0.1 m		
Black/white error (6%/90%)	< 15 % of setting distance S_r		
Hysteresis (typical)	< 5 % of setting distance S_r or 4cm (for white 90%) < 10 % of setting distance S_r or 6cm (for black 6%)		
Repetition accuracy	< 5 % (of setting distance S_r) or 4cm		
Light spot diameter	< 40 mm in the case of $S_r = 2$ m		
Minimum object size	> 40 mm		
Ambient light immunity to EN 60947-5-2:	Halogen lamps (100-120Hz > 10,000 lux Fluorescent lamps (30 kHz) > 5,000 lux Energy saving lamps > 2,000 lux		
Utilization category to EN 60947-5-2	DC 12		
Rated operating voltage	+ 24 V DC, polarized		
Operating voltage range	+ 10 ... + 30 V DC		
Current consumption	< 90 mA (display off) < 110 mA (display on)	< 100 mA (display off) < 120 mA (display on)	< 220mA with front pane heating
Power-on delay	< 300 ms		
Input – / Output – pins	Pin 2 = Input (In 2) or output (Out 2), depending on configuration Pin 4 = Output (Out 1)		
	Pin 5 = Input (In 1)	Pin 5 = Analog output	Pin 5 = Input (In 1)
Digital Outputs	User set functions (e.g. switching output, alarm output, ...)		
Output circuit	User set PNP (open collector), NPN (open collector) or complementary (push-pull)		
Output current	max. 100 mA		
Voltage drop	< 2.0 V		
Residual current	< 100 μ A		
Circuit protection	Reversed power supply, overload, short-circuit (pulsed)		
Inputs	User set functions (e.g. teach-in, trigger, test, ...)		
Input circuit	Voltage input +10 V ... U_{supply}		
Input pulse duration	min. 1 ms		
Analog Output	Current output 3..21mA: • 3 mA correspond to distance < 0.2 m • 4 ... 20 mA correspond to distance 0.2 m ... 2.0 m • 21 mA correspond to distance > 2.0 m (or no object)		
Switch-on/off time (T_{ON} / T_{OFF})	≤ 2.5 ms	≤ 5 ms	≤ 2.5 ms
Insulation resistance	20 M Ω at 500 V DC		
Insulation voltage strength	1 kV AC, 50/60 Hz (1 min)		

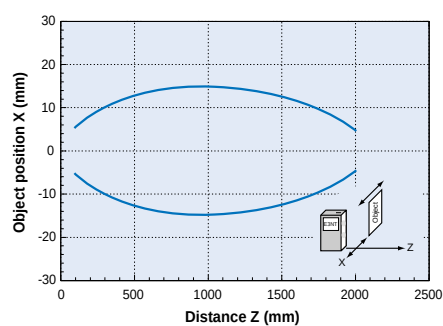
Item	Model		
	E3NT-L17 E3NT-L37	E3NT-L27 E3NT-L47	E3NT-LH17 E3NT-LH37
Impulse strength (insulation)	6 kV		
Dimensions (length x width x depth)	85 x 27 x 65 mm		
Materials			
Housing	Powder-coated aluminum, sea-water resistant, 231 GD AlSi12 (Cu) (standard version) Aluminum with foodstuff-approved coating (option)		
Front pane	Glass		
Keyboard	HTV silicone		
Seals	RTV silicone		
Housing color	Grey, RAL 7030		
Assembly	Screw fastening by way of four M5 threads and two M5 through holes or with universal mounting bracket (order separately)		
Connection	M12 connector, 5-pole (piercing)		
Ambient temperature range	- 25 °C ... + 55 °C	- 10 °C ... + 55 °C (analog output)	- 40 °C ... + 55 °C
Storage temperature range	- 40 °C ... + 60 °C		
Permissible relative humidity	35 % ... 95 %, no condensation		
Enclosure rating	IP 67 (EN 60529/IEC 529)		
Protection class	II (250 V AC)		
Vibration resistance (to IEC 68-2-6)	± 1.5 mm, 1 h, 10 - 70 Hz		
Shock resistance (to IEC 68-2-27)	300 m/s²		
User set parameters	- Mode - Output function - Teach/set switching points - Output switching - Function on connector pin 2 and 5 - Switch-on and off delay - Type of switch-off time function - Type of display on the sensor - Keyboard lock - Energy saving mode - Display direction - Reset to factory defaults		

Accessories

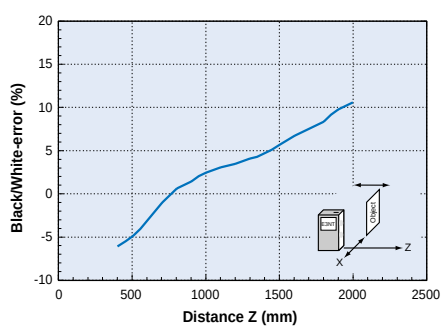
Item	Model	
	E3NT-AL 232 2 M	
Dimensions (length x width x depth)	29.5 x 72.9 x 26.4 mm	
Housing material	ABS and PMMA (IR transparent)	
Housing colour	Black, RAL 9005	
Assembly	Snap mounting on sensor	
Connection	2 m connecting cable with 9-pole sub-D connector	
Ambient temperature range	- 10 °C ... + 50 °C	
Storage temperature range	- 40 °C ... + 60 °C	
Permission relative humidity	35% ... 85%, no condensation	
Degree of protection to EN 60529 / IEC 529	IP 54	
Emitted light	IR communication element 880 nm	
Rated operating voltage	Via RS 232 interface from PC	
Current consumption	6 mA	

Characteristic data (typical)

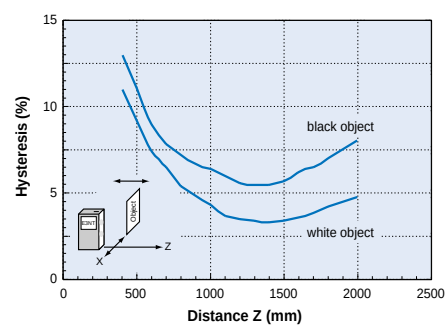
Operating range
(90% remission)



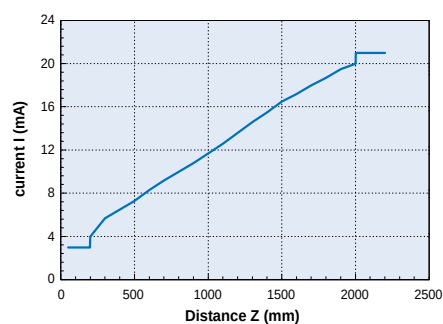
Black/White - Error
(6% - 90% remission)



Hysteresis



Analog output current
(90% remission)



Circuit diagram

Output

Push-pull output circuit (Out1 at pin 4 / Out2 at pin 2)	Load connection		
	PNP	NPN	Analog

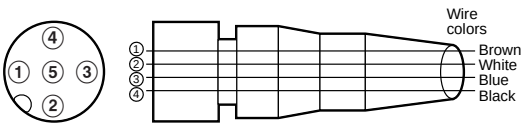
When use is made of the PNP or NPN output circuit, the output circuit that is not selected is deactivated. When used as a complementary output, NPN or PNP outputs act in antiphase as the switch state changes.

Input

In2 at pin 2	In1 at pin 5 (not available for analogue output models)

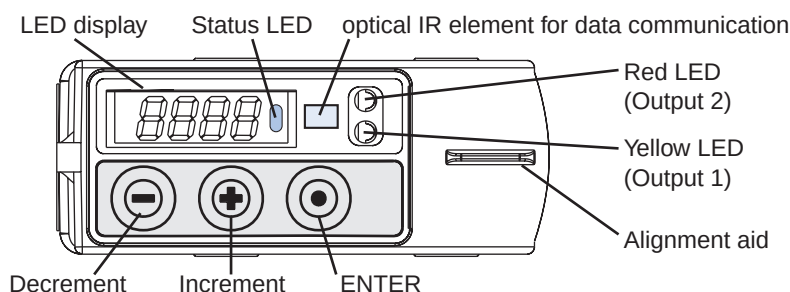
The sensor inputs are realised in positive logic and detect a positive voltage level of more than 1 ms duration as a valid signal if the voltage level is between 10 V and the power supply voltage.

Connectors



Class	Wire jacket color	Connector pin no.	Application
For DC	Brown	1	Power supply (+V)
	White	2	Output or Input Out2 / In2
	Blue	3	Power supply (0V)
	Black	4	Output Out1
	Grey	5	Analog Output or Input In1

Nomenclature



LED display	The distance from the measured object and the names of the menu levels during set-up of the sensor are displayed by the 4-digit 7-segment LED display. The display appears as red digits or letters. If the sensor is set to a bar chart display, the distance from the measured object is displayed as a green LED bar chart.		
LED	The switching status and the stability of the two outputs are signalled as follows by two LEDs, visible from the top and the front of the sensor:		
	Yellow LED (Output 1)	ON	Object stably detected
		Blinking	Object not stable detected
		OFF	No object within range
	Red LED (Output 2)	ON	Object stably detected
		Blinking	Object not stable detected
		OFF	No object within range
	Status LED	ON	Set-up menu selected
		Blinking	Menu level with change of setting distance
		OFF	RUN (normal) mode

Operation

Setting the switching points

The switching points can either be user set (Teach-in mode) with a measured object positioned at the corresponding distance or can be set using the setting input, for remote setting. For each output of the sensor (up to two), up to two switching points can be user set.

Only one switching point is active in the foreground and background suppression modes.

For the 2-point window evaluation mode, two switching points must be set.

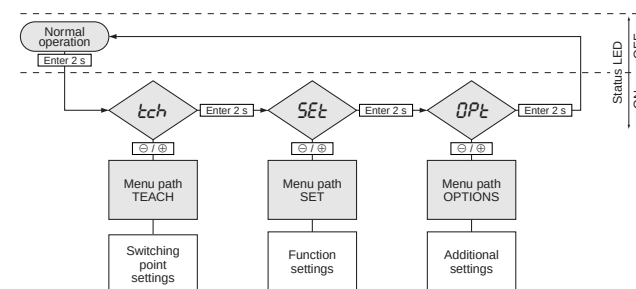
Teaching the switching points in the normal mode

The sensor is set at the factory for both outputs to **BGS**, light on.

- Place the target object in front of the sensor at the desired position.
- Teach the switching point for output 1:
 - Beginning with the $\oplus$ key, press it simultaneously with the ENTER $\odot$ key. Threshold level is obtained and the output/LED is updated. Status LED is blinking.
 - Using the $\oplus/\ominus$ keys an adjustment of the switching point is possible. The output/LED is updated immediately.
 - Pressing the ENTER $\odot$ key for more than 2 seconds or after 2 minutes without any activation of the keys, the sensor returns to normal operation. The status LED is turned off.
- Teach the switching point for Output 2:

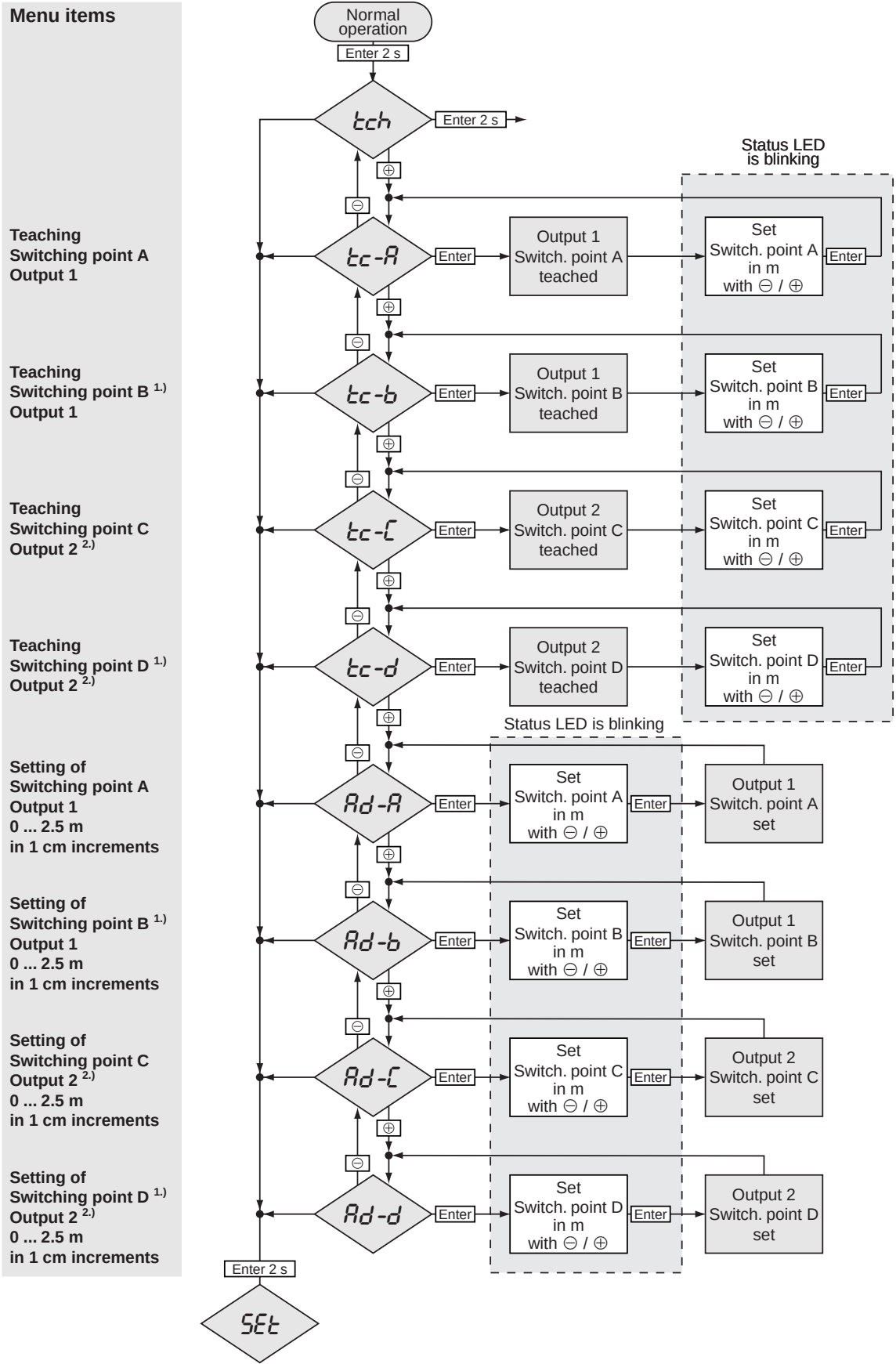
- Beginning with the $\ominus$ key, press it simultaneously with the ENTER $\odot$ key.

Main menu structure

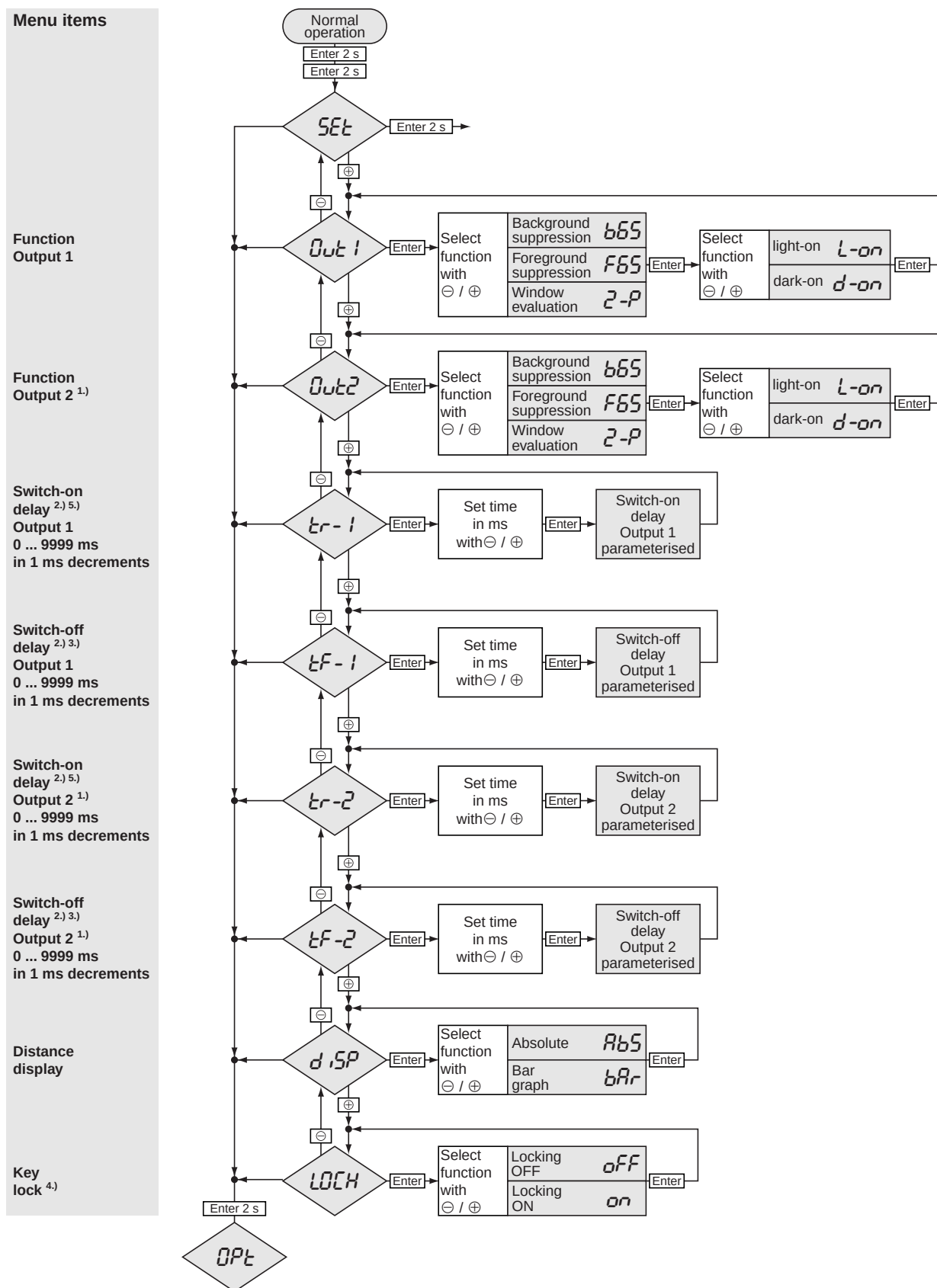


When the ENTER $\odot$ key is pressed for 2 seconds, the sensor switches from the normal mode to the TEACH menu path. The sensor switches to each next menu path when the ENTER $\odot$ key is repeatedly pressed for 2 seconds. In the menu paths, the required parameters can be selected by pressing $\ominus$ and $\oplus$ keys.

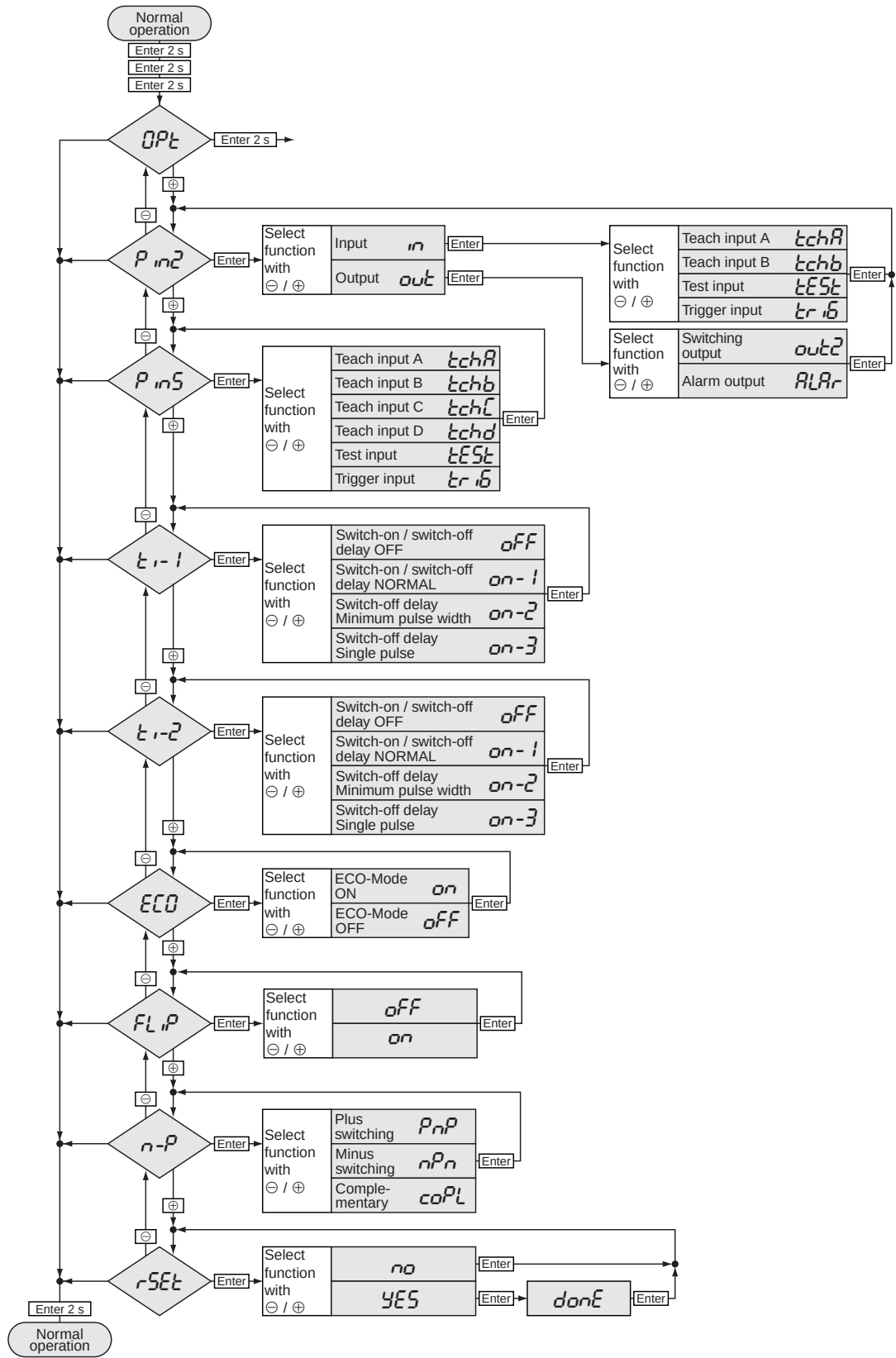
- To skip a menu path, you can also press the ENTER key for 4 seconds.
- [ENTER] Press the ENTER $\odot$ key < 1 second
- [ENTER 2s] Press the ENTER $\odot$ key > 2 seconds.



SET menu



- Menu items
- Function
Connector pin 2
- Function
Connector pin 5
- Function
Switch-on /
switch-off
delay
Output 1
- Function
Switch-on /
switch-off
delay
Output 2 ¹⁾
- Energy saving mode
ECO ²⁾
- Turn display
- Output
stage
- Reset
to
Works default



Dimensions

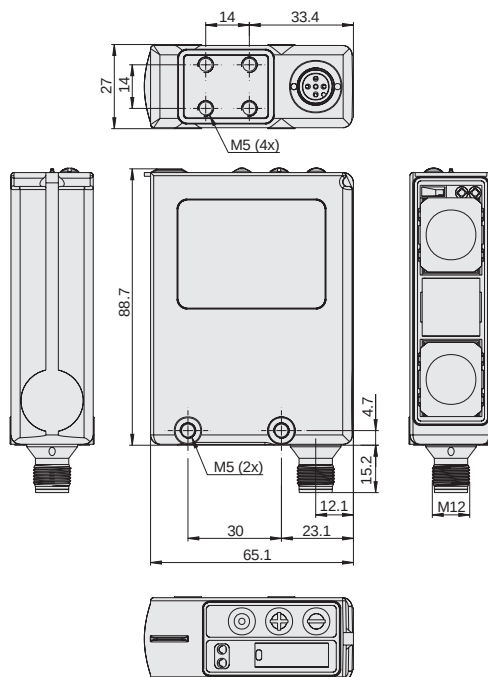
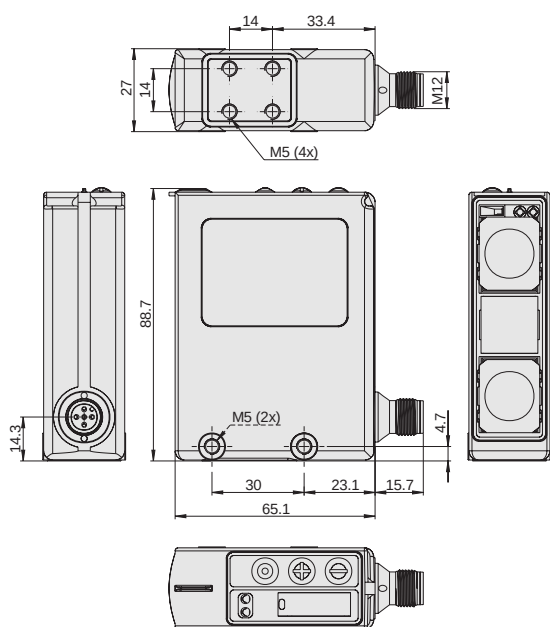
Sensors

E3NT-L17
E3NT-L27
E3NT-LH17

CAD file E3NT_01

E3NT-L37
E3NT-L47
E3NT-LH37

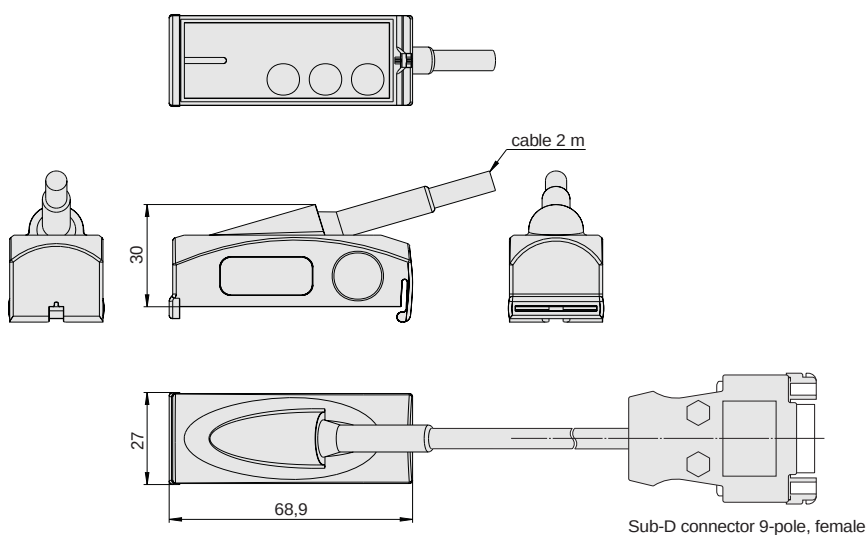
CAD file E3NT_02



Accessoires (order separately)

[Optical data link](#)
E3NT-AL232 2m

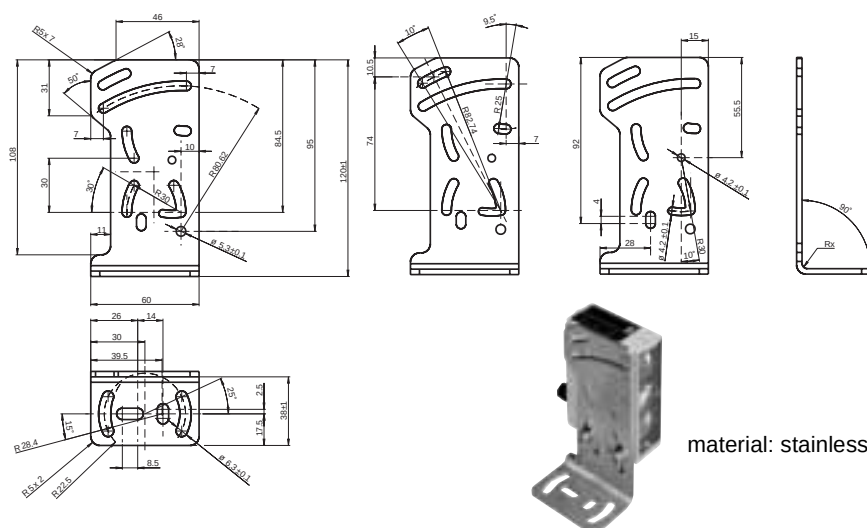
CAD file E3NT_03



Universal mounting bracket
E39-EL1

CAD file

E3NT_04

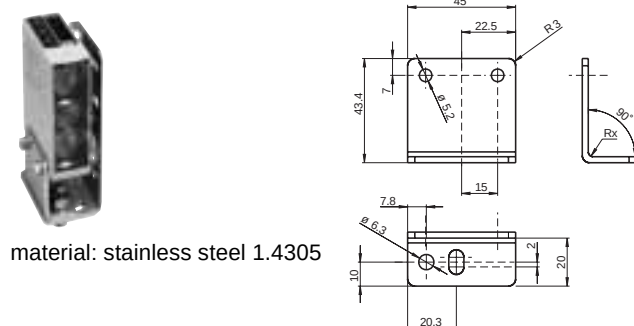


material: stainless steel 1.4305

Adapter bracket
E39-EL2

CAD file

E3NT_05



material: stainless steel 1.4305

Precautions

⚠ Caution

Do not connect an AC power supply to the Sensor. If AC power (100 VAC or more) is supplied to the Sensor, it may explode or burn.

Be sure to abide by the following precautions for the safe operation of the Sensor.

Safety notes

The diffuse reflective sensors in the E3NT type series may only be used as described in these operating instructions.

They may only be operated as part of a higher-level overall system, e.g. of a machine installation.

Diffuse reflective sensors in the E3NT type series must not be used as safety components within the scope of the EU machine guideline.

Their use is not permitted in applications in which the safety of persons depends on functioning of the sensor!

Wiring

Power Supply Voltage and Output Load Power Supply Voltage

Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

Load Short-circuiting

Do not short-circuit the load, otherwise the Sensor may be damaged.

Operating Environment

Do not use the Sensor in locations with explosive or flammable gas.

Correct Use

Design

Power Reset Time

The Sensor is ready to operate 300 ms after the Sensor is turned ON. If the load and Sensor are connected to independent power supplies respectively, be sure to turn ON the Sensor before supplying power to the load.

Wiring

Avoiding Malfunctions

If using the Photoelectric Sensor with an inverter or servomotor, always ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

- If Sensors are mounted face-to-face, make sure that the optical axes are not in opposition to each other. Otherwise, mutual interference may result.
- Always install the Sensor carefully so that the aperture angle range of the Sensor will not cause it to be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistive properties.
- Use M5 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

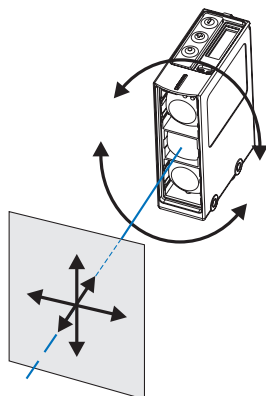
M12 Connector

- Always turn OFF the power supply to the Sensor before connecting or disconnecting the connector.
- Hold the connector cover to connect or disconnect it.
- Secure the connector cover by hand. Do not use pliers, otherwise the connector may be damaged.
- If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

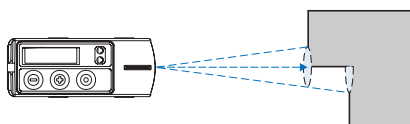
Mounting Directions

Sensor assembly

Contrary to sensors with single triangulation, E3NT with double triangulation, allows the measured object's direction of motion to be in all three directions. Thus, the rotatory position of the sensor about its optical axis can be chosen freely.



If the light spot is not completely on the same plane as the target object (minimum object size) the distance is not determined and malfunction can occur. If necessary a trigger signal or timer function has to be applied.

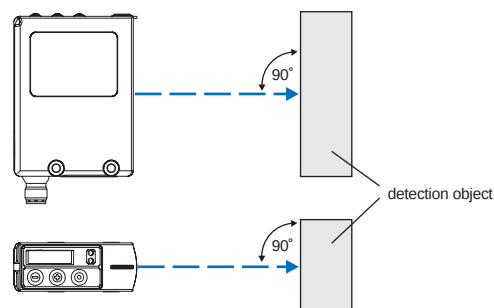


The sensor must be fitted so that:

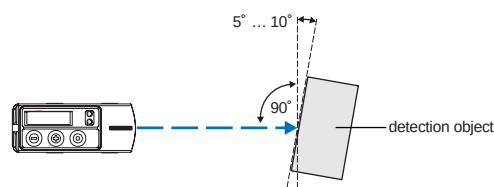
- It is correctly aligned before it is adjusted
- It is protected as far as possible against vibration and shock
- It is protected as far as possible against extraneous incident light
- It is protected as far as possible against damage and soiling
- Electrical connection is possible
- It is as accessible as far as possible for maintenance work
- Operation of the push buttons is possible
- The display is visible.

Sensor's assembly direction

As far as possible, the sensor's optical surface should be aligned parallel to the surface of the measured object.



If the measured object has a glossy, reflecting surface, the sensor's optical system should be tilted by 5 ... 10° in relation to the surface of the measured object.



If there is a reflecting surface in parallel with the sensor's optical axis, this might lead to unstable switching states.

Therefore, reflecting objects within the sensor's optical axis should be avoided.

If this should not be possible, the reflecting surface should not be parallel to the sensor's optical axis, but should be rotated by at least 10°.

Mirror-like objects can cause malfunction inside and outside the sensing range. Avoid mirror-like objects in or close to the optical axis.

Inspection and Maintenance

Cleaning

Do not use any scratching or abrasive cleaning materials. The protective pane of the optical system might get damaged.

The sensor requires no maintenance.

Remove dirt build up from the optical system and the display at regular intervals only with a soft, non abrasive fabric. Residual dirt may have influence on the switching point and display accuracy.

Oil-resistive, long-distance photoelectric sensor (metal case)

E3S-C

Achieves excellent water/oil-resistance and long-distance detection.

Features

Meets IP67 tough standard water/oil resistance

E3S-C meets the IP67 requirements of the IEC standards and 6P of the NEMA standards. E3S-C can be used worry-free in automotive assembly lines and other production lines where oil vapor exists. It can also be applied to food processing lines because it resists hydrogen peroxide, detergent and potassium hydroxide.

Sensing distance is six times longer than that of conventional OMRON photoelectric sensor

The sensing distance of the E3S-C is six times longer than that of the conventional, metal case type OMRON photoelectric sensor. The through-beam, retroreflective (with M.S.R. function) and diffuse reflective models have sensing distances of 30, 3 and 2 meters, respectively.

Through-beam Model	5m E3S-5E4	30m
Retroreflective Model	2 m (non-polarized) E3S-R2E4	3 m (polarized)
Diffuse Reflective Model	300mm E3S-DS30E4	2m

Excellent shock resistance of 1,000 m/s²

The industry's top-class photoelectric sensor features shock resistance of 1,000 m/s², which is as high as that of a proximity sensor at rated values, and vibration resistance of as high as 10 to 2,000 Hz. The E3S-C can be used worry-free in metal processing, conveyor and other lines.

Lineup of M12 metal connector joint type models

Lineup of water/oil/shock-resistant M12 metal connector joint type models are available. This series ensures ease of sensor replacement during maintenance.

NPN/PNP output selector

The operation panel has the NPN/PNP output selector. You need not prepare two NPN and PNP models for export. You need not worry about malfunctions due to noise, either.



Mutual interference prevention enhanced (Retroreflective, diffuse reflective models)

Fuzzy inference is introduced into the mutual interference prevention for the first time in the industry. This prevents a malfunction due to mutual interference, enabling two sensors to be mounted closely side by side.

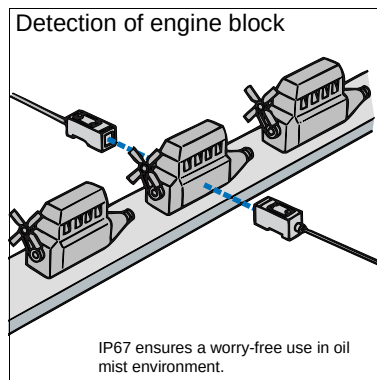
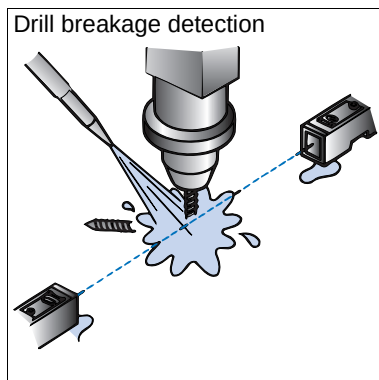
Easy optical axis alignment

OMRON's original "automatic position compensation system" minimizes misalignment of mechanical and optical axes to merely $\pm 2^\circ$. The optical axis is aligned perfectly by only installing the sensor.

PAT Pending

First in the Industry

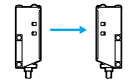
Application



Ordering Information

Sensors

Red light Infrared light

Sensor type	Shape	Connection method	Sensing distance	Model
Through-beam	Horizontal Model 	Pre-wired	 30m	E3S-CT11
		Junction connector		E3S-CT11-M1J
	Vertical Model 	Pre-wired		E3S-CT61
		Junction connector		E3S-CT61-M1J
Retroreflective Models	Horizontal Model 	Pre-wired	 3m	E3S-CR11
		Junction connector		E3S-CR11-M1J
	Vertical Model 	Pre-wired		E3S-CR61
		Junction connector		E3S-CR61-M1J
Diffuse-reflective	Horizontal Model 	Pre-wired	 700mm	E3S-CD11
			 2m	E3S-CD12
		Junction connector	 700mm	E3S-CD11-M1J
			 2m	E3S-CD12-M1J
	Vertical Model 	Pre-wired	 700mm	E3S-CD61
			 2m	E3S-CD62
		Junction connector	 700mm	E3S-CD61-M1J
			 2m	E3S-CD62-M1J

Accessories (Order Separately)

Slits

Slit width	Sensing distance	Minimum sensing object (typical)	Model	Quantity	Remarks
Width 0.5 mmx11 mm	1.8 m	0.5 mm dia.	E39-S61	1 each for emitter and receiver (total of 8 pcs.)	(Plug-in type long slit) Can be used with through-beam E3S-CT□1 (-M1J).
Width 1 mmx11 mm	3.5 m	1 mm dia.			
Width 2 mmx11 mm	7 m	2 mm dia.			
Width 4 mmx11 mm	15 m	2.6 mm dia.			

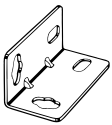
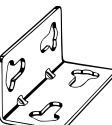
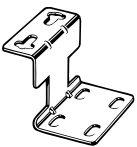
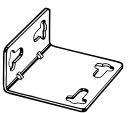
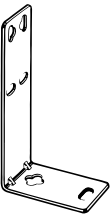
Reflectors

Name	Sensing distance (typical)	Model	Quantity	Remarks
Reflectors	3 m (rated value)	E39-R1	1	Attached to the Retroreflective E3S-CR□1 (-M1J).
	4 m	E39-R2	1	---
Small reflector	1.5 m	E39-R3	1	---
	750 mm	E39-R4	1	---
Tape Reflector	700 mm (50 mm) *	E39-RS1	1 pc.	The M.S.R. function is available.
	1,100 mm (100 mm) *	E39-RS2	1 pc.	
	1,400 mm (100 mm) *	E39-RS3	1 pc.	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Note: 1. When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L102	1	Attached to the horizontal model.
	E39-L103	1	Attached to the vertical model.
	E39-L85	1	Mounting bracket designed to switch from E3S-□□□□42, 44 to the vertical model of E3S-C.
	E39-L86	1	Mounting bracket designed to switch from E3S-□□□□43 to the vertical model of E3S-C.
	E39-L87	1	---

Note: If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shaped 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/performance

Sensor type Model		Through-beam	Retroreflective model (with M.S.R. function)	Diffuse-reflective	
				Horizontal E3S-CT11 (-M1J)	Horizontal E3S-CD11 (-M1J)
Item		Vertical E3S-CT61 (-M1J)	Vertical E3S-CR61 (-M1J)	Vertical E3S-CD61 (-M1J)	Horizontal E3S-CD12 (-M1J)
					Vertical E3S-CD62 (-M1J)
Sensing distance		30 m	3 m (When using the E39-R1)	700 mm (White paper 300 x 300 mm)	2 m (White paper 300 x 300 mm)
Standard sensing object		Opaque, 15dia. min.	Opaque: 75 mm dia. min.	---	
Differential distance		---		20% max. of sensing distance	
Directional angle		Both emitter and receiver: 3° to 15°	3° to 10°	---	
Light source (wave length)		Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (880 nm)	
Supply voltage		10 to 30 VDC [ripple (p-p) 10% included]			
Current consumption		Both emitter and receiver: 25 mA max.	40 mA max.		
Control output		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2.0 V max.) Open collector output type (NPN/PNP switch selectable) Light-ON/Dark-ON switch selectable			
Protective circuits		Reverse polarity protection, output short-circuit protection	Reverse polarity protection, output short-circuit protection, mutual interference prevention		
Response time		Operation or reset: 1 ms max.			Operation/reset: 2 ms max. each
Sensitivity adjustment		Single-turn adjustment		2-turn endless adjuster (with indicator)	
Ambient illuminance		(on Receiver lens) Incandescent lamp: 5,000 lux max. Sunlight: 10,000 lux max.			
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)			
Insulation resistance		20 M Ω min. at 500 VDC			
Dielectric strength		1,000 VAC at 50/60 Hz 1 minute			
Vibration resistance		10 to 2,000 Hz double amplitude 1.5 mm or 300 m/s ² for 0.5 h in each of X, Y, Z directions			
Shock resistance		1000 m/s ² (approx.- 100G) 3 times each in X, Y, and Z directions			
Protective structure		IEC Standard IP67, NEMA 6P (limited to indoors use) *			
Connection method		Pre-wired (standard length: 2 m), Junction connector (standard length: 300 mm)			
Weight (Packed state)		About 270 g (pre-wired type) About 230 g (M12 connector joint type)	About 160 g (pre-wired type) About 130 g (M12 connector joint type)	About 150 g (pre-wired type) About 110 g (M12 connector joint type)	
Material	Case	Zinc diecast			
	Operation panel cover	Polyethyl sulfon			
	Lens	Acrylics			
	Mounting Brackets	Stainless steel (SUS304)			
Accessories		Mounting bracket (with screws), adjusting screwdriver, instruction manual, reflector (Retroreflective model only)			

* NEMA (National Electrical Manufacturers Association) Standards

Output Circuit Diagram

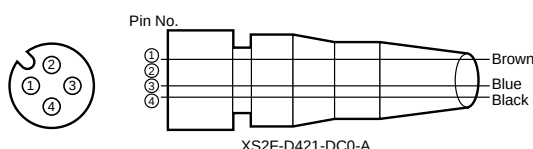
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CT11(-M1J) E3S-CT61(-M1J) E3S-CR11(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate Reset (Between brown and black)	L•ON (LIGHT ON)	Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate Reset (Between brown and black)	D•ON (DARK ON)	Emitter (Through-beam Models) Connector Pin Arrangement Note: Terminal 2 and 4 are not used.

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CT11(-M1J) E3S-CT61(-M1J) E3S-CR11(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate Reset (Between blue and black)	L•ON (LIGHT ON)	Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate Reset (Between blue and black)	D•ON (DARK ON)	Emitter (Through-beam Models) Connector Pin Arrangement Note: Terminal 2 and 4 are not used.

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	+V
	---	②	---
	Blue	③	0V
	Black	④	Output

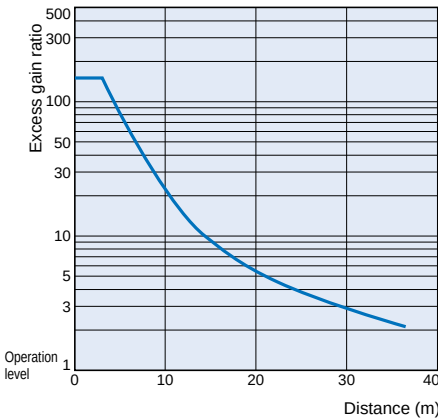
Note: Pin 2 is open.

Characteristic data (typical)

Operating Range

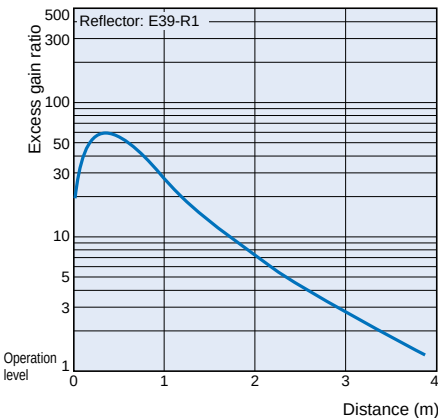
Through-beam

E3S-CT□1(-M1J)



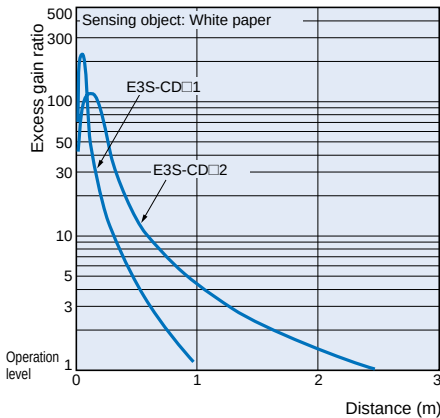
Retroreflective Models

E3S-CR□1 (-M1J) + E39-R1 (supplied reflector)



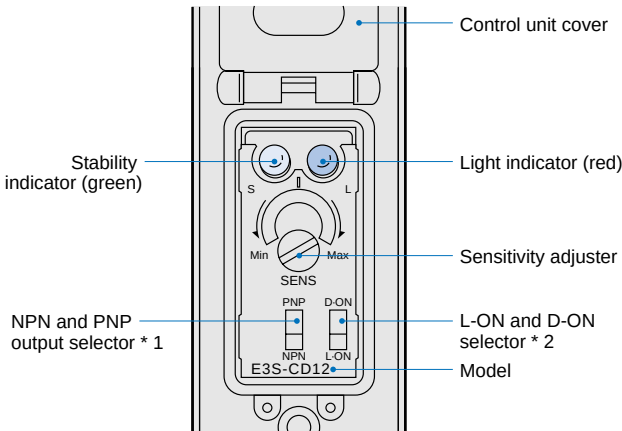
Diffuse-reflective

E3S-CD□□(-M1J)

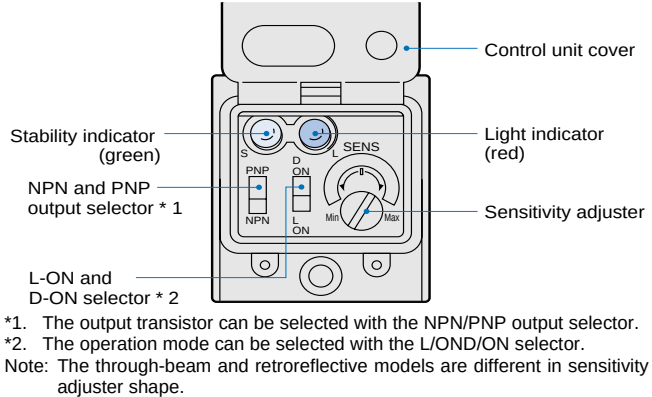


Nomenclature:

(Horizontal type)



(Vertical type)



Operation

Sensitivity adjustment (diffuse reflective model, light-ON)

Sequence	Detection state	Sensitivity adjuster	Indicator state	Adjustment procedure
① Point A			ON→OFF OFF→ON Stability indicator (green) Light indicator (red)	Place a sensing object in the predetermined position, turn the sensitivity adjuster clockwise (increase sensitivity) until the incident indicator (red) is turned ON, and define this position as (A).
② Point B			ON→OFF ON→OFF Stability indicator (green) Light indicator (red)	Remove the sensing object, turn the sensitivity adjuster further clockwise until the incident indicator (red) is turned ON by a background object, and define this position as (B). Turn the sensitivity adjuster counterclockwise (decrease sensitivity) from (B) until the incident indicator (red) is turned OFF, and define this position as (C). When there is no background object, define the maximum adjuster position (Max) as (C).
③ Setting	---		ON ON↔OFF Stability indicator (green) Light indicator (red)	Set the adjuster in the middle of positions (A) and (C) (optimum sensitivity setting). Also make sure that the stability indicator (green) is turned ON when there is an object and when there is no object. When the indicator is not turned ON, recheck the detection method since there is a little allowance.

Unlike the conventional models, the E3S-C scarcely has sensitivity variations between products. Therefore, you need to make the above adjustment on only one diffuse reflective model of E3S-CD that will be used for detection under the same conditions, and match the indicator points of the other diffuse reflective models of E3S-CD with the above adjusted one. (You need not match the sensitivity of each sensor.)

Precautions

Correct Use

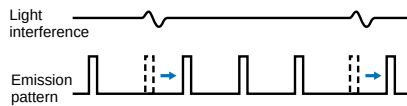
Design

Fuzzy mutual interference prevention

When reflective photoelectric sensors are installed side by side, one sensor may receive the light from the other sensor, which may disturb the incident signal, causing a malfunction. The fuzzy mutual interference prevention monitors interfering light for a predetermined period of time before light is emitted, and imports the interfering light level and incident frequencies as data. Using these values, fuzzy inference is made to find the risk of malfunction to control the light emitting timing, reducing the risk.

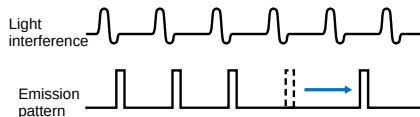
(When risk is low)

Light is emitted after interfering light is gone.



(When risk is high)

Light is emitted after shifting to a gap of interfering light.



Wiring Considerations

Cable

- An oil-resistance cable is used to ensure oil resistance.
- The bending radius should be 25 mm or more.

Installation

Sensor installation

- Note that during the E3S-C installation, hammering it will damage the water resistance function.
- Use an M4 screw, tightened to a torque of no more than 1.18 Nm.

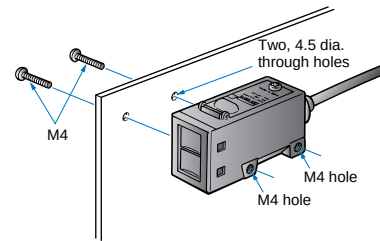
(When using the mounting bracket)

- To set the sensor on the mechanical axis, use the optical axis locking holes.
- When the sensor cannot be set on the mechanical axis, move the E3S-C vertically and/or horizontally and set it in the center of the area where the incident indicator is turned ON. Make sure that the stability indicator is ON.

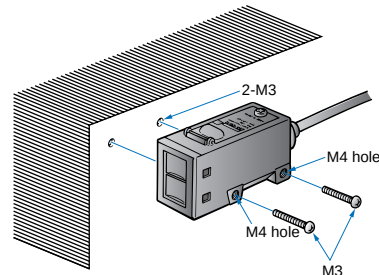
(Direct installation)

Install the E3S-C as shown below.

[M4 screwing]



[M3 screwing]

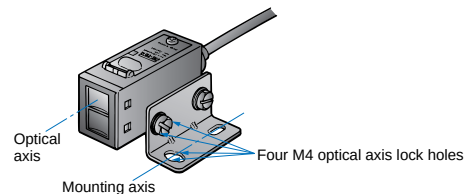


Optical axis adjustment

(Optical axis locking holes)

By fitting screws into the optical axis locking holes, the mounting bracket is set onto the mounting shaft of the mounting bracket.

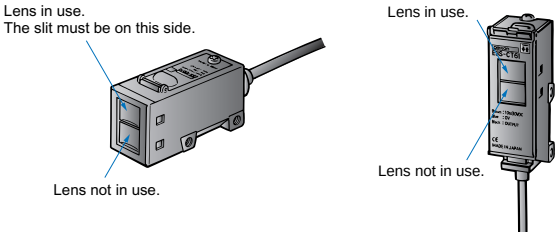
For adjustment



Optical axis position of through-beam model

Unlike the conventional product, the through-beam model has two lenses, but the one actually used is as shown below. When fitting the slit, use it after matching the slit hole with the used lens.

(Horizontal model) (Vertical model)



Water Resistance

To ensure water resistance, tighten the operation panel cover screws to 0.34 Nm to 0.54 Nm torque.

Miscellaneous

Oil resistance/chemical resistance

- Though E3S-C has a high oil resistance, it may not be able to exhibit its performance depending on the oil type. Use oil in compliance with the following table.
- Regarding the oil resistance of E3S-C, it has passed tests on the oils given in the following table. Refer to the table for examining the oil to be used.

Testing oil classification	JIS classification	Product name	Dynamic viscosity (mm ² /s) at 40°C	PH
Lubricant	---	Velocity No. 3	2.02	---
Water-insoluble coolant	Class 2 No. 5	Daphne Cut	Not less than 10 to less than 50	
	Class 2 No. 11	Yushiron Oil No. 2ac	Less than 10	
Water-soluble coolant	Class W1 No. 1	Yushiroken EC50T-3	---	7 to 9.5
		Yushiron Lubic HWC68		7 to 9.9
	Class W1 No. 2	Gryton 1700D		7 to 9.2
	Class W2 No. 1	Yushiroken S50N		7 to 9.8

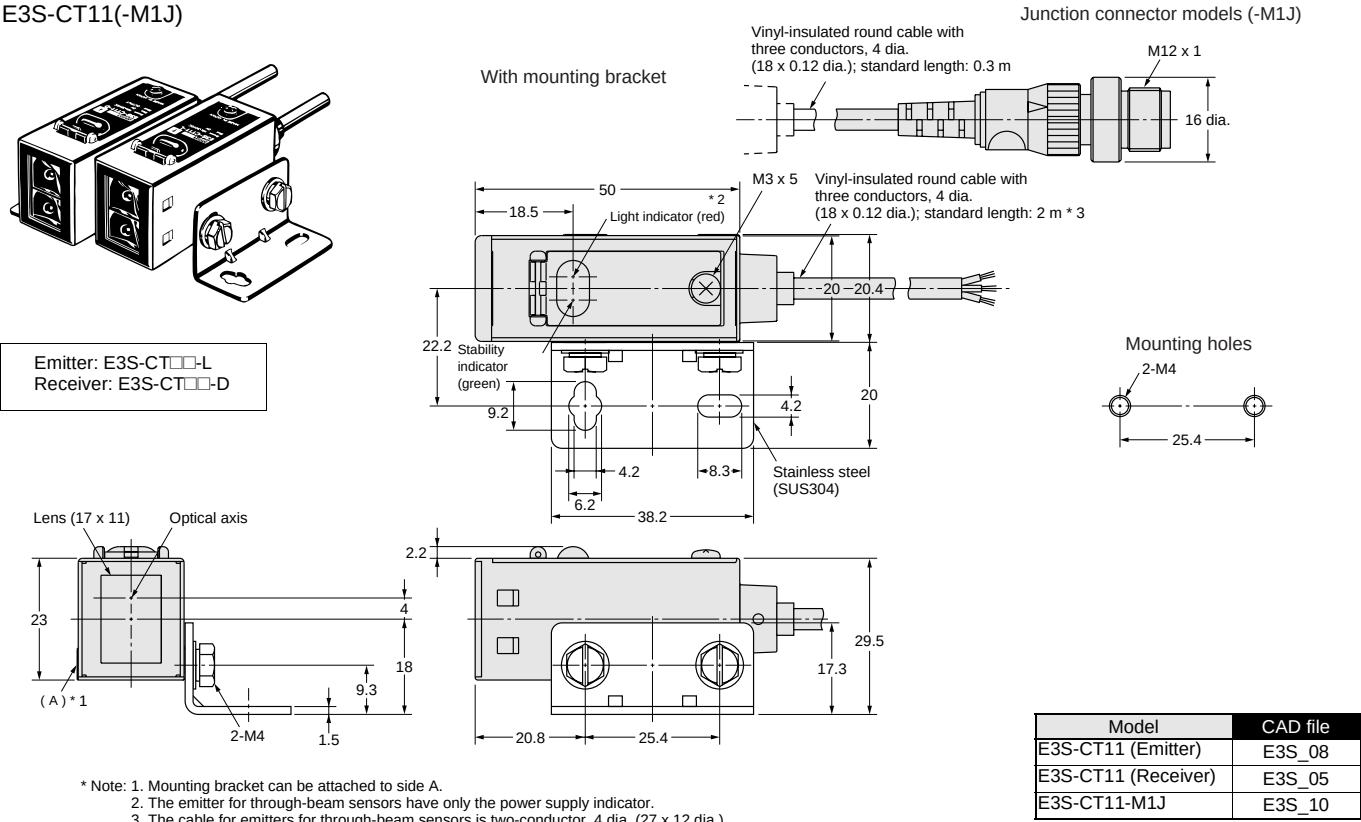
Note: 1. The E3S-C was immersed in the oils in the above table at 50°C for 240 hours, and passed the test of 100-MΩ or more insulation resistance.
2. For use in the environment where the E3S-C is exposed to the oil other than those in the above table, use the dynamic viscosity and PH in the above table. Pre-examine the oils since the sensor may be affected by additives and like in the oils.

Dimensions (Unit: mm)

Sensors

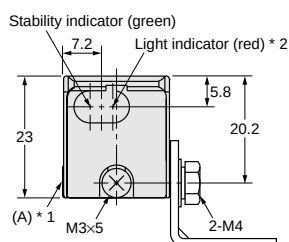
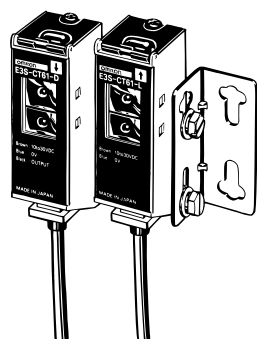
Through-beam model (horizontal model)

E3S-CT11(-M1J)

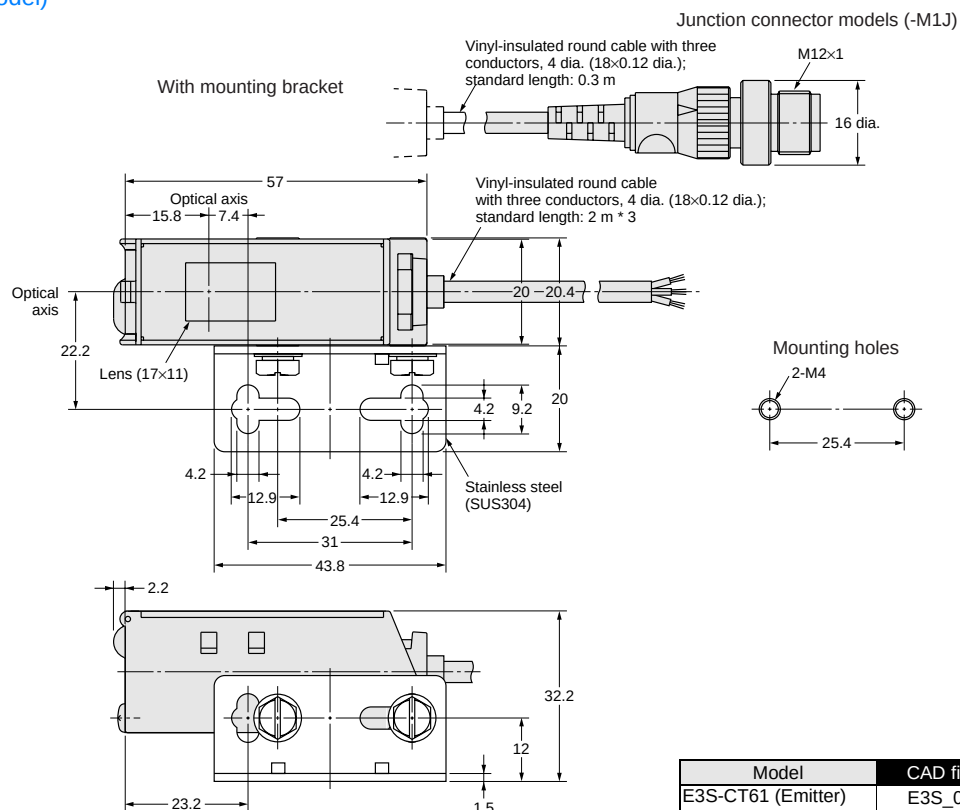


Through-beam model (vertical model)

E3S-CT61(-M1J)



- * 1. Mounting bracket can be attached to side A.
- * 2. The emitter for through-beam sensors have only the power supply indicator.
- * 3. The cable for emitters for through-beam sensors is two-conductor, 4 dia. (27x12 dia.).



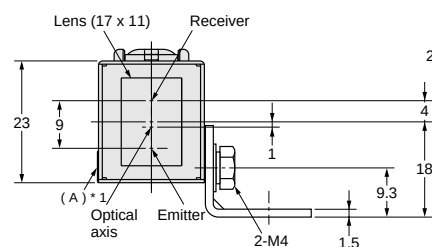
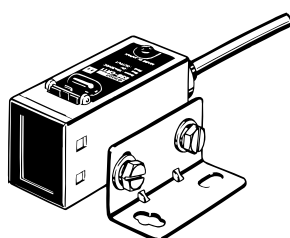
Model	CAD file
E3S-CT61 (Emitter)	E3S_06
E3S-CT61 (Receiver)	E3S_07
E3S-CT61-M1J	E3S_09

Retro/diffuse reflective model (horizontal model)

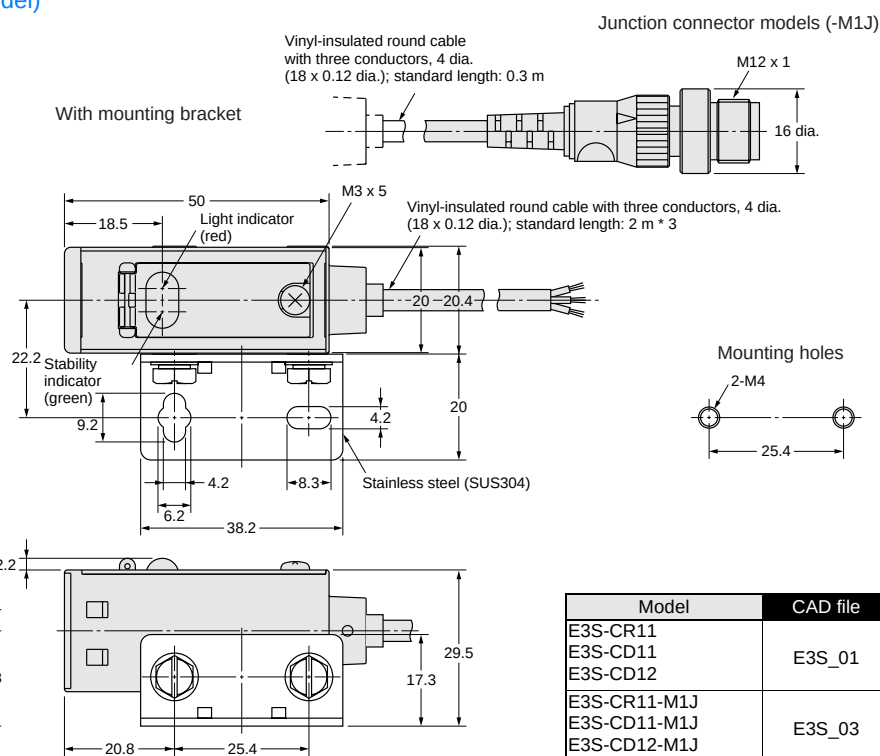
E3S-CR11(-M1J)

E3S-CD11(-M1J)

E3S-CD12(-M1J)



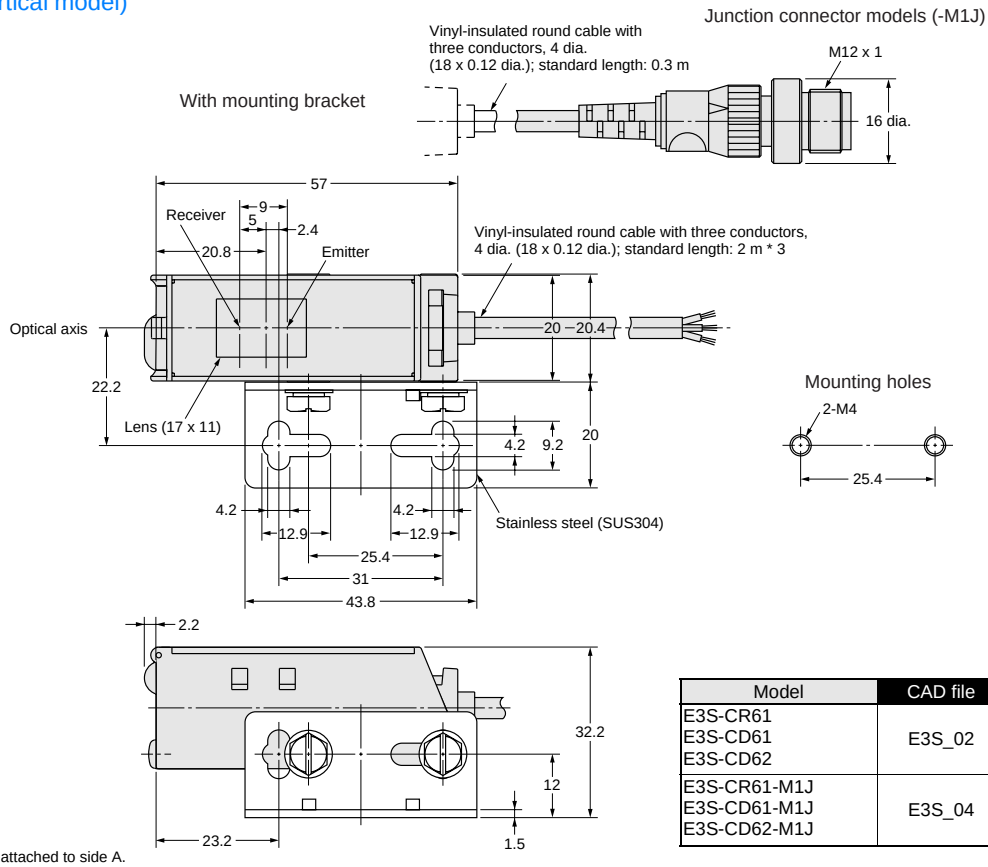
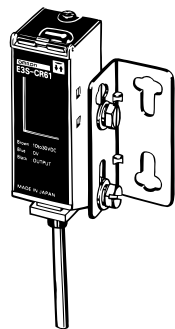
* Note: Mounting bracket can be attached to side A.



Model	CAD file
E3S-CR11	E3S_01
E3S-CD11	
E3S-CD12	
E3S-CR11-M1J	E3S_03
E3S-CD11-M1J	
E3S-CD12-M1J	

Retro/diffuse reflective model (vertical model)

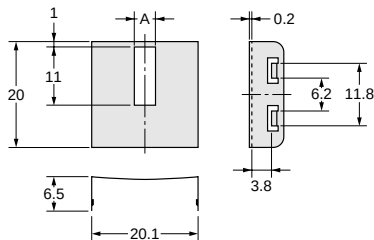
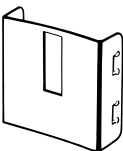
E3S-CR61(-M1J)
E3S-CD61(-M1J)
E3S-CD62(-M1J)



Accessories (Order Separately)

Plug-in type long slit (for through-beam model)

E39-S61



Dimension A (mm)	Material	Quantity
0.5	Stainless steel (SUS 304)	1 each for emitter and receiver (total of 8 pcs.)
1		
2		
4		

Distance setting photoelectric sensor (metal case)

E3S-CL

A complicated sensitivity adjustment is not necessary. Just set the distance to ensure a stable detection of works of various colors. New distance setting models of long-distance/oilproof/waterproof type and high-performance type



Features

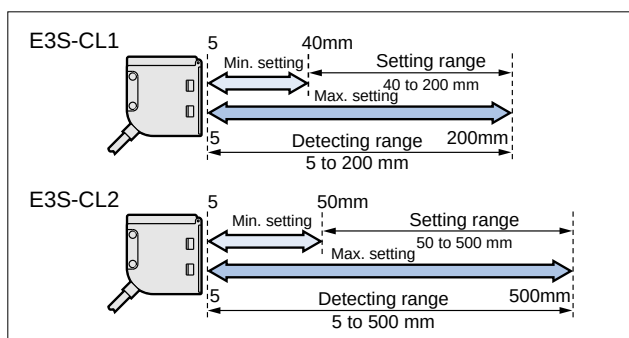
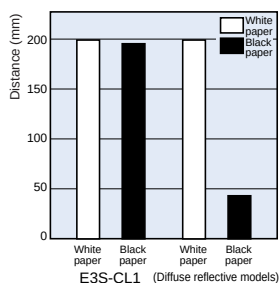
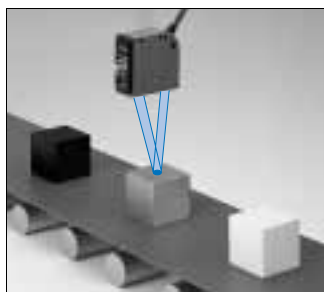
Stable Detection Regardless of Color, Material, or Size of a Detecting Object. Black/White Error of Only 2% max.

(E3S-CL1: Only 4 mm at 200 mm!)

The industry's minimum black/white error of only 2% (E3S-CL1). Like the conventional diffuse reflective model, the variation of the detecting distance has been minimized in a black object or a work of uneven color. This detection system is also resistant to contamination of the lens surface and work. The E3S-CL2 has a black/white error of 10%.

Compact and incl. a Long Detection Distance of 500 mm (E3S-CL2)

While the size is as compact as 40x42.6x15.4 mm, the E3S-CL2 using infrared LEDs ensures detection of 500-mm long distance. The E3S-CL1 using red LEDs has achieved the detecting distance of 200 mm.



Features

Eliminates Background Influences with a Hysteresis of Only 2% max. (E3S-CL1)

The hysteresis is the industry's minimum 2% max. (E3S-CL1). As a triangulation measuring is used, objects behind the setting distance cannot be detected. The sensor is insensitive to the influence of background objects of high reflectivity, and stable detects works on a conveyor from above. The hysteresis of the E3S-CL2 is 10% max. of the detecting distance (5% max. for white paper).



What Is Distance Setting?
(Differences from other detecting system)

Distance-setting

Fea- tures	- When the sensing object moves in direction A, the center position of the reflected light moves in direction B. This is received by the 2-split photodiode and the place where the incident levels are the same on the N and F sides is defined as the setting distance. - The object is detected by the incident circuit processing only when $N \geq F$, and is not detected when $N < F$. Therefore, detection is stable without being influenced by the work type and background objects.
Struc- ture	

Diffuse-reflective

Fea- tures	- Since the level of the reflected light is judged for detection, the sensing distance varies with the color, material and/or size of the work. - A malfunction may occur if there is any object of high reflectivity in the background.
Struc- ture	

6-turn adjuster with indicator

- The 6-turn adjuster with indicator ensures ease of distance setting.
- Fine distance setting is possible.



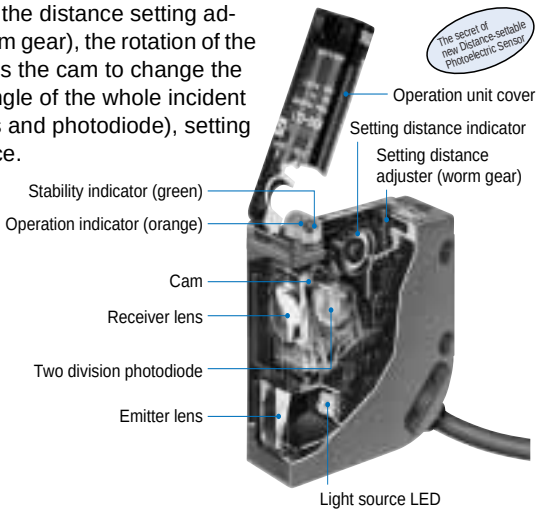
Solid Body Provides Excellent Durability

Has a sturdy metal body. Furthermore, the water resistance of IEC Standard IP67 and the oil resistance of IP67g (E3S-CL2) ensure a worry-free operation in a wide range of applications. E3S-CL2 uses an oil-resistant cable as standard.



Optical Technology of E3S-CL
(Patent pending)

By turning the distance setting ad-juster (worm gear), the rotation of the gear moves the cam to change the incident angle of the whole incident block (lens and photodiode), setting the distance.

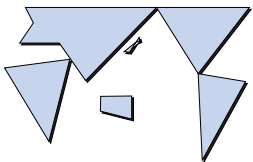


NPN/PNP Output is Switch Selectable

- Since NPN or PNP output can be selected with a single switch, one model meets equipment exported anywhere.
- Light-ON/Dark-ON is also switch selectable.

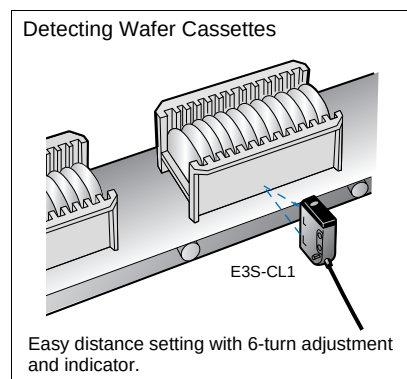
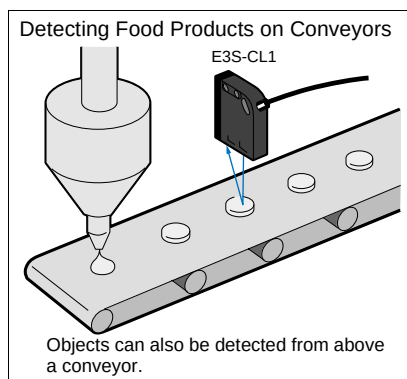
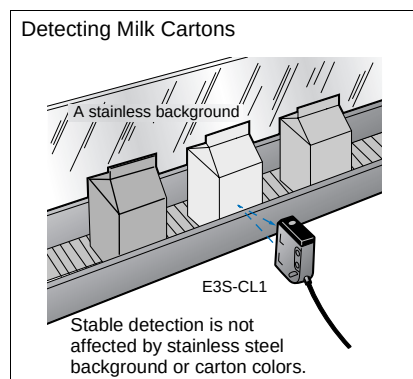
Conforms to Applicable EN/IEC Standards

- The sensors satisfy the electrical safety (IEC947-5-2), noise resistance (IEC947-5-2, IEC801-2/3/4) and noise radiation restrictions (EN500 81-2, EN55011) re-quired for photoelectric sensors.

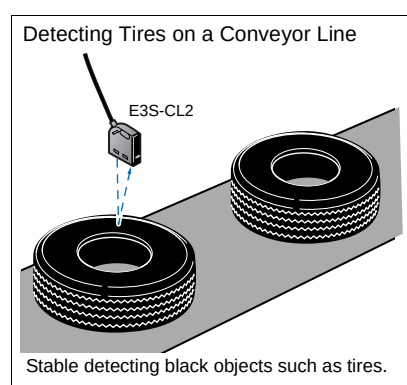
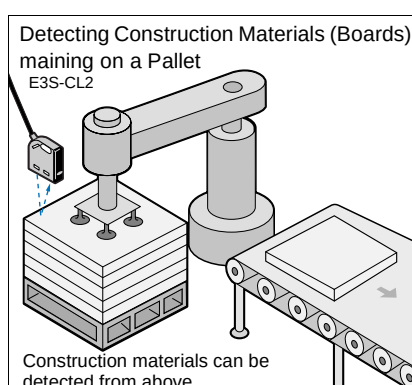
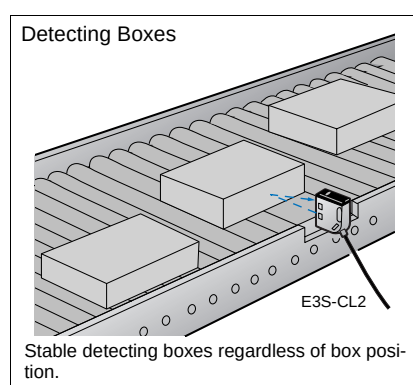


Application

E3S-CL1



E3S-CL2



Ordering Information

Red light Infrared light

Shape	Sensing/Setting range	Model
		E3S-CL1
		E3S-CL2

Rating/performance

Sensing method		Distance-setting	
Item	Model	E3S-CL1	E3S-CL2
Sensing		5 to 200 mm (White paper 200 x 200 mm) (Setting distance 200 mm)	5 to 500 mm (White paper 200 x 200 mm) (Setting distance 500 mm)
Setting range		40 to 200 mm (White paper 200 x 200 mm)	50 to 500 mm (White paper 200 x 200 mm)
Differential distance		2% max.	10% max.
Reflectivity characteristics (black/white error) *1		2% max.	10% max.
Light source (wave length)		Red LED (700 nm)	Infrared LED (860 nm)
Power supply voltage		10 to 30 VDC [ripple (p-p) 10% included]	
Current consumption		35 mA max.	50 mA max.
Control output		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2.0 V max.) Open collector output type (NPN/PNP switch selectable) Light-ON/Dark-ON switch selectable	
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention	
Response time		Operation or reset: 1 ms max.	Operation or reset: 2 ms max.
Distance setting		6-turn endless adjuster (with indicator)	
Ambient illuminance		Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.	
Ambient temperature		Operating/Storage: -25°C to 55°C (with no icing or condensation)	
Ambient humidity		Operating/Storage: 35% to 85%RH (with no condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions	
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP67, NEMA 6P (limited to indoor use) *2	IEC Standard IP67, NEMA 6P (limited to indoor use)
Connection method		Pre-wired models (standard length: 2 m)	
Weight (Packed state)		Approx. 170 g	
Material	Case	Zinc diecast	
	Operation panel cover	Polyethyl sulfon	
	Lens	Acrylics	
	Mounting Brackets	Stainless steel (SUS304)	
Accessories		Mounting bracket, hexagon bolt M4 x 12 (with spring washer, flat washer), adjusting screwdriver, instruction manual	

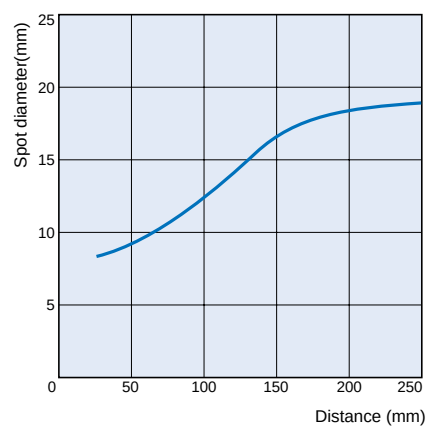
*1. Sensing distance difference between standard white paper (reflectivity 90%) and standard black paper (reflectivity 5%)

*2. NEMA (National Electrical Manufacturers Association) Standards

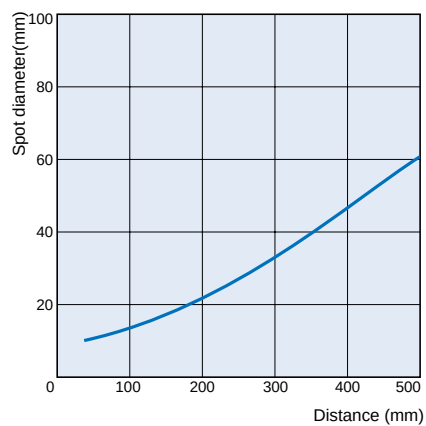
Characteristic data (typical)

Spot Diameter vs. Sensing Distance

E3S-CL1

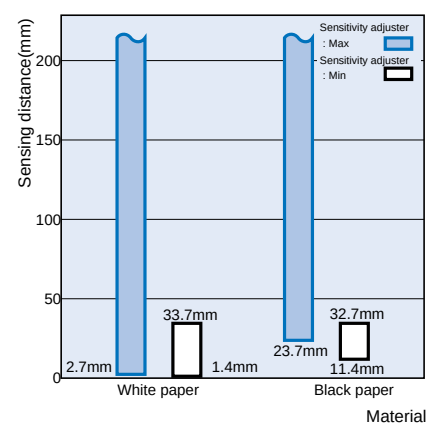


E3S-CL2

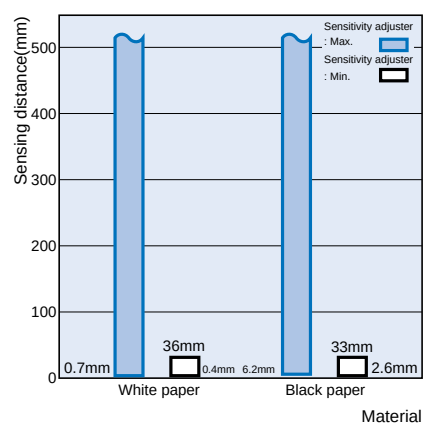


Short distance characteristic

E3S-CL1



E3S-CL2



Output Circuit Diagram

NPN output

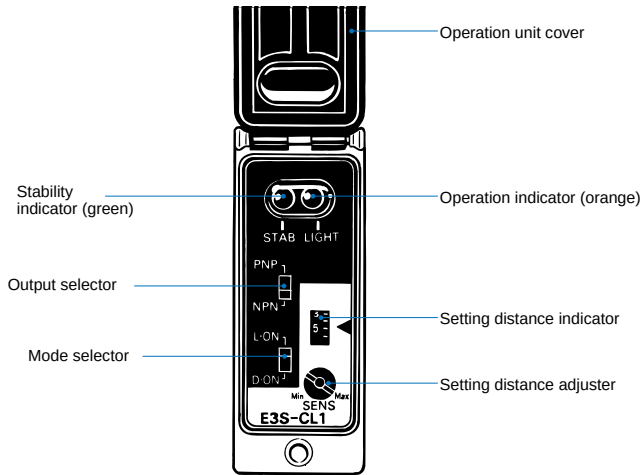
Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CL1 E3S-CL2	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CL1 E3S-CL2	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

Nomenclature:

Operation panel



Output selection switch

- ① When using the sensor with NPN output, move the switch to the **NPN** position.
- ② When using the sensor with PNP output, move the switch to the **PNP** position.

Mode selection switch

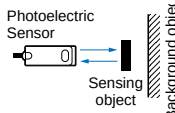
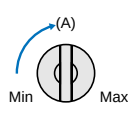
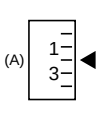
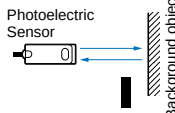
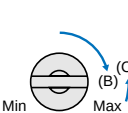
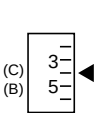
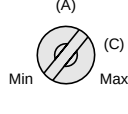
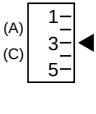
- ① When using the sensor with Light-ON, move the switch to the **L•ON** position.
- ② When using the sensor with Dark-ON, move the switch to the **D•ON** position.

Distance Adjuster

- ① Turning the distance setting adjuster clockwise (to the Max position) increases the detecting distance, and turning it counterclockwise (to the Min position) decreases the distance.
- ② The distance setting adjuster is a 6-turn endless adjuster ranging from the Min position to the Max position, and its number of turns is displayed on the setting distance indicator according to the rotation of the adjuster.

Operation

Sensitivity adjustment (distance setting type, Light-ON)

Sequence	Detection state	Position of distance setting adjuster	State of setting distance indicator	Indicator state	Adjustment Steps
(1) Point (A)				ON→OFF  Stability indicator (green) OFF→ON  Operation indicator (orange)	Place a sensing object in the predetermined position, turn the adjuster clockwise until the incident indicator (orange) is turned ON, and define this position as (A).
(2) Points (B), (C)				ON→OFF  Stability indicator (green) ON→OFF  Operation indicator (orange)	(1) If there is a background object, remove the sensing object, turn the adjuster further clockwise until the incident indicator (orange) is turned ON, and define this position as (B). Turn the adjuster counterclockwise from (B) until the incident indicator (orange) is turned OFF, and define this position as (C). (2) If there is no background object, define the maximum adjuster position (Max) as (C).
(3) Setting	---			ON  Stability indicator (green) ON↔OFF  Operation indicator (orange)	Set the adjuster in the middle of positions (A) and (C). Also make sure that the stability indicator (green) is turned ON when there is an object and when there is no object. When the indicator is not turned ON, reexamine the detection method since there is a little allowance.

Precautions

Correct Use

Design

Cable

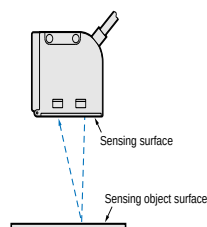
The oil-resistant cable is used to ensure oil resistance. (E3S-CL2)

Installation

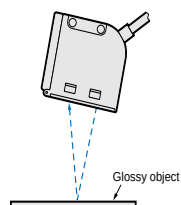
Sensor installation

Mounting orientation

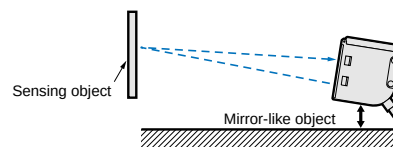
- Install the photoelectric sensor in such manner that its detection surface and the object surface are parallel (without inclination relative to the sensing object).



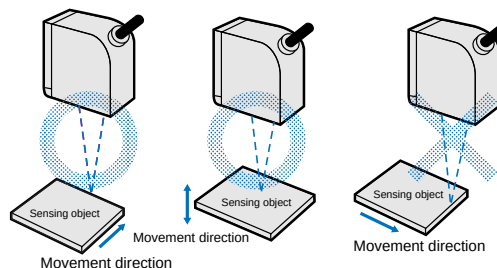
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right. In this case, ensure that the Sensor is not influenced by any background objects.



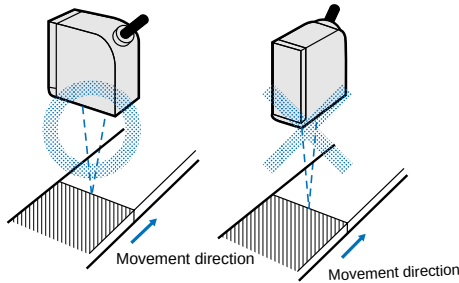
- If there is a mirror-smooth object under the photoelectric sensor, operation may become unstable. Therefore, incline the photoelectric sensor as shown below or move it away from the object.



- Install the photoelectric sensor in either of the following orientations, being careful of the direction in which the sensing object will move.



- Also, when the color/material of the sensing object varies extremely, install the photoelectric sensor in either of the following orientations.



- Install the photoelectric sensor so that the sun, fluorescent lamp, incandescent lamp or any other strong light will not enter the directional angle range of the sensor.

Mounting Precautions

- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will loose its water-resistive properties.
- Use M4 screws.
- Tighten the screws to the torque of 1.2 Nm max.

Others

Oil resistance/chemical resistance (E3S-CL2)

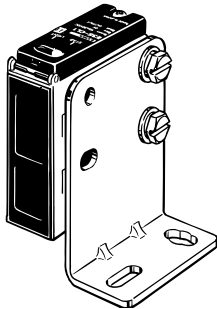
For the oil resistance of E3S-CL2, the Sensor has passed tests on the oils given in the following table. Refer to the table for examining the oil to be used. Depending on the oil type, however, the Sensor may not be able to exhibit its performance.

Testing oil classification	JIS classification	Product name	Dynamic viscosity (mm ² /s) at 40°C	PH
Lubricant	---	Velocity No. 3	2.02	---
Water-insoluble coolant	Class 2 No. 5	Daphne Cut	Not less than 10 to less than 50	
	Class 2 No. 11	Yushiron Oil No. 2ac	Less than 10	
Water-soluble coolant	Class W1 No. 1	Yushiroken EC50T-3	---	7*9.5
		Yushiron Lubic HWC68		7*9.9
	Class W1 No. 2	Gryton 1700D		7*9.2
	Class W2 No. 1	Yushiroken S50N		7*9.8

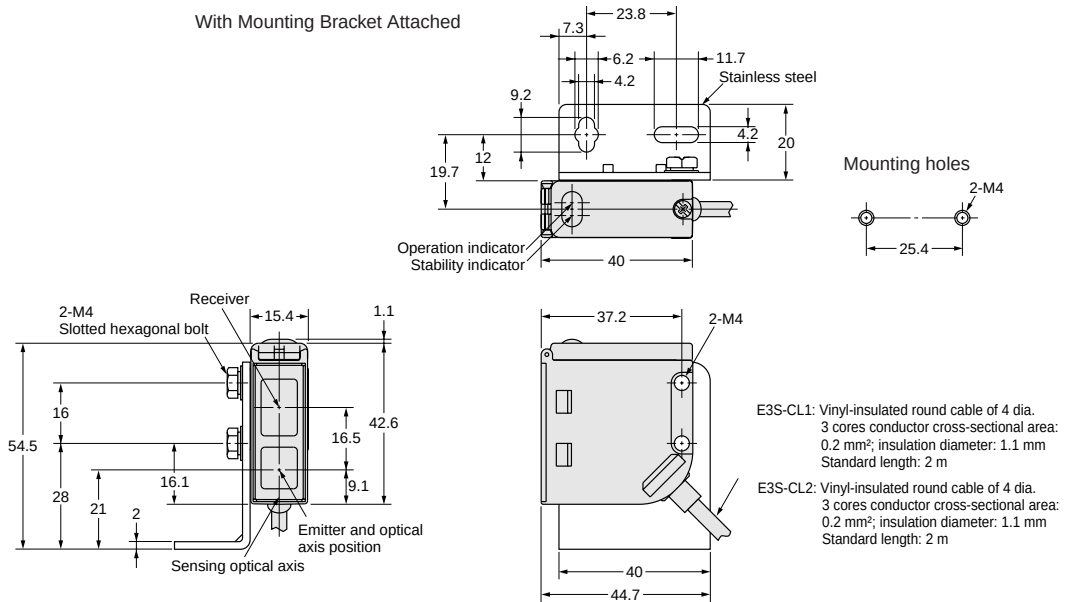
Note: 1. E3S-C was submerged in the oils in the above table at 50°C for 240 hours, and passed the test of 100-MΩ or more insulation resistance.
2. For use in the environment where E3S-C is exposed to the oil other than those in the above table, use the dynamic viscosity and PH in the above table. Pre-check the oils since the sensor may be affected by additives etc. in the oils.

Dimensions (Unit: mm)

E3S-CL1
E3S-CL2



With Mounting Bracket Attached



CAD file E3S_11

Note: The output selector, mode selector and distance setting adjuster are exposed when the cover is opened.

Photoelectric switch with built-in amplifier (long distance)

E3G

Long-distance Retroreflective Photoelectric Sensor with a Sensing Distance of 10 m Sensor with Distance Setting up to 2 m

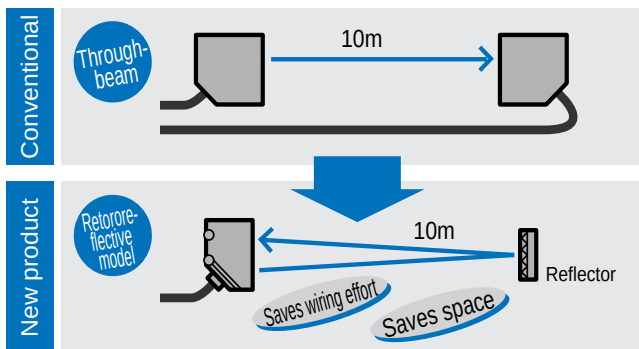


Features

Retroreflective Models

Though the Size Is Compact, the Sensing Distance Is as Long as 10m.

Replace the conventional through-beam model with the retroreflective model for saving wiring and installation space.

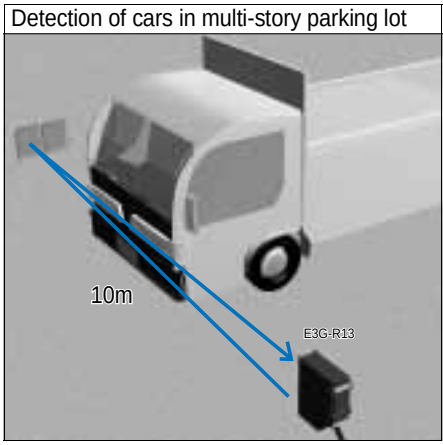
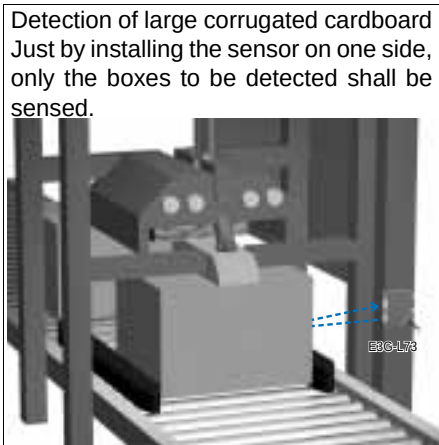
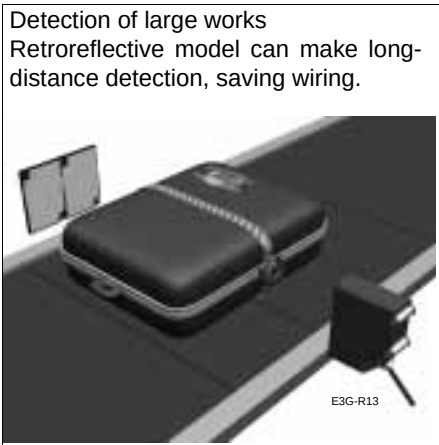


Easy monitoring of Operation stability by means of stability indicator.



The stability indicator becomes darker due to dust on the lens or improper optical axis adjustment.

Application



Features

Distance-setting

Distance-setting Models with a Long 2-m Sensing Distance Incorporate a Teaching Function

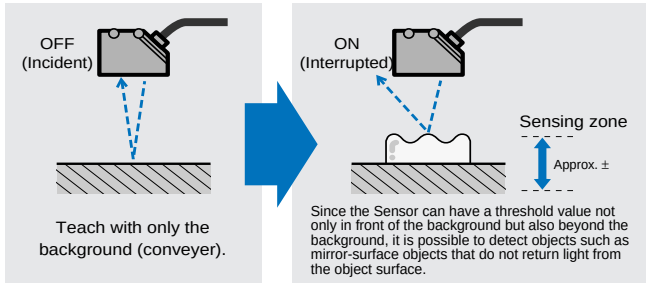
Sensitivity adjustment without being influenced by background objects is possible by simply pressing a button. Useful for teaching without a sensing object.

Easy Optimum Sensing Distance Adjustments

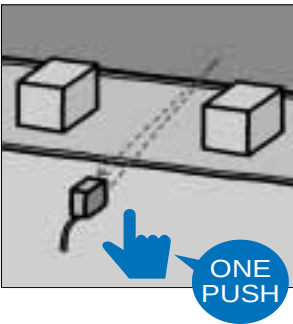
Teaching with and without a sensing object ensures highly accurate detection without influence from the background.

Zone Setting Function

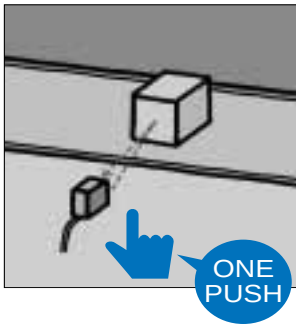
Effective for detecting glossy objects, which were difficult to detect with conventional sensors. (D-ON)



Without sensing object



With sensing object



General

Select either transistor (NPN/PNP selectable) or relay output. Three connection methods (plus a model with a timer function). Select either a DC power supply or a variable power supply: 24 V to 240 VAC or 12 to 240 VDC).

IEC Standard IP67 Water Proofing



M12 Rotary Connector Available on Models with DC Power Supplies



Ordering Information

Sensors

Red light Infrared light

Sensor type	Shape	Connection method	Sensing distance	Timer function	Model	
					NPN/PNP selector	Relay contact output
Retroreflec- tive Models (with M.S.R. Function)		Pre-wired	 10m [500mm]*	---	E3G-R13-G	---
		Connector type			E3G-R17-G	
		Terminal block		ON or OFF delay 0 to 5 s (adjustable)	---	E3G-MR19-G E3G-MR19T-G
Distance- setting		Pre-wired	White paper 300 × 300 mm 0.2 to 2 m	---	E3G-L73	---
		Connector type			E3G-L77	
		Terminal block		ON or OFF delay 0 to 5 s (adjustable)	---	E3G-ML79-G E3G-ML79T-G

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Accessories (Order Separately)

Reflectors

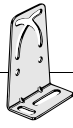
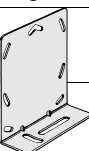
Shape	Sensing distance (typical)	Model	Quantity	Remarks
	10 m (500 mm) *	E39-R2	1	---
	6 m (100 mm) *	E39-R1S	1	---

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Terminal Protection Cover for Side-pullout Cable

Shape	Model	Quantity	Applicable type	Remarks
	E39-L129-G	1	E3G-MR19(T)-G E3G-ML79(T)-G	Provided with rubber bushing and cap for pullout prevention in horizontal direction

Mounting Brackets

Shape	Model	Quantity	Applicable type	Remarks
	E39-L131	1	E3G-R1□ E3G-L7□	---
	E39-L132	1		Rear-mounting use
	E39-L135	1	E3G-MR19(T)-G E3G-ML79(T)-G	Cable pulled out downwards
	E39-L136	1		---

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shaped 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/Performance

Sensor type		Retroreflective Models (M.S.R. function)				Distance-setting			
Item	Model	E3G-R13-G	E3G-R17-G	E3G-MR19-G	E3G-MR19T-G	E3G-L73	E3G-L77	E3G-ML79-G	E3G-ML79T-G
Sensing distance		10 m (500 mm) * (When using the E39-R2)				0.2 to 2 m (White paper 300 x 300 mm)			
Setting distance		---				0.5 to 1.2 m (White paper 300 x 300 mm)			
Standard sensing object		Opaque: 80 dia. min.				---			
Hysteresis (typical)		---				10% of setting distance			
Directional angle		Sensor: 1° to 5°				---			
Reflectivity characteristics (black/white error)		---				±10% max. (At detection distance of 1m)			
Light source (wave length)		Red LED (700 nm)				Infrared LED (860 nm)			
Spot size		---				70 mm dia. max. (At detection distance of 1m)			
Power supply voltage		10 to 30 VDC [Ripple (p-p) 10% included]		12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz		10 to 30 VDC (Ripple (p-p) 10% included)		12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz	
Current/Power consumption		50 mA max.		2 W max.		60 mA max.		2 W max.	
Control output		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2 V max.) Open collector output type (NPN/PNP output switch selectable) L-ON/ D-ON switch selectable		Relay output: Switch-over contact 250 VAC 3A (cosφ=1) max. 30 VDC 3A max. L-ON/D-ON switch selectable		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2 V max.) Open collector output type (NPN/PNP output switch selectable) L-ON/ D-ON switch selectable		Relay output: Switch-over contact 250 VAC 3A (cosφ=1) max. 30 VDC 3A max. L-ON/D-ON switch selectable	
Life expectancy (relay output)	Me- chani- cal	---		50,000,000 operations min. (switching frequency: 18,000 operations/h)		---		50,000,000 operations min. (switching frequency: 18,000 operations/h)	
	Electri- cal	---		100,000 operations min. (switching frequency: 1,800 operations/h)		---		100,000 operations min. (switching frequency: 1,800 operations/h)	
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention		Mutual interference prevention function		Reverse polarity protection, output short-circuit protection, mutual interference prevention		Mutual interference prevention function	
Response time		Operation/reset: 1 ms each		Operation/reset: 30 ms each		Operation/reset: 5 ms each		Operation/reset: 30 ms each	
Sensitivity adjustment		One-turn adjuster				Teaching method (NORMAL mode/ZONE mode)			
Timer function		---			ON delay/ OFF delay 0 to 5 s (Adjuster variable system)	---			ON delay/ OFF delay 0 to 5 s (Adjuster variable system)
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.							
Ambient temperature		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)							
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)							
Insulation resistance		20 M Ω min. at 500 VDC							
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute		2,000 VAC at 50/60 Hz for 1 minute		1,000 VAC at 50/60 Hz for 1 minute		2,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance		Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Sensor type		Retroreflective Models (M.S.R. function)				Distance-setting			
Item	Model	E3G-R13-G	E3G-R17-G	E3G-MR19-G	E3G-MR19T-G	E3G-L73	E3G-L77	E3G-ML79-G	E3G-ML79T-G
Shock resistance		500 m/s ² 3 times in each of X, Y and Z directions							
Protective structure		IEC 60529 IP67 (with Protective Cover attached)							
Connection method		Pre-wired (standard length: 2 m)	M12 Connector	Terminal block		Pre-wired (standard length: 2 m)	M12 Connector	Terminal block	
Weight (Packed state)		Approx. 150 g	Approx. 50 g	Approx. 150 g			Approx. 50 g	Approx. 150 g	
Material	Case	PBT (polybutylene terephthalate)							
	Lens	Acrylics (PMMA)							
	Mounting Brackets	Stainless steel (SUS304)							
Accessories		Instruction sheet, and screwdriver for adjustment				Instruction sheet			

Output Circuit Diagram

NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-R13-G E3G-R17-G E3G-L73 E3G-L77	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	L•ON (LIGHT ON)	* Set the NPN or PNP selector to NPN Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-R13-G E3G-R17-G E3G-L73 E3G-L77	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	L•ON (LIGHT ON)	* Set the NPN or PNP selector to PNP Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	D•ON (DARK ON)	

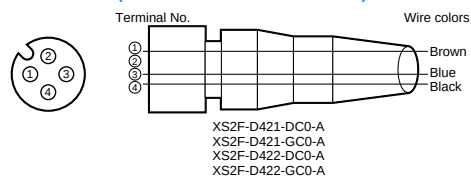
Relay contact output

Timer function	Model	Timing chart	Mode selection switch	Output circuit
None	E3G-MR19-G E3G-ML79-G		L•ON (LIGHT ON)	
			D•ON (DARK ON)	
ON or OFF delay 0 to 5 s (adjustable)	E3G-MR19T-G E3G-ML79T-G		L•ON (LIGHT ON)	
			D•ON (DARK ON)	

* For ON and OFF, delay timers vary independently.

Note: Td1, Td2: Delay time (0 to 5 s), T1: Any period longer than delay time, T2: Any period shorter than delay time

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	Power supply (+V)
	-	②	-
	Blue	③	Power supply (0 V)
	Black	④	Output

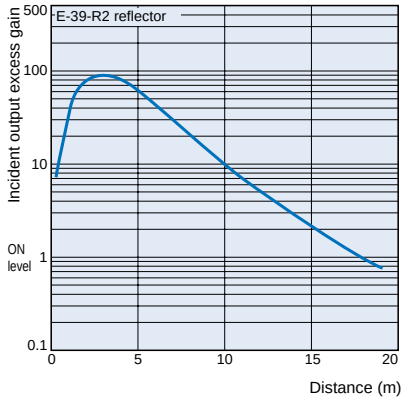
Note: Pin 2 is not used.

Characteristic data (typical)

E3G

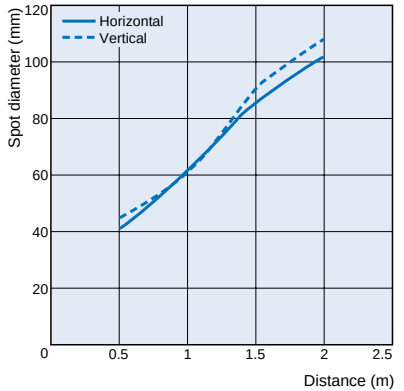
E3G-R/MR Retroreflective Models

Operating Range

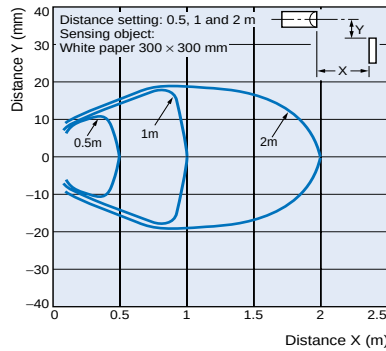


E3G-L/ML Distance-setting Models

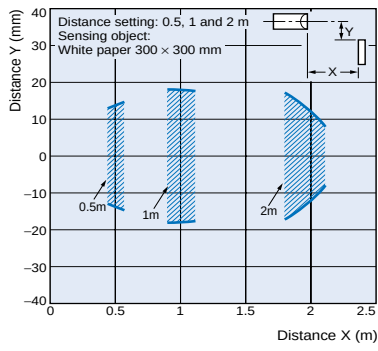
Spot Diameter vs. Sensing Distance



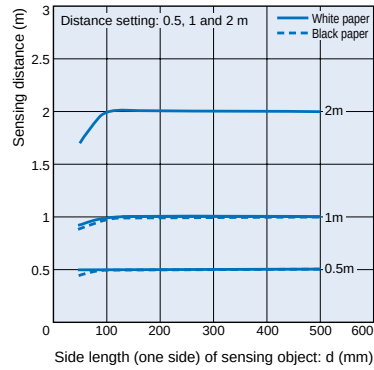
Sensing Zone (in NORMAL mode)



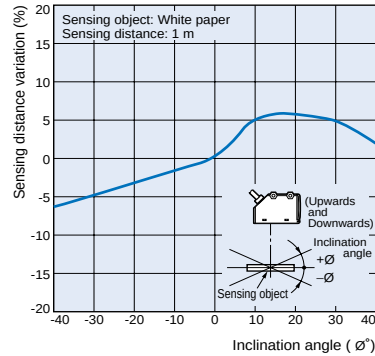
Sensing Zone in ZONE Mode



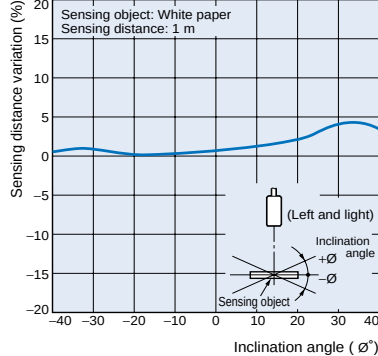
Sensing Object Size vs. Setting Distance



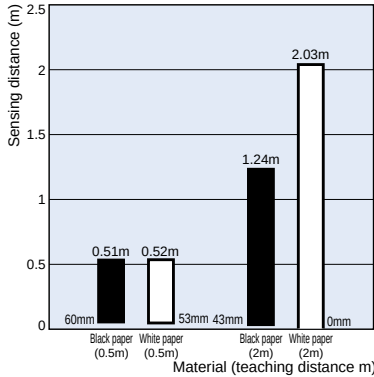
Sensing Object Angle Characteristics (Up and Down)



Sensing Object Angle (Left and Right)



Close-range Characteristics

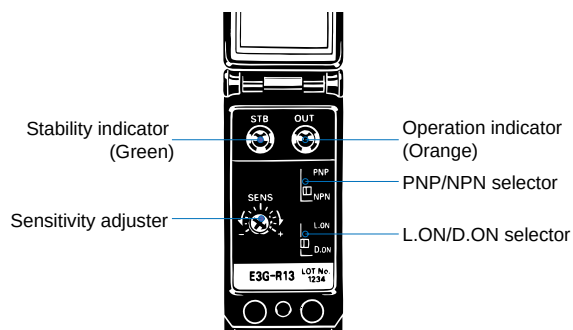


Nomenclature

Retroreflective Models

E3G-R13-G (Pre-wired model)

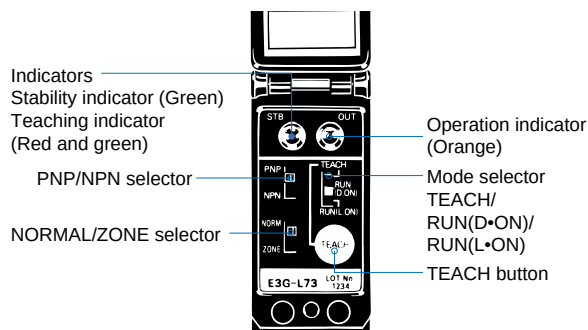
E3G-R17-G (Connector model)



Distance-setting

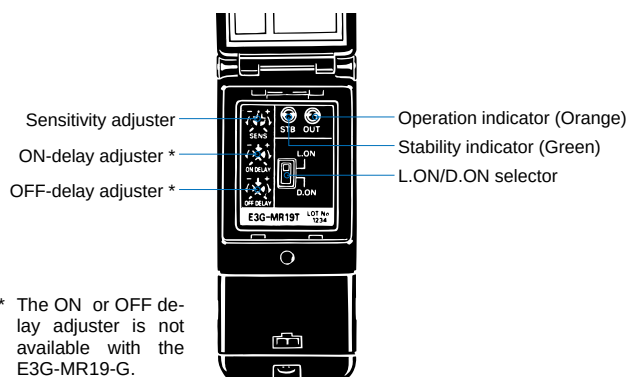
E3G-L73 (Pre-wired model)

E3G-L77 (Connector model)



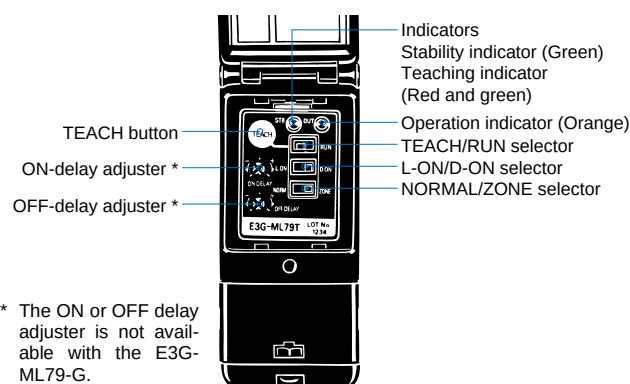
E3G-MR19-G (Terminal Block Model)

E3G-MR19T-G (Terminal Block Model with Timer)



E3G-ML79-G (Terminal Block Model)

E3G-ML79T-G (Terminal Block Model with Timer)



Operation

E3G-L/ML

Adjustment Steps

Pro- ce- dure	Operation
1	Install, wire, and turn on the Sensor.
2	Perform distance setting (teaching). Refer to "Distance Setting (Teaching)".
3	Check that the mode selector is set to RUN.

Distance Setting (Teaching)

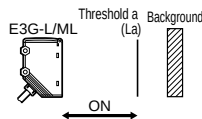
Select the most appropriate teaching method in reference to the following descriptions.

Application	Teaching without sensing objects (i.e., Teaching the background).	Setting a threshold in the middle between the back-ground and sensing object for operation.	Detection of glossy objects in front of the background.	Setting the maximum sensing distance of the Sensor.
Teaching	Normal one-point teaching	Normal two-point teaching	Zone teaching	Maximum distance setting (in normal mode)
Setting method	Press the TEACH button with the background object.	Press the TEACH button with the background object.	Press the TEACH button with the background object (conveyor, etc.).	Press the TEACH button for longer than three seconds.
Set threshold	Threshold (a) is set to a distance in front of the background of 20% of the background distance.	Threshold (a) is set approximately in the middle between the background and sensing object.	Thresholds (a and b) are set in the sensing distance on condition that the difference between these thresholds is approximately 10% of the whole sensing distance.	The threshold is set in such manner that the stability indicator will turn ON at approximately 2 m if the sensing object is white paper.
Output ON range	The output is ON between the Sensor and La.	The output is ON between the Sensor and La.	The output is ON between La and Lb.	The output is ON whenever the sensing object is located between the Sensor and at a distance of 2.2 m.

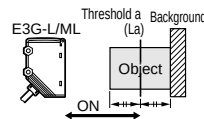
La: Distance equivalent to threshold (a)

Lb: Distance equivalent to threshold (b)

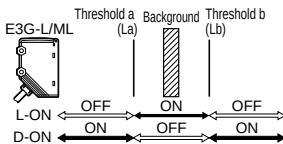
Normal Mode1. Normal One-point Teaching



2. Normal Two-point Teaching



Zone Mode Zone Teaching



Normal one-point teaching

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .
3	Press the TEACH button with the background. • The teaching indicator (red) will turn ON.
4	Set the mode selector to RUN . (Set to L-ON or D-ON mode.)

Note: Perform normal one-point teaching with the background.

Normal two-point teaching

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .

Pro- ce- dure	Operation
3	Press the TEACH button with a sensing object. • The teaching indicator (red) will turn ON.
4	Move the sensing object and press the TEACH button with the background. • If the teaching is successful, the teaching indicator (green) will turn ON. • If the teaching is not successful, the teaching indicator (red) will flash.
5	When the teaching is successful, the setting is complete. Set the mode selector to RUN . (Use the operation mode selector to set L-ON/D-ON.) → When the teaching is not successful, change the work position and setting distance again, and restart the setting from step "3".

Zone teaching

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to ZONE .
3	Press the TEACH button with the background. • The teaching indicator (red) will turn ON and the teaching indicator (green) will then turn ON.
4	Set the mode selector to RUN . (Set to L-ON or D-ON mode.)

Note: Perform zone teaching with the background.

Maximum distance setting (in normal mode)

If you want to set the maximum distance of the sensor, set a maximum distance as depicted in the following procedure.

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .
3	Press the TEACH button 3 s or more. • The teaching indicator (red) will turn ON. • In 3 s, the teaching indicator (green) will turn ON.
4	When the teaching indicator (green) turns ON, the setting is complete. Set the mode selector to RUN . (Set to L-ON/ D-ON.)

Precautions

Correct Use

E3G-R/MR

Design

Power Supply

A full-wave rectification power supply can be used with the E3G-MR19(T)-G.

Wiring Considerations

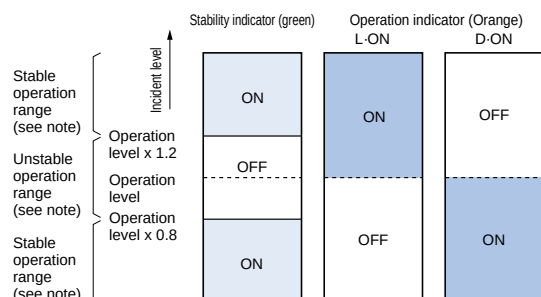
The tensile strength of the cable during operation should not exceed the values shown below.

Model	Tensile strength
E3G-R13-G E3G-MR19(T)-G	50 N max.
E3G-R17-G	10 N max.

● For adjustment

Display

- The following graphs indicate the status of each operation level.
- Set the E3G so that it will work within the stable operation range.



Note: If the operation level is set to the stable operation range, the E3G will operate with the highest reliability and without being influenced by temperature change, voltage fluctuation, dust, or setting change.

E3G-L/ML

Design

Power Supply

A full-wave rectification power supply can be used with the E3G-ML79(T)-G.

Wiring Considerations

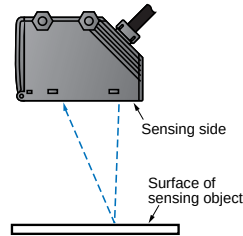
The tensile strength of the cable during operation should not exceed the values shown below.

Model	Tensile strength
E3G-L73 E3G-ML79(T)-G	50 N max.
E3G-L77	10 N max.

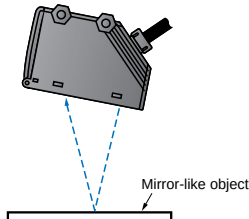
Mounting

Mounting Directions

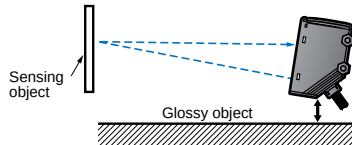
- Install the photoelectric sensor in such way that its detection surface and the object surface are always parallel (without inclination relative to the sensing object).



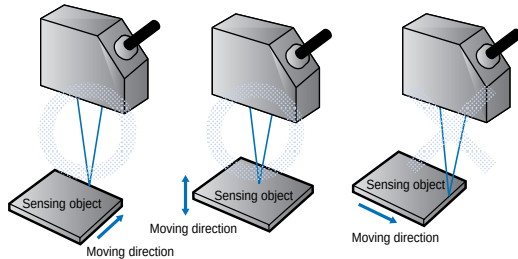
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right, provided that the Sensor is not influenced by any background objects.



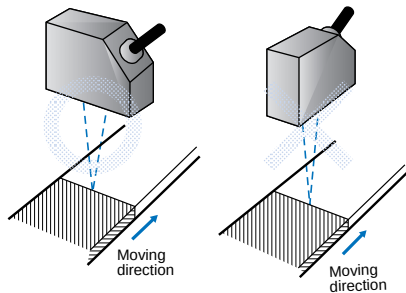
- If there is a mirror-like object below the Sensor, the Sensor may not be in stable operation. Therefore, incline the Sensor or keep the Sensor a distance away from the mirror-like object as shown below.



- Ensure not to install the Sensor in the incorrect direction. Refer to the following.



Install the Sensor as shown in the following if each sensing object greatly differs in color or material.



Miscellaneous

EEPROM Write Error

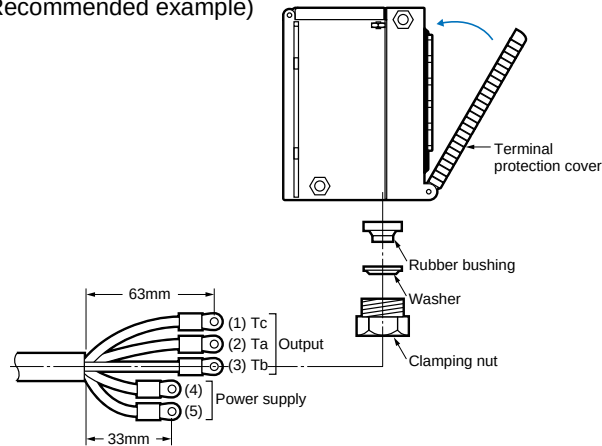
If a write error occurs (operation indicator flickers) due to power-off, static electricity or other noise in the teaching mode, perform teaching again.

E3G-M□(T)-G

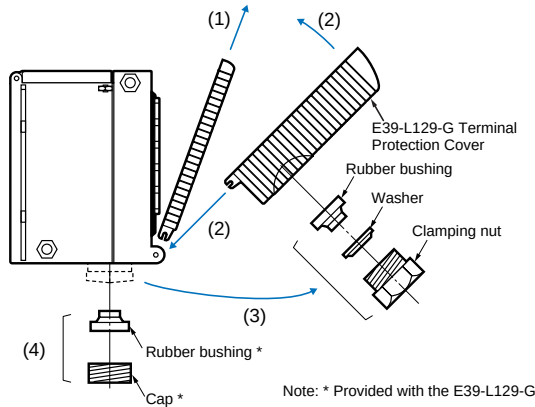
Wiring Considerations

- The cable with an external diameter of 6 to 8 mm is recommended.
- Securely tighten the cover to maintain water resistance and dust resistance. The thread size of the conduit socket is PG 13.5
- Do not tighten with the cable caught by the terminal protection cover. Otherwise, the water-resistant structure and like cannot be maintained.

(Recommended example)



- Changing to Side-pullout Cable from Vertical-pullout Cable



Note: * Provided with the E39-L129-G

Pro-cedure	Operation
①	Remove the present cover.
②	Attach the E39-L129-G Terminal Protection Cover for side-pullout cable.
③	Remove the clamping nut, washer, and rubber bushing of the E3G. These are used for the side-pullout cable.
④	Attach the rubber bushing and cap provided with the E39-L129-G to the E3G as replacements.

All E3G Models

Design

[Load Relay Contact](#)

If a load is used that will spark when it is turned OFF (e.g. a contactor or valve), the usually closed side may be turned ON before the usually open side is turned OFF or vice versa. If both usually open output and usually closed output are used simultaneously, apply an surge suppressor to the load. (Refer to OMRON's "Switch/Relay/Connector (PCB Product) Catalog" for typical examples of surge suppressors.

Wiring Considerations

[Connection/Wiring](#)

The E3G has load short-circuit protection. If load short-circuit or like has occurred, the output turns OFF. Therefore, recheck the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 2 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 1.2 times of the rated load current.

Mounting

- If Sensors are mounted face-to-face, ensure that no optical axes cross each other. Otherwise, mutual interference may result.
- Be sure to install the Sensor carefully so that the directional angle range of the Sensor will not be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistive properties.
- Use M4 screws for Sensor installation.
- For case installation, tighten it to the torque of 1.2 Nm max.

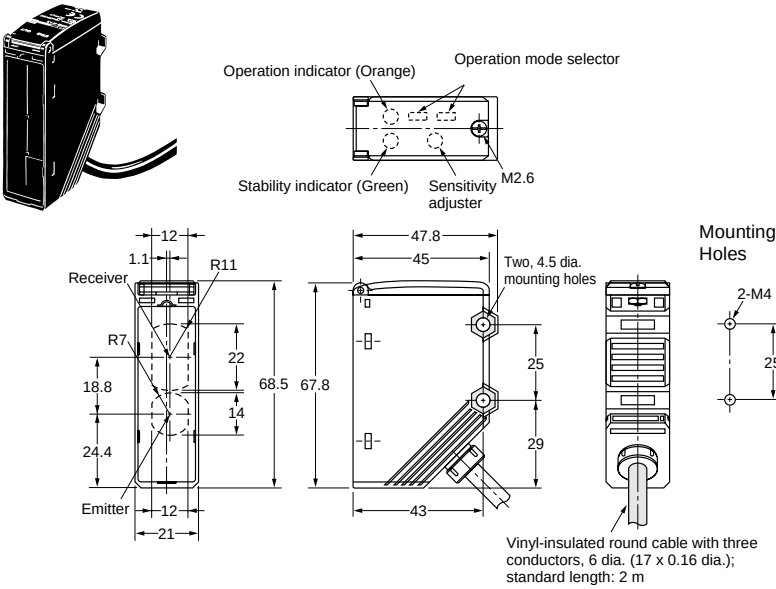
Water Resistance

Tighten the operation cover screws and terminal block cover screws to a torque of 0.3 to 0.5 Nm in order to ensure water resistivity.

Dimensions (Unit: mm)

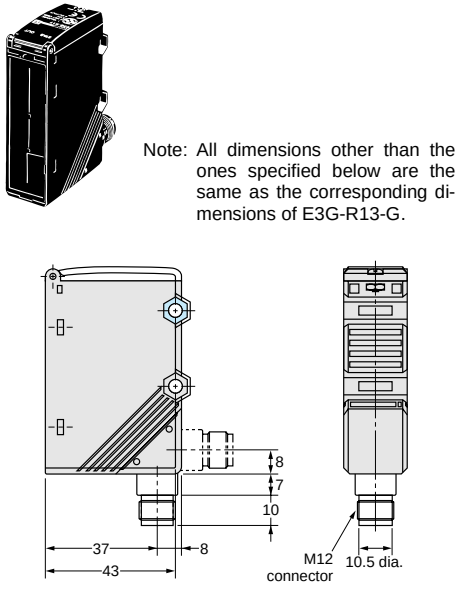
Sensors
Retroreflective Models

Pre-wired
E3G-R13-G



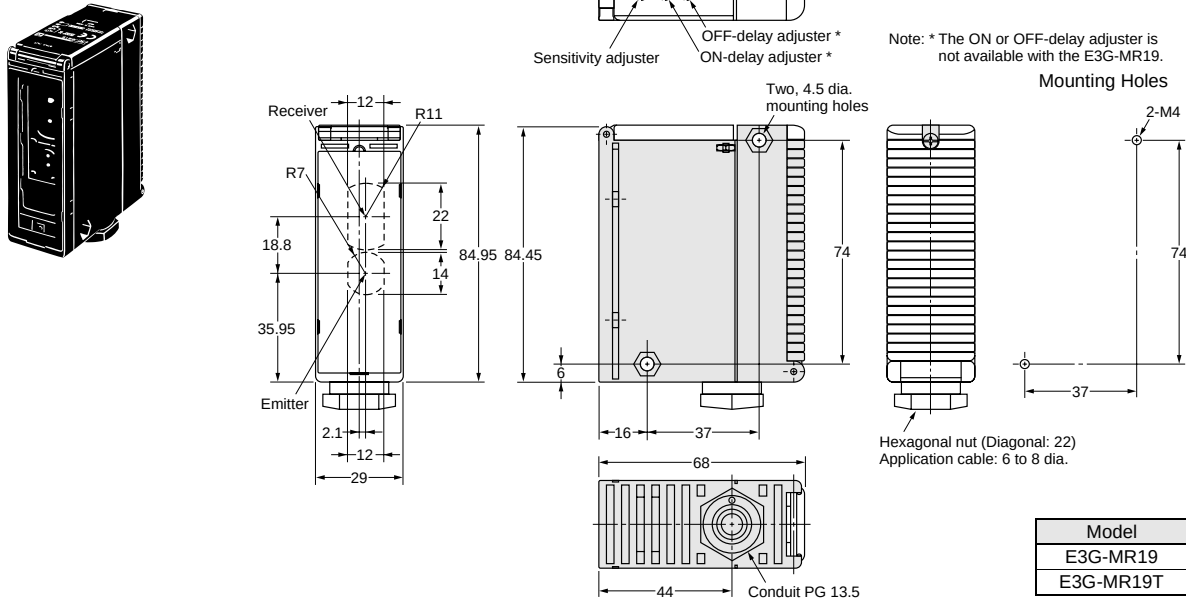
CAD file E3G_02

Connector type
E3G-R17-G



CAD file E3G_04

Terminal block
E3G-MR19-G
E3G-MR19T-G

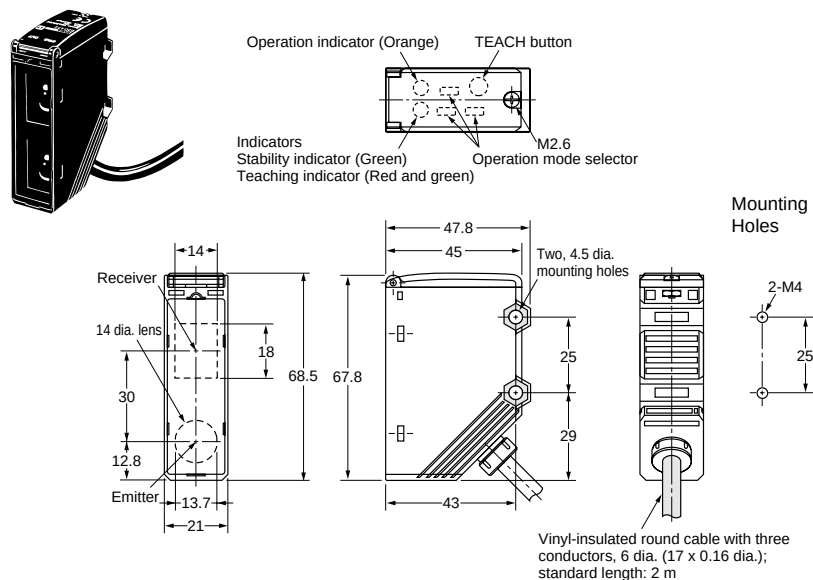


Model	CAD file
E3G-MR19	E3G_08
E3G-MR19T	E3G_07

Distance-setting

Pre-wired

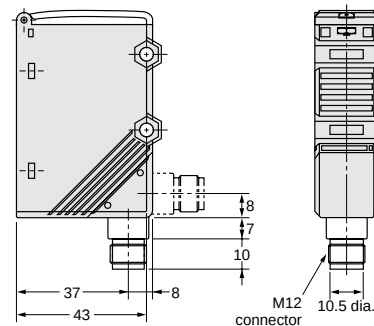
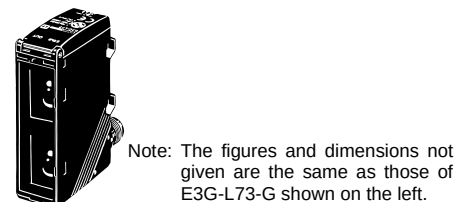
E3G-L73



CAD file E3G_01

Connector type

E3G-L77

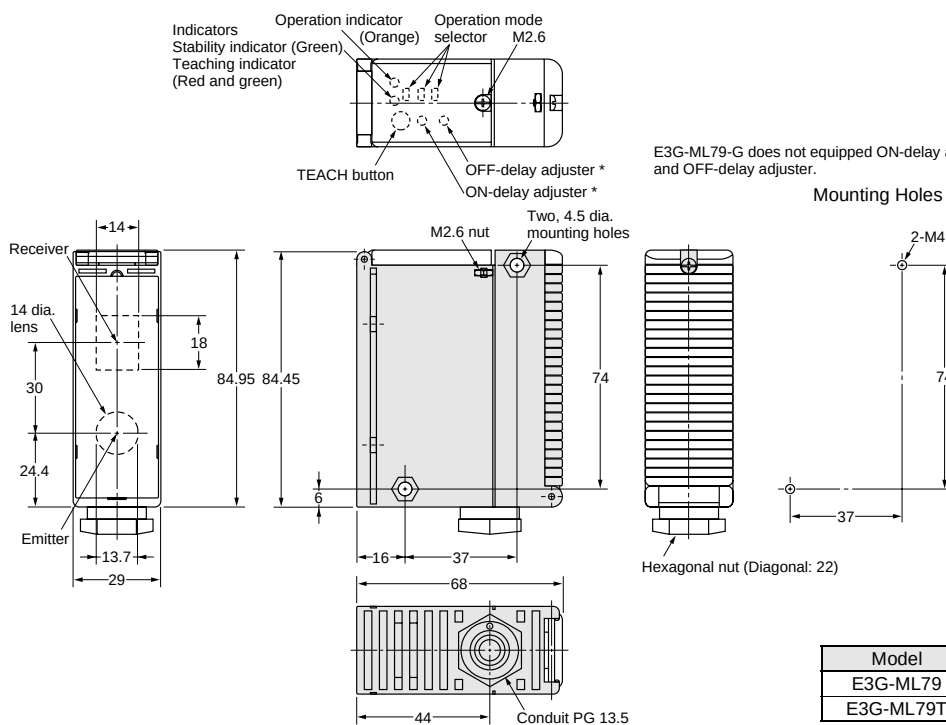
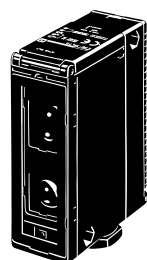


CAD file E3G_03

Terminal block

E3G-ML79-G

E3G-ML79T-G

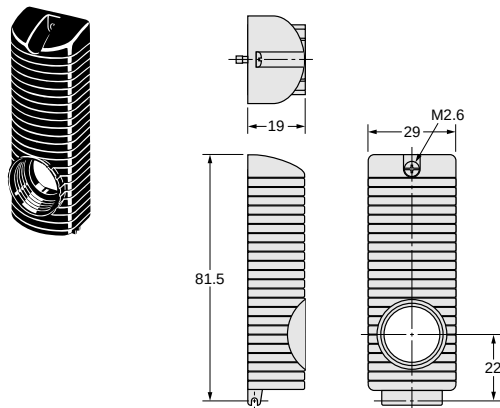


E3G-ML79-G does not equipped ON-delay adjuster and OFF-delay adjuster.

Model	CAD file
E3G-ML79	E3G_05
E3G-ML79T	E3G_06

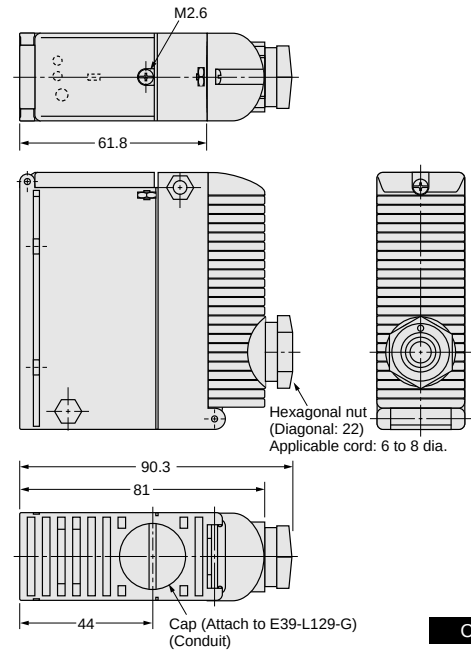
Accessories (Order Separately)

Terminal Protection Cover for Side-pullout Cable
E39-L129-G



Note: 1. The cover is provided with a rubber bushing and cap to prevent the cable from being pulled out in vertical direction.

Terminal Protection Cover for Side-pullout Cable (Example of E3G-MR19-G)



CAD file E39_41

Reflectors and Mounting Brackets

A-216

Distance-setting Photoelectric Sensor

E3G-L1/L3

Sharply cuts all influences such as work glossiness, inclination and colors.

CE

Features

1 mm dia. pin-point beam allows detection of minute objects

(E3G-L1)

OMRON's unique Hyper LED achieves a pin-point light source only 1/7 the size of conventional light sources, with uniform light-intensity distribution. The Hyper LED achieves stable detection of small objects by eliminating non-detection of objects due to the drop-out which commonly occurs at the center of conventional LEDs.

The clearly visible spot makes it easy to check the optical axis adjustment and sensing position.

Smallest in the Industry

Stable detection is not limited to object color, but also on inclination and glossiness

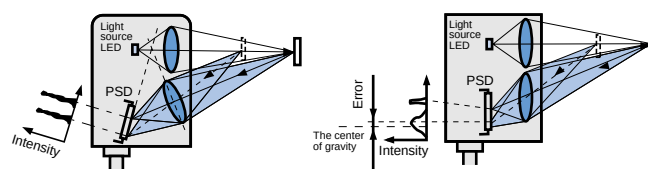
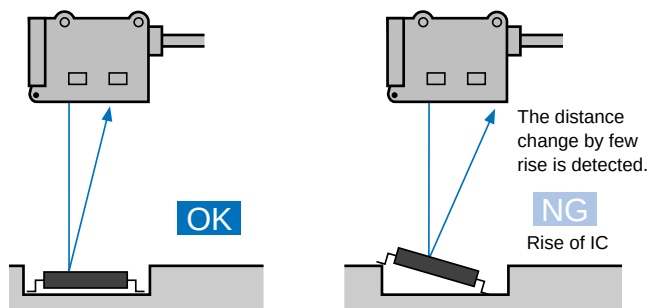
(Inclination characteristic of E3G-L1 is 2.6 times better than that of conventional models.)

The use of the shining object free optical system with the conventional triangulation measuring reduces the discrepancies in sensing distance due to object color, surface, and inclination. (E3G-L3: 2.2 times better than conventional model)

First in the Industry

Shine-proof Optical System (E3G-L1/L3)

Conventional Distance-setting Model



A low-error distance signal is assured because an image is formed on the position sensitive detectors (PSD), irrespective of the sensing distance. Detection is also stable with respect to the inclination of the object.

Image formation on the position sensitive detectors (PSD) is impossible at some sensing distances. The spot diameter is large, distance errors occur due to displacement of the object center of gravity, and detection is unstable with respect to inclination of the object.

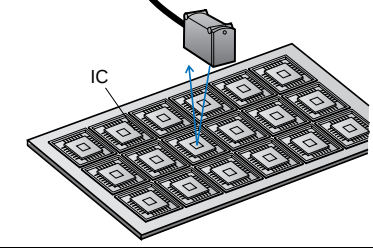
Application

Meets the needs of all industries, including semiconductors, electronic components, food and packaging

Normal mode

E3G-L1 (50 mm type)

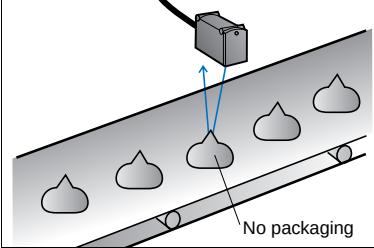
Detection of small electronic components in a tray



IC

E3G-L3 (200 mm type)

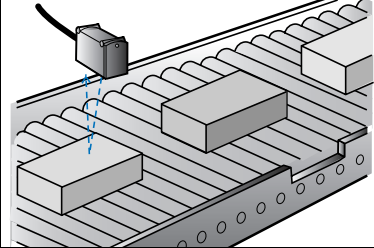
Detection of thin or uneven objects



No packaging

E3G-L3 (200 mm type)

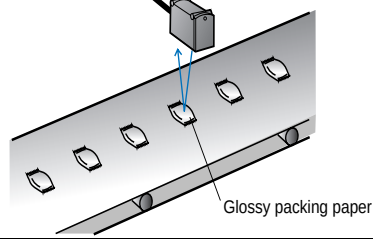
Detection of objects on a production line with glossy background



Zone mode

E3G-L1 (50 mm type)

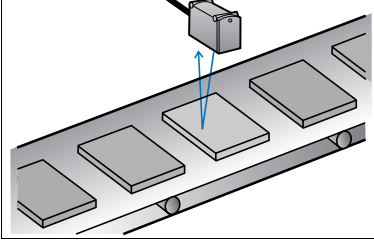
Detection of packed candies



Glossy packing paper

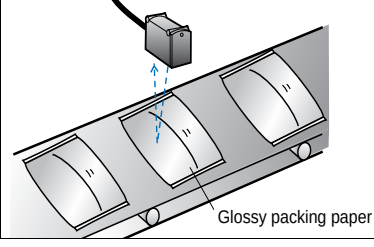
E3G-L3 (200 mm type)

Detection of tiles on a conveyor



E3G-L3 (200 mm type)

Detection of packaged confectionery on a conveyor



Glossy packing paper

Features

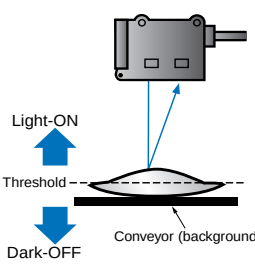
Simple Detection of Glossy, Uneven Objects

First in the Industry

Normal Mode

Selectable

Zone Mode

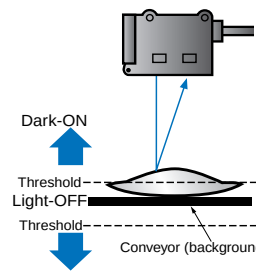


Light-ON

Threshold

Dark-OFF

Conveyor (background)



Dark-ON

Threshold

Light-OFF

Dark-ON (with Dark-ON setting)

Conveyor (background)

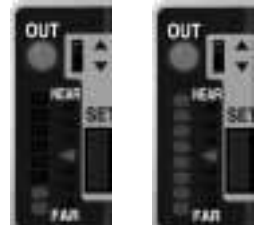
As a triangulation measuring with 4% or less differential travel (E3G-L1) is used, objects behind the setting distance cannot be detected. At a setting distance of 30 mm, a step on objects with a thickness of 1.2 mm can be detected.

Glossy, uneven objects are reliably detected because the Light-OFF status occurs only when the conveyor is detected, and Dark-ON status when objects exist.

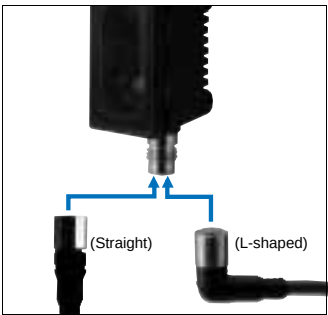
Optimal Background and Conveyor Teaching Double-bar Display Indicates Excess Gain at a Glance

Features one-touch teaching function settings. After the object, background, and conveyor or teaching are complete, fine adjustment of the sensitivity can be made in 13 levels in the Normal mode or in 5 levels in the Zone mode. It is simple to increase excess gain and set up the fine-step detection.

The operation indicator turns ON when the light incident level exceeds a threshold value. Excess gain can also be checked at a glance.



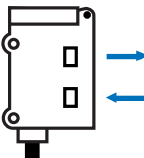
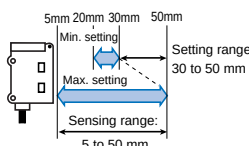
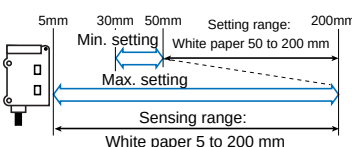
Line-up of M8 Connector Type
Easy to disconnect and maintain.



Ordering Information

Sensors

Red light Infrared light

Shape	Connection method	Sensing/Setting range	Operating mode	Model	
				NPN output	PNP output
	Pre-wired		Light-ON Dark-ON (selectable)	E3G-L11	E3G-L12
	Connector type			E3G-L15	E3G-L16
	Pre-wired			E3G-L31	E3G-L32
	Connector type			E3G-L35	E3G-L36

Accessories

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L139	1	Provided with E3G-L□1/-L□2
	E39-L140	1	Provided with E3G-L□5/-L□6

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable		2 m	4 conductors	XS3F-M421-402-A
		5 m		XS3F-M421-405-A
		2 m		XS3F-M422-402-A
		5 m		XS3F-M422-405-A

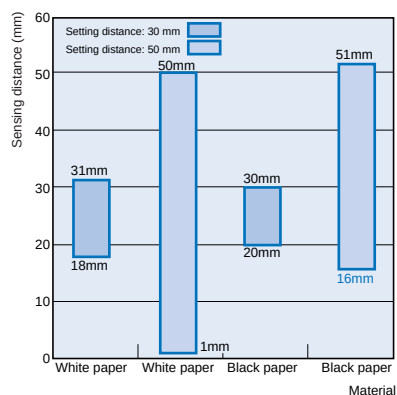
Rating/Performance

Item		Sensor type	Distance-setting						
		Model	NPN out-put	E3G-L11	E3G-L15	E3G-L31	E3G-L35		
			PNP out-put	E3G-L12	E3G-L16	E3G-L32	E3G-L36		
Sensing		5 to 50 mm (White paper 50 x 50 mm, Setting distance 50 mm)			5 to 200 mm (White paper 50 x 50 mm, Setting distance 200 mm) 5 to 150 mm (Black paper 50 x 50 mm, Setting distance 150 mm)				
Setting range		30 to 50 mm (White paper/Black paper 50 x 50 mm)			50 to 200 mm (White paper 50 x 50 mm) 50 to 150 mm (Black paper 50 x 50 mm)				
Differential distance		4% max. of sensing distance			10% of setting distance (typical)				
Reflectivity characteristics (black/white error)		4% max. of sensing distance			10% max. of setting distance (Setting distance 50 to 150 mm)				
Light source (wave length)		Red LED (660 nm)			Infrared LED (860 nm)				
Spot size		1 mm dia. max. (Sensing distance 38 mm)			15 mm dia. max. (Sensing distance 150 mm)				
Power supply voltage		10 to 30 VDC [ripple (p-p) 10% included]							
Current consumption		55 mA max.			65 mA max.				
Control output		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN type: 1.2 V max., PNP type: 2 V max.) Open collector output type (depends on the NPN/PNP output, format) Light-ON/Dark-ON switch selectable							
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention							
Response time		Operation or reset: 1.5 ms max.			Operation or reset: 2.5 ms max.				
Distance setting		Teaching method (NORMAL mode/ZONE mode)							
Fine distance adjustment		Manual threshold fine adjustment (NORMAL mode: 13 levels/ZONE mode: 5 levels)							
Indicator lamp		Operation indication (orange), distance indication (green, 8 levels), threshold indication (red, NORMAL mode: 13 levels/ZONE mode: 5 levels)							
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight: 10,000 lux max.							
Ambient temperature		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)							
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)							
Insulation resistance		20 M Ω min. at 500 VDC							
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute							
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions							
Protective structure		IEC 60529 IP67 (with Protective Cover attached)							
Connection method		Pre-wired (standard length: 2 m)		M8 connector		Pre-wired (standard length: 2 m)		M8 connector	
Weight (Packed state)		Approx. 64 g		Approx. 21 g		Approx. 64 g		Approx. 21 g	
Material	Case	PBT (polybutylene terephthalate)							
	Cover	Acrylics (PMMA)							
	Mounting Brackets	Stainless steel (SUS304)							
Accessories		Mounting bracket (with screws), instruction manual							

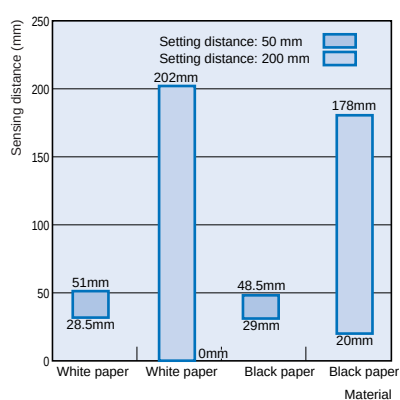
Characteristic data (typical)

Close-range Characteristics

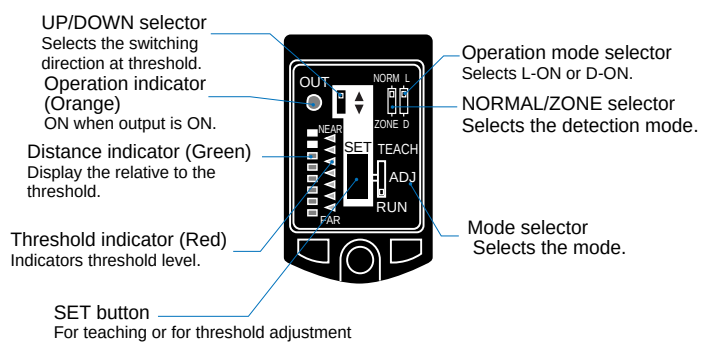
E3G-L1



E3G-L3



Part names and functions



Output Circuit Diagram

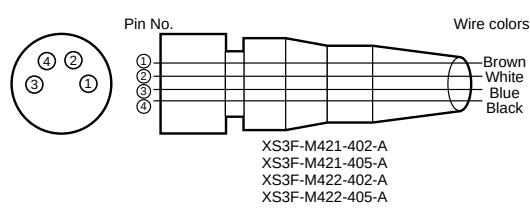
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-L11 E3G-L15 E3G-L31 E3G-L35	Light ON		L•ON (LIGHT ON)	Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-L12 E3G-L16 E3G-L32 E3G-L36	Light ON		L•ON (LIGHT ON)	Connector Pin Arrangement Note: Terminal 2 is not used.
	Dark ON		D•ON (DARK ON)	

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is open.

Operation

Adjustment Steps

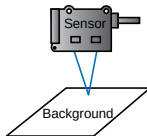
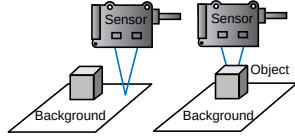
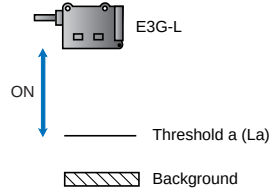
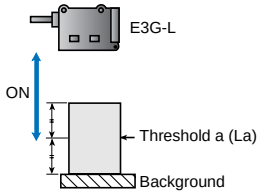
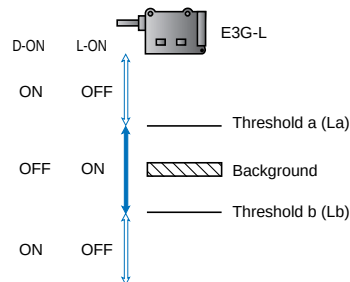
Procedure	Operation
1	Install, wire, and turn on the Sensor.
2	Perform distance setting (teaching). Refer to "Distance Setting (Teaching)".
3	Fine-adjust the threshold as necessary. Refer to "Manual Tuning (Fine Distance Adjustment)" on page A-97.
4	Check that the mode selector is set to RUN .

Distance Setting (Teaching)

Select the most appropriate teaching method in reference to the following descriptions.

Application	1	2	3
	Teaching without sensing objects (i.e. Teaching the background).	- Detection of slight differences in surface level. - Setting a threshold in the middle between the background and sensing object for operation.	Detection of glossy objects in front of the background.



Teaching	1	2	3
	Normal one-point teaching	Normal two-point teaching	Zone one-point teaching
Setting method	Press the TEACH button with the background object. 	Press the TEACH button with background object and with sensing object. 	Press the TEACH button with the background object (conveyor, etc.).
Set threshold	Threshold (a) is set immediately in front of the background.	Threshold (a) is set approximately in the middle between the background and sensing object.	A pair of thresholds, (a) and (b), are set.
Output ON range	The output is ON between the Sensor and La. 	The output is ON between the Sensor and La. 	The output is ON between La and Lb. 

La: Distance equivalent to threshold (a) Lb: Distance equivalent to threshold (b)

● The following settings are also possible:

Setting the maximum sensing distance of the Sensor: Maximum distance setting.

Setting the minimum differential travel of the Sensor: Minimum distance setting.

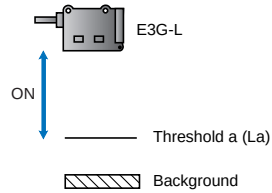
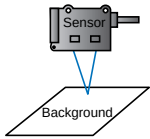
● Distance from sensor to background must be as shown below during normal one-point or zone one-point teaching.

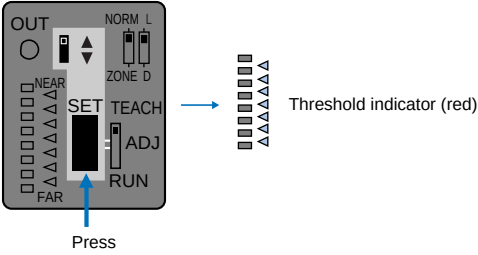
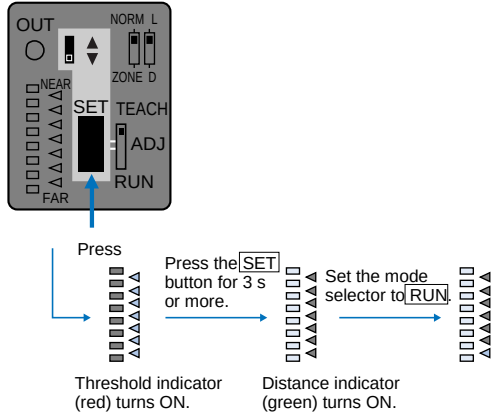
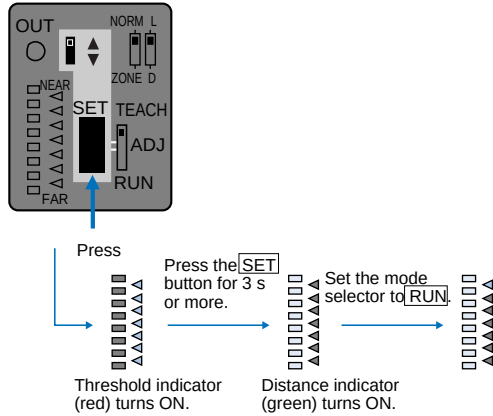
Model	Distance from sensor to background
E3G-L1□	32 mm min.
E3G-L3□	55 mm min.

● Maximum sensing distance of E3G-L3 type may differ by color of the sensing object when setting distance is more than 150 mm.

Confirm the operation of the Sensor before actual operation.

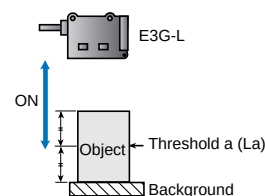
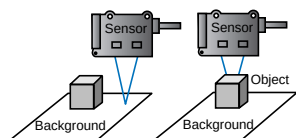
1 Normal one-point teaching



Pro- ce- dure	Operation	Panel Status
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Press the SET button with the background. • All threshold indicators (red) are turned ON.	
4	Set the mode selector to RUN .	
5	Set to L-ON or D-ON mode with the operation mode selector. L-ON: Output ON between background and sensor. D-ON: Output OFF between background and sensor.	
Application Example 1		
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Set the UP/DOWN selector to down.	
4	Press the SET button for 3 s or more. • All threshold indicators (red) are turned ON.	
5	When all distance indicators (green) are then turned ON, the setting is complete. Set the mode selector to RUN .	
6	Set L-ON/D-ON with the operation mode selector. (Refer to Normal one-point teaching)	
Application Example 2		
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Set the UP/DOWN selector to up.	
4	Press the SET button for 3 s or more. • All threshold indicators (red) are turned ON.	
5	When all distance indicators (green) are turned ON, the setting is complete. Set the mode selector to RUN .	
6	Set L-ON/D-ON with the operation mode selector. (Refer to Normal one-point teaching)	

La: Distance equivalent to threshold (a)

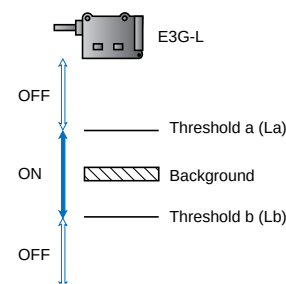
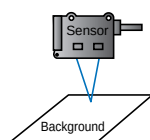
2 Normal two-point teaching



Proce- dure	Operation	Panel Status
1	Set the mode selector to TEACH .	Object Threshold indicator (red) turns ON. Background Distance indicator (green) turns ON. Threshold indicator (red) starts to flash.
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Press the SET button with a sensing object located at sensing position. • All threshold indicators (red) are turned ON.	
4	Move the sensing object and press the SET button with the back-ground. • If the teaching is successful, all distance indicators (green) are turned ON. • If the teaching is not successful, all threshold indicators (red) flicker.	
5	If the teaching is successful, set the mode selector to RUN to complete the teaching operation. If the teaching is not successful, change the position of the object and setting distance that have been set and repeat from the above step 3.	
6	Set to L-ON or D-ON mode with the operation mode selector.	

La: Distance equivalent to threshold (a)

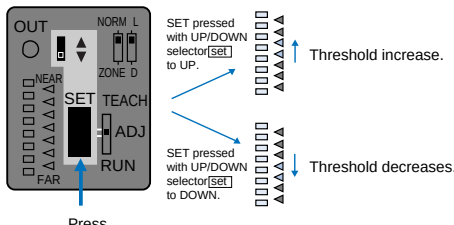
3 Zone one-point teaching



Proce- dure	Operation	Panel Status
1	Set the mode selector to TEACH .	Object Distance indicator (green) turns ON. Background Threshold indicator (red) starts to flash.
2	Set the NORMAL/ZONE mode selector to ZONE .	
3	Press the SET button with the background. While the button is pressed, all threshold indicators (red) are turned ON. When the button is released: • If the teaching is successful, all distance indicators (green) are turned ON.	
4	Set the mode selector to RUN .	
5	Set to L-ON or D-ON mode with the operation mode selector. L-ON: Output ON between background and sensor. D-ON: Output OFF between background and sensor.	

La: Distance equivalent to threshold (a)

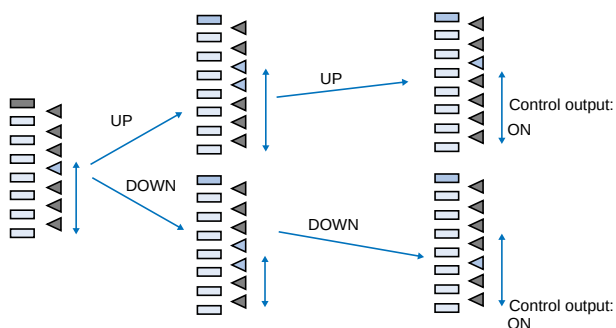
Manual Tuning (Fine Distance Adjustment)

Pro- ce- dure	Operation	Panel Status																																							
	Fine adjustment of the threshold is possible after teaching.																																								
1	Set the mode selector to ADJ .																																								
2	In the ADJ mode, specify the adjustment direction with the UP/DOWN selector. The threshold changes every time the SET button is pressed. The setting can be made in up to 13 levels (for normal one-point or two-point teaching).	 SET pressed with UP/DOWN selector SET to UP. Threshold increase. SET pressed with UP/DOWN selector SET to DOWN. Threshold decreases. Press																																							
3	Upon completed adjustment, set the mode selector to RUN .	Threshold Indicator Display During Distance Adjustment Max. 13 adjustment levels for normal teaching. <table><tr><td>Threshold indicator</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td><td>▲▲▲▲▲▲▲▲▲▲▲▲▲</td></tr><tr><td>Level</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr></table> Five adjustment levels for zone teaching. <table><tr><td>Threshold indicator</td><td>▲▲▲▲▲</td><td>▲▲▲▲▲</td><td>▲▲▲▲▲</td><td>▲▲▲▲▲</td><td>▲▲▲▲▲</td></tr><tr><td>Level</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	Threshold indicator	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	Level	1	2	3	4	5	6	7	8	9	10	11	12	13	Threshold indicator	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	Level	1	2	3	4	5
Threshold indicator	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲▲▲▲▲▲																													
Level	1	2	3	4	5	6	7	8	9	10	11	12	13																												
Threshold indicator	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲																																				
Level	1	2	3	4	5																																				

Threshold and distance display method

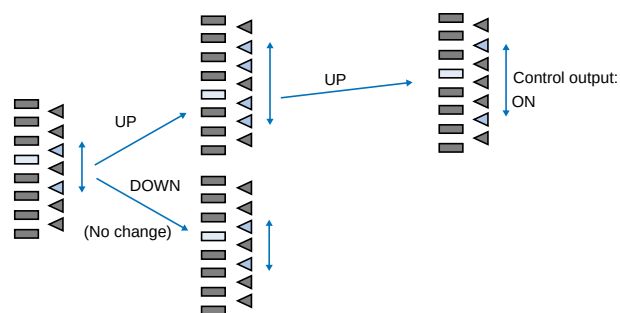
(Display for distance setting with normal one-point or two-point teaching)

The distance indicators show the distance level. The distance indicators show the relative distances to the threshold. The threshold can be shifted using the UP/DOWN selector and SET button. The differential travel is fixed.



(Display for distance setting with zone teaching)

The distance indicators show the current distance band. The distance indicators show the relative distances to the threshold. The ON range can be shifted using the UP/DOWN selector and SET button. The differential travel is fixed.



Precautions

Correct Use

Wiring Considerations

Cable

The bending radius should be 25 mm or more.

Avoiding Malfunctions

If using the photoelectric sensor with an inverter or servomotor, be sure to ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

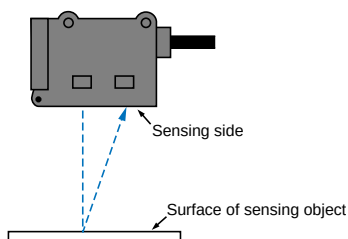
- If Sensors are mounted face-to-face, ensure that no optical axes cross each other. Otherwise, mutual interference may result.
- Be sure to install the Sensor carefully so that the directional angle range of the Sensor will not be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistant properties.
- Use M3 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

M8 Connector

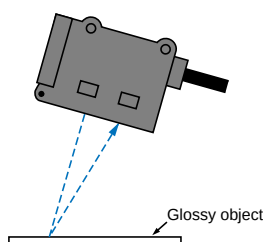
- Be sure to connect or disconnect the metal connector after turning OFF the Sensor.
- Hold the connector cover to connect or disconnect the metal connector.
- Secure the connector cover by hand. Do not use any pliers, otherwise the connector may be damaged.
- If the M8 connector is not connected securely, the M8 connector may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

Installation Directions

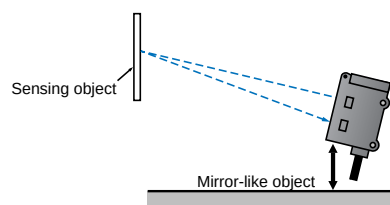
- Ensure that the sensing side of the Sensor is parallel to the surface of each sensing object. Do not incline the Sensor towards the sensing object.



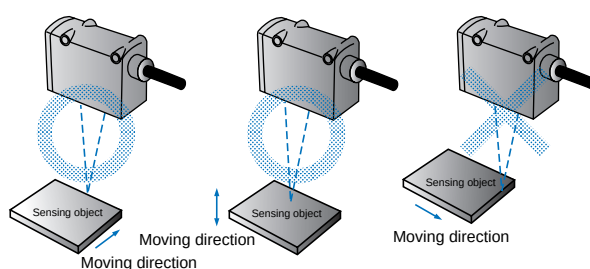
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right, provided that the Sensor is not influenced by any background objects.



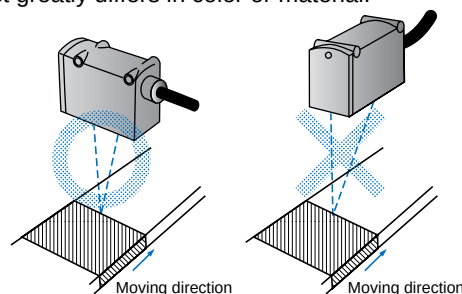
- If there is a mirror-like object below the Sensor, the Sensor may not be in stable operation. Therefore, incline the Sensor or keep the Sensor at a certain distance from the mirror-like object as shown below.



- Ensure not to install the Sensor in the incorrect direction. Refer to the following.



Install the Sensor as shown in the following if each sensing object greatly differs in color or material.



● Adjustment

If the Sensor is not in stable operation due to color differences, perform a fine adjustment of the threshold level and confirm stable detection. Refer to "Manual Teaching (Fine Distance Setting).

● Maintenance and Inspection

Cleaning

Thinner or like damage the casing of the Sensor. Do not apply thinner to clean the Sensor.

Miscellaneous

EEPROM Writing Error

If a teaching data error occurs (with the operation indicator flashing) due to a power failure or static noise, perform the teaching operation of the Sensor again.

Water Resistance

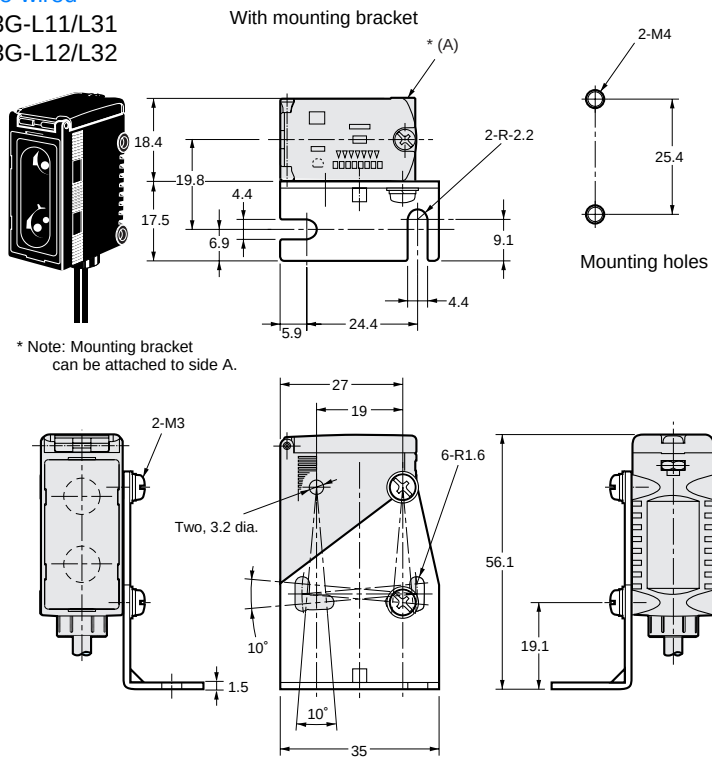
To ensure the water resistivity of the Sensor, tighten the screws of the operation panel cover to a torque of 0.2 to 0.3 Nm.

Dimensions (Unit: mm)

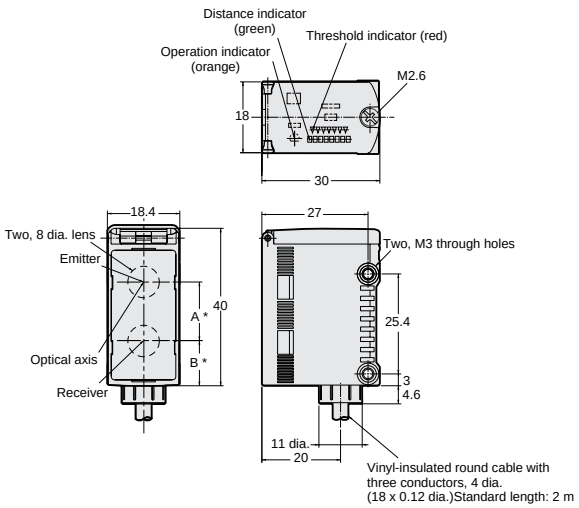
Sensors

Pre-wired

E3G-L11/L31
E3G-L12/L32



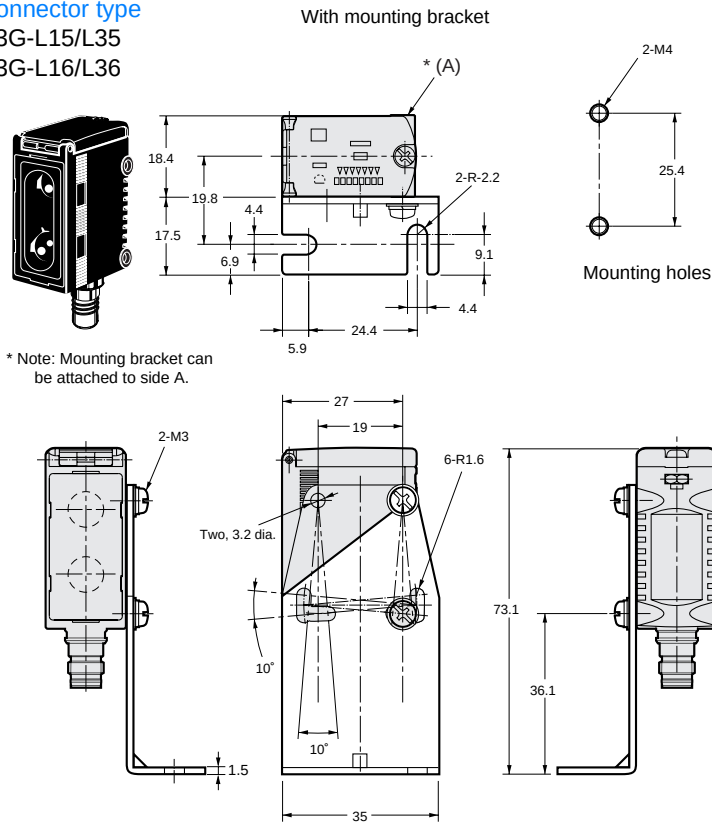
Model	CAD file
E3G-L11/12	E3G_09
E3G-L31/32	E3G_11



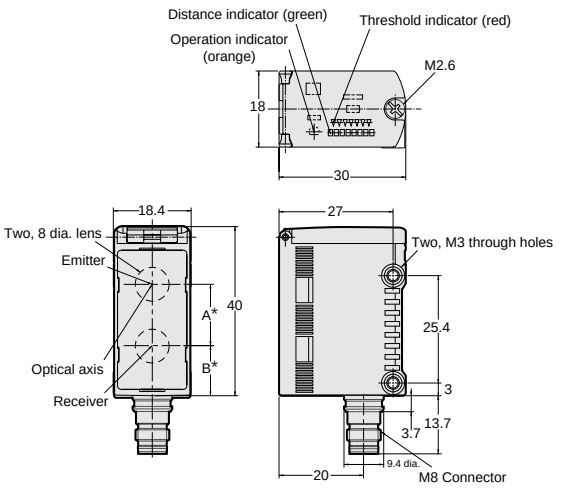
Model	A	B
E3G-L1□	14.5	11.88
E3G-L3□	16	10.35

Connector type

E3G-L15/L35
E3G-L16/L36



Model	CAD file
E3G-L15/16	E3G_10
E3G-L35/36	E3G_12



Model	A	B
E3G-L1□	14.5	11.88
E3G-L3□	16	10.35

Accessories (Order Separately)

A-198

Photoelectric sensor

E3F2

Threaded Cylindrical Photoelectric Sensors with Built-in Amplifier for Use as an Optical Proximity Switch

**Features**

- M18 DIN-sized cylindrical housing
- Housing materials: plastic, nickel plated brass and stainless steel
- Axial and radial types (with integrated 90°-optics)
- Improved enclosure ratings (IP67)
- DC switching types with connectors for easy maintenance
- Full metal plug-in type
- Sensing distance separate type : 7 m
- Retroreflective polarized type (MSR): 2 m
- Long detection distance (30 cm) with sensitivity adjuster for diffuse type
- Wide-beam characteristics (10 cm) for diffuse type
- Wide operating voltage range (10 to 30 VDC or 24 to 240 VAC)
- Short-circuit and reverse connection protection (DC switching type)
- UL and CSA approved (AC switching types)
- UL listed (DC switching types)

Selection Guide

DC-Switching Models

Housing Material: Plastic

Sensing method		Appearance	Connection method	Sensing distance	Model	
					PNP output	NPN output
Through-beam		 axial	pre-wired M12 connector	7 m	E3F2-7B4 E3F2-7B4-P1	E3F2-7C4 E3F2-7C4-P1
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)	 axial	pre-wired M12 connector	0.1 - 2 m (with reflector E39-R1)	E3F2-R2B4 E3F2-R2B4-P1	E3F2-R2C4 E3F2-R2C4-P1
	Polarizing (with MSR function)		pre-wired M12 connector		— —	— —
	Non-polarizing (without MSR function)	 radial	pre-wired M12 connector		— —	— —
	Polarizing (with MSR function)		pre-wired M12 connector		E3F2-R2RB41 E3F2-R2RB41-P1	E3F2-R2RC41 E3F2-R2RC41-P1
	Fixed sensing distance Wide-beam characteristics	 axial	pre-wired M12 connector	0.1 m	E3F2-DS10B4-N E3F2-DS10B4-P1	E3F2-DS10C4-N E3F2-DS10C4-P1
	Adjustable sensing distance		pre-wired M12 connector	0.3 m	E3F2-DS30B4 E3F2-DS30B4-P1	E3F2-DS30C4 E3F2-DS30C4-P1
Diffuse reflective	Fixed sensing distance Wide-beam characteristics	 radial	pre-wired M12 connector	0.1 m	— —	— —
	Adjustable sensing distance		pre-wired M12 connector	0.3 m	E3F2-DS30B41 E3F2-DS30B41-P1	E3F2-DS30C41 E3F2-DS30C41-P1

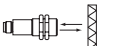
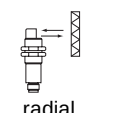
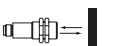
Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4 2M or E3F2-R2RB4 5M). For other cable length please contact your OMRON sales representative.

Housing material: Metal (Nickel plated brass)

Sensing method		Appearance	Connection method	Sensing distance	Model	
					PNP output	NPN output
Through-beam		 axial	pre-wired M12 connector	7 m	E3F2-7B4-M E3F2-7B4-M1-M	E3F2-7C4-M E3F2-7C4-M1-M
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)	 axial	pre-wired M12 connector	0.1 - 2 m (with reflector E39-R1)	— —	— —
	Polarizing (with MSR function)		pre-wired M12 connector		E3F2-R2RB4-M E3F2-R2RB4-M1-M	E3F2-R2RC4-M E3F2-R2RC4-M1-M
	Non-polarizing (without MSR function)	 radial	pre-wired M12 connector		— —	— —
	Polarizing (with MSR function)		pre-wired M12 connector		E3F2-R2RB41-M E3F2-R2RB41-M1-M	E3F2-R2RC41-M E3F2-R2RC41-M1-M
	Fixed sensing distance Wide-beam characteristics	 axial	pre-wired M12 connector	0.1 m	E3F2-DS10B4-M E3F2-DS10B4-M1-M	E3F2-DS10C4-M E3F2-DS10C4-M1-M
	Adjustable sensing distance		pre-wired M12 connector	0.3 m	E3F2-DS30B4-M E3F2-DS30B4-M1-M	E3F2-DS30C4-M E3F2-DS30C4-M1-M
Diffuse reflective	Fixed sensing distance Wide-beam characteristics	 radial	pre-wired M12 connector	0.1 m	— —	— —
	Adjustable sensing distance		pre-wired M12 connector	0.3 m	E3F2-DS30B41-M E3F2-DS30B41-M1-M	E3F2-DS30C41-M E3F2-DS30C41-M1-M

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4-M 2M or E3F2-R2RB4-M 5M). For other cable length please contact your OMRON sales representative.

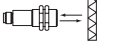
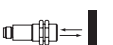
Housing material: Metal (Stainless steel)

Sensing method		Appearance	Connection method	Sensing distance	Model	
					PNP output	NPN output
Through-beam			pre-wired	7 m	E3F2-7B4-S	E3F2-7C4-S
			M12 connector		E3F2-7B4-M1-S	E3F2-7C4-M1-S
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)		pre-wired	0.1 - 2 m (with reflector E39-R1)	—	—
			M12 connector		—	—
	Polarizing (with MSR function)		pre-wired		E3F2-R2RB4-S	E3F2-R2RC4-S
			M12 connector		E3F2-R2RB4-M1-S	E3F2-R2RC4-M1-S
	Non-polarizing (without MSR function)		pre-wired		—	—
			M12 connector		—	—
	Polarizing (with MSR function)		pre-wired		—	—
			M12 connector		—	—
Diffuse reflective	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	E3F2-DS10B4-S	E3F2-DS10C4-S
			M12 connector		E3F2-DS10B4-M1-S	E3F2-DS10C4-M1-S
	Adjustable sensing distance		pre-wired	0.3 m	E3F2-DS30B4-S	E3F2-DS30C4-S
			M12 connector		E3F2-DS30B4-M1-S	E3F2-DS30C4-M1-S
	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	—	—
			M12 connector		—	—
	Adjustable sensing distance		pre-wired	0.3 m	—	—
			M12 connector		—	—

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4-S 2M or E3F2-R2RB4-S 5M). For other cable length please contact your OMRON sales representative.

AC-Switching Models

Housing material: Plastic

Sensing method		Appearance	Connection method	Sensing distance	Model	
					Light-ON	Dark-ON
Through-beam			pre-wired	3 m	E3F2-3Z1	E3F2-3Z2
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)		pre-wired	0.1 - 2 m (with reflector E39-R1)	E3F2-R2Z1	E3F2-R2Z2
Diffuse reflective	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	E3F2-DS10Z1-N	E3F2-DS10Z2-N

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.

Accessories (Order Separately)

Name	Sensing distance (typical) [1.]	Model	Remark
Reflectors	0.1 - 3.7 m (axial)	E39-R1	60 x 40 mm (included in some models)
	0.1 - 2.4 m (radial)		
	0.1 - 4.2 m (axial)	E39-R7	Ø 84 mm
	0.1 - 2.7 m (radial)		
Tape Reflectors	0.1 - 5.3 m (axial)	E39-R8	100 x 100 mm
	0.1 - 3.1 m (radial)		
		E39-RSA	35 x 10 mm
		E39-RSB	35 x 40 mm
		E39-RS3	80 x 70 mm
Lens Cap		E39-F31	
Mounting Bracket		Y92E-B18	

For detailed information about Accessories, refer to the main chapter "Accessories" at the end of the document.

Note: 1. Typical sensing distance corresponds to 80 % of the max. sensing distance. For details, please refer to "Engineering Data".

Sensor I/O Connectors

Cord	Shape	Cable type		Model
Standard	Straight 	2 m	Four-wire type	XS2F-D421-D80-A
		5 m		XS2F-D421-G80-A
	L-shaped 	2 m		XS2F-D422-D80-A
		5 m		XS2F-D422-G80-A
Vibration-proof robot cable	Straight 	2 m		XS2F-D421-D80-R
		5 m		XS2F-D421-G80-R
	L-shaped 	2 m		XS2F-D422-D80-R
		5 m		XS2F-D422-G80-R

E3F2

Ordering Information: type list

DC-Switching Models, plastic

Model	Sensing method, sensing distance	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7B4-P1	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7C4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7C4-P1	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7DB4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DB4-P1	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DC4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7DC4-P1	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7L 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-7L -P1	Through-beam, 7 m	axial	Connector	N.A.	Emitter only
E3F2-DS10B4-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10B4-P1	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10C4-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS10C4-P1	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS30B4 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41-P1	Diffuse reflective, 0.3 m	radial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-P1	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30C4 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41-P1	Diffuse reflective, 0.3 m	radial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-P1	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-R2B4 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Non-polarizing
E3F2-R2B4-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Non-polarizing, without reflector
E3F2-R2B4-P1	Retroreflective, 2 m	axial	Connector	PNP	Non-polarizing
E3F2-R2B4-P1-E	Retroreflective, 2 m	axial	Connector	PNP	Non-polarizing, without reflector
E3F2-R2C4 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Non-polarizing
E3F2-R2C4-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Non-polarizing, without reflector
E3F2-R2C4-P1	Retroreflective, 2 m	axial	Connector	NPN	Non-polarizing
E3F2-R2C4-P1-E	Retroreflective, 2 m	axial	Connector	NPN	Non-polarizing, without reflector
E3F2-R2RB41 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB41-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RB41-P1	Retroreflective, 2 m	radial	Connector	PNP	Polarizing
E3F2-R2RB41-P1-E	Retroreflective, 2 m	radial	Connector	PNP	Polarizing, without reflector
E3F2-R2RC41 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC41-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing, without reflector
E3F2-R2RC41-P1	Retroreflective, 2 m	radial	Connector	NPN	Polarizing
E3F2-R2RC41-P1-E	Retroreflective, 2 m	radial	Connector	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41 2M or E3F2-R2RB41 5M). For other cable length please contact your OMRON sales representative.

DC-Switching Models, metal (nickel plated brass)

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7B4-M1-M	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7C4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7C4-M1-M	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7DB4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DB4-M1-M	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DC4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7DC4-M1-M	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7L-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A	Emitter only
E3F2-7L-M1-M	Through-beam, 7 m	axial	Connector	N.A	Emitter only
E3F2-DS10B4-M 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10B4-M1-M	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10C4-M 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS10C4-M1-M	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS30B41-M 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41-M1-M	Diffuse reflective, 0.3 m	radial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-M 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B4-M1-M	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30C41-M 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41-M1-M	Diffuse reflective, 0.3 m	radial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-M 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C4-M1-M	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-R2RB41-M 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB41-M1-M	Retroreflective, 2 m	radial	Connector	PNP	Polarizing
E3F2-R2RB41-M1-M-E	Retroreflective, 2 m	radial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB41-M-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RB4-M 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB4-M1-M	Retroreflective, 2 m	axial	Connector	PNP	Polarizing
E3F2-R2RB4-M1-M-E	Retroreflective, 2 m	axial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB4-M-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RC41-M 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC41-M1-M	Retroreflective, 2 m	radial	Connector	NPN	Polarizing
E3F2-R2RC41-M1-M-E	Retroreflective, 2 m	radial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC41-M-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing, without reflector
E3F2-R2RC4-M 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC4-M1-M	Retroreflective, 2 m	axial	Connector	NPN	Polarizing
E3F2-R2RC4-M1-M-E	Retroreflective, 2 m	axial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC4-M-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41-M 2M or E3F2-R2RB41-M 5M). For other cable length please contact your OMRON sales representative.

DC-Switching Models, metal (stainless steel)

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4-M1-S	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7B4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7C4-M1-S	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7C4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7DB4-M1-S	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DB4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DC4-M1-S	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7DC4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7L-M1-S	Through-beam, 7 m	axial	Connector	N.A.	Emitter only
E3F2-7L-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-DS10B4-M1-S	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10B4-S 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10C4-M1-S	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS10C4-S 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS30B4-M1-S	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-S 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30C4-M1-S	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-S 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-R2RB4-M1-S	Retroreflective, 2 m	axial	Connector	PNP	Polarizing
E3F2-R2RB4-M1-S-E	Retroreflective, 2 m	axial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB4-S 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB4-S-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RC4-M1-S	Retroreflective, 2 m	axial	Connector	NPN	Polarizing
E3F2-R2RC4-M1-S-E	Retroreflective, 2 m	axial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC4-S 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC4-S-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41-S 2M or E3F2-R2RB41-S 5M). For other cable length please contact your OMRON sales representative.

AC-Switching Models, plastic

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-3LZ 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-3DZ1 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Light-ON	Receiver only
E3F2-3DZ2 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Dark-ON	Receiver only
E3F2-3Z1 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Light-ON	Receiver and Emitter
E3F2-3Z2 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Dark-ON	Receiver and Emitter
E3F2-R2Z1 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Light-ON	Non-polarizing
E3F2-R2Z2 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Dark-ON	Non-polarizing
E3F2-R2Z1-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Light-ON	Non-polarizing, without reflector
E3F2-R2Z2-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Dark-ON	Non-polarizing, without reflector
E3F2-DS10Z1-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	Light-ON	Wide-beam characteristic
E3F2-DS10Z2-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	Dark-ON	Wide-beam characteristic

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.

Specifications

Ratings / Characteristics of DC Switching Models

Item	E3F2-7B4-□ E3F2-7C4-□	E3F2-R2B4-□ E3F2-R2C4-□	E3F2-R2RB4-□ E3F2-R2RC4-□ E3F2-R2RB41-□ E3F2-R2RC41-□	E3F2-DS10B4-□ E3F2-DS10C4-□	E3F2-DS30B4-□ E3F2-DS30C4-□ E3F2-DS30B41-□ E3F2-DS30C41-□
Sensing method	Through-beam	Retroreflective		Diffuse reflective	
		non-polarizing (without MSR function)	polarizing (with MSR function)	wide-beam characteristic	adjustable sensing distance
Power supply voltage	10 to 30 V DC				
Current consumption	45 mA max.	25 mA max.	30 mA max.	25 mA max.	30 mA max.
Rated sensing distance [1.]	7m	0.1 - 2 m (with reflector E39-R1)	0.1 - 2 m (with reflector E39-R1)	0.1 m (5 x 5 cm white mat paper)	0.3 m (10 x 10 cm white mat paper)
Typical sensing distance for different reflector types (ref. to accessories) [2.]	—	E39-R1:4.0 m E39-R7:4.5 m E39-R8:5.3 m	E39-R1: axial 3.7 m radial 2.4 m E39-R7: axial 4.2 m radial 2.7 m E39-R8: axial 5.3 m radial 3.1 m	—	
Standard object	Opaque: 11 mm dia. min.	Opaque: 56 mm dia. min.		—	
Directional angle	3° to 20°	3° to 20°	3° to 20°	—	
Differential travel (hysteresis)	—			20% max.	
Response time	Operation and Reset: 2.5 ms max.				
Control output	Transistor (open collector), load current: 100 mA max. (residual voltage: 2 V max.)				
Power reset time	50 ms				
Ambient illumination	Incandescent lamp: 3000 lx max. Sunlight: 10000 lx max.				
Ambient temperature	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)				
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)				
Insulation resistance	20 MΩ min. at 500 V DC between energized parts and case				
Dielectric strength	1000 VAC max. , 50 / 60 Hz for 1 min. between energized parts and case				
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)				
Shock resistance	Destruction: 500 m/s ² each direction (X, Y, Z)				
Enclosure ratings	IP67 [3.]; NEMA 1, 2, 4				
Light source	Infrared LED (880 nm)		Red LED (660 nm)	Infrared LED (880 nm)	
Indicators	Light incident / power indicator for light source (red)				
Sensitivity adjustment	Fixed				Adjustable
Connection method	2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) [4.]) or M12-connector				
Operation mode	Light-ON or Dark-ON selectable by wiring				
Weight (approx.)					
Plastic case	pre-wired (2 m)	120 g	60 g		
	connector	40 g	20 g		
Metal case	pre-wired (2 m)	180 g	90 g		
	connector	120 g	50 g		
Circuit protection	Output short-circuit and power supply reverse polarity				
Housing materials	Plastic	Plastic	Plastic (only radial type)	Plastic	Plastic
	Nickel brass	—	Nickel brass	Nickel brass	Nickel brass
	Stainless steel [5.]	—	Stainless steel [5.]	Stainless steel [5.]	Stainless steel [5.]

Note: 1. For stable sensing distance in detail, please refer to "Engineering Data"

2. Typical sensing distance corresponds to 80 % of the max. sensing distance.

3. The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter "Precautions")

4. For other cable materials (e.g. PUR) please contact your OMRON sales representative.

5. Material-specification for stainless steel housing case: 1.4305 (W.-No.), 303 (AISI), 2346 (SS). For other stainless steel materials please contact your OMRON sales representative.

Ratings / Characteristics of AC Switching Models

Item	E3F2-3Z1 E3F2-3Z2	E3F2-R2Z1 E3F2-R2Z2	E3F2-DS10Z1 E3F2-DS10Z2
Sensing method	Through-beam	Non-polarizing Retroreflective	Diffuse reflective (wide-beam characteristic)
Power supply voltage	24 to 240 VAC $\pm 10\%$, 50 / 60 Hz		
Current consumption	10 mA max.	5 mA max.	
Rated sensing distance[1.]	3 m	0.1 - 2 m (with reflector E39-R1)	0.1 m (5 x 5 cm white mat paper)
Typical sensing distance for different reflector types [2.]	—	E39-R1: 3,4 m E39-R7: 3,9 m E39-R8: 5,2 m	—
Detectable object	Opaque object: 11 mm min.	Opaque object: 56 mm min.	Opaque objects
Directional angle	3° to 20°		—
Differential travel	—		20 % max.
Response time	30 ms max.		
Control output	AC solid state (SCR) 200 mA max.; residual voltage: 5 V max. at 200 mA		
Power reset time	100 ms		
Ambient illumination	Incandescent lamp: 3000 lx max. Sunlight: 10000 lx max.		
Ambient temperature [5.]	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)		
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)		
Insulation resistance	20 M Ω min. at 500 V DC between energized parts and case		
Dielectric strength	1500 VAC, 50 / 60 Hz for 1 min between energized parts and case		
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)		
Shock resistance	500 m/sqr (approx. 50 g) for each direction (X, Y, Z)		
Enclosure rating	IP67 [3.]; NEMA 1, 2, 4		
Light source	Infrared LED (880 nm)		
Indicators	Light incident/power indicator for light source (red)		
Sensitivity adjustment	Fixed		
Connection method	2 m, 5 m pre-wired cable (PVC dia. 4 mm (14 / 0.15) [4.])		
Operation mode	Light-ON or Dark-ON (fixed)		
Circuit protection	None		
Weight (approx.)	110 g (pre-wired 2 m cable)		
Housing materials	Case: ABS, lens: Acrylate resin		

Note: 1. For stable sensing distance in detail, please refer to "Engineering Data"

2. Typical sensing distance corresponds to 80 % of the max. sensing distance.

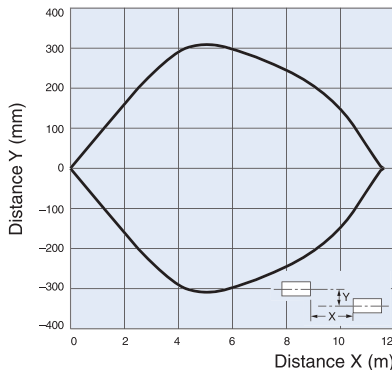
3. The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter "Precautions")

4. For other cable materials (e.g. PUR) please contact your OMRON sales representative.

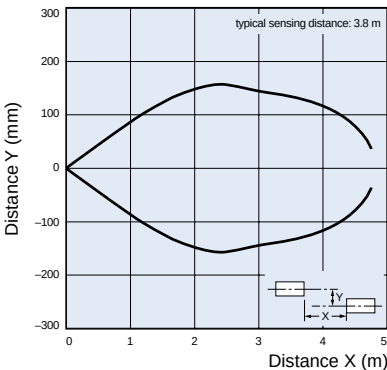
Engineering Data (Typical)

Operating Range (typical)

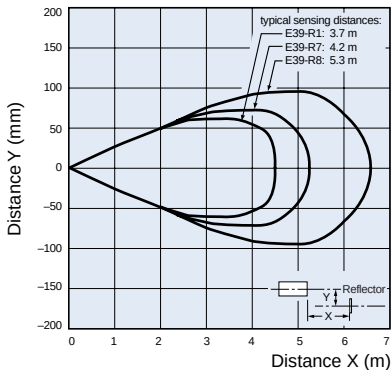
Through-beam Models (axial)
E3F2-7□4-□



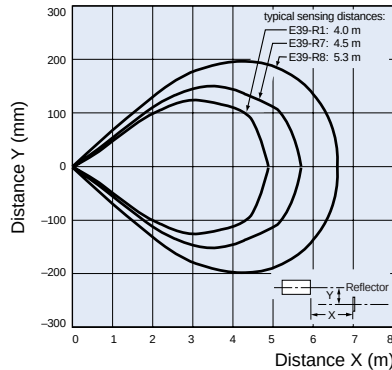
Through-beam Models (axial)
E3F2-3Z□



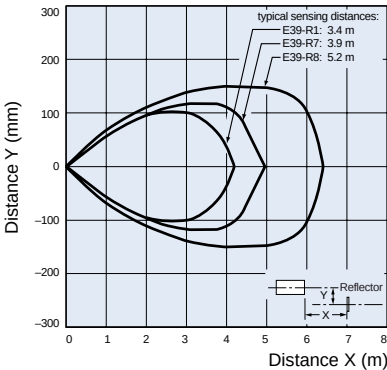
Retroreflective Models (axial)
E3F2-R2R□4-□ (polarizing)
and reflectors



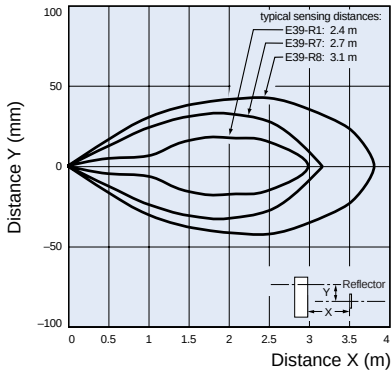
Retroreflective Models (axial)
E3F2-R2□4-□ (non polarizing)
and reflectors



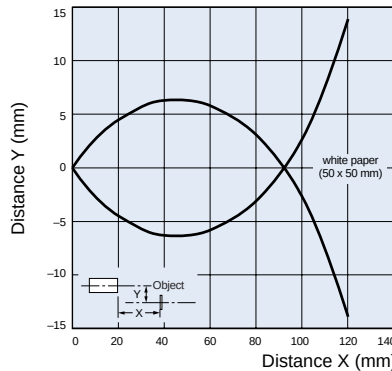
Retroreflective Models (axial)
E3F2-R2Z□ (non polarizing)
and reflectors



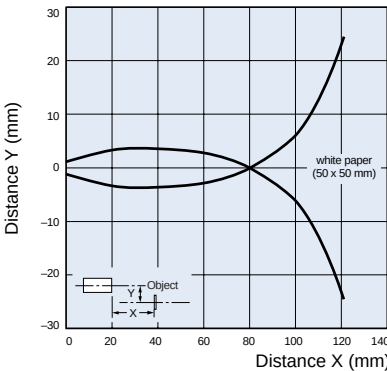
Retroreflective Models (radial)
E3F2-R2R□41-□ (polarizing)
and reflectors



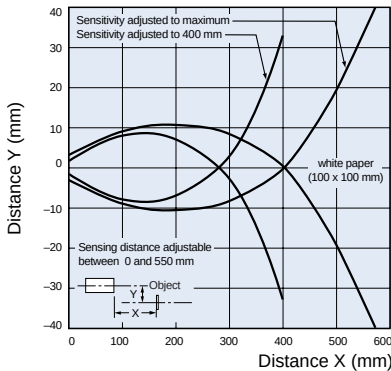
Diffuse reflective Models (axial)
E3F2-DS10□4-□ (wide-beam type)



Diffuse reflective Models (axial)
E3F2-DS10Z-□ (wide-beam type)

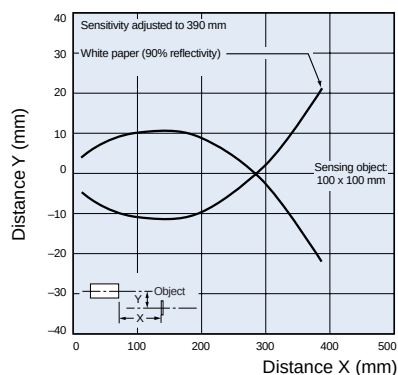


Diffuse reflective Models (axial)
E3F2-DS30□4-□



Diffuse reflective Models (radial)

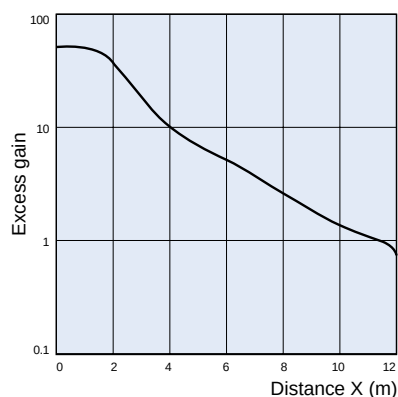
E3F2-DS30□41-□



Excess Gain Ratio vs. Distance (typical)

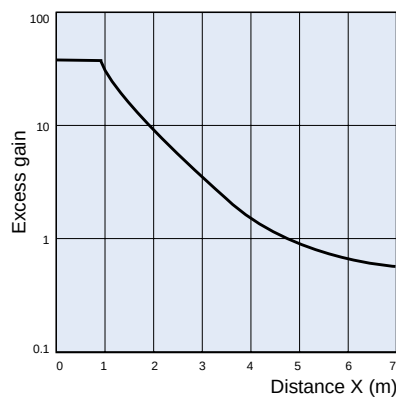
Through-beam Models (axial)

E3F2-7□4-□



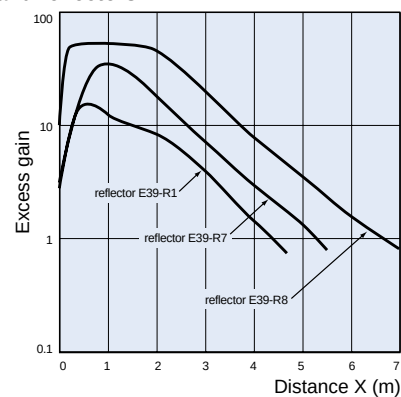
Through-beam Models (axial)

E3F2-3Z□



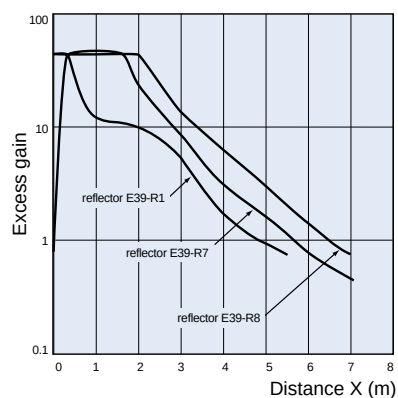
Retroreflective Models (axial)

E3F2-R2R□4-□ (polarizing)
and reflectors



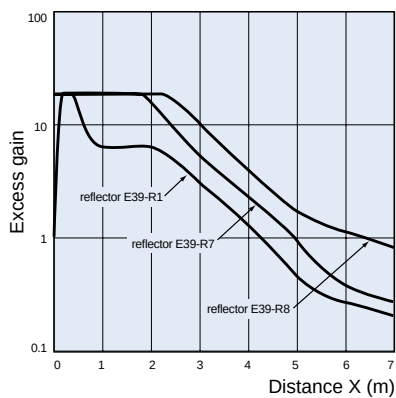
Retroreflective Models (axial)

E3F2-R2□4-□ (non polarizing)
and reflectors



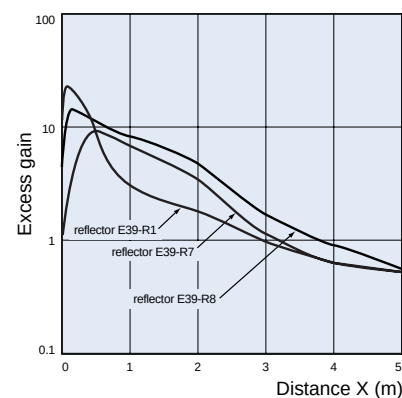
Retroreflective Models (axial)

E3F2-R2Z□ (non polarizing)
and reflectors

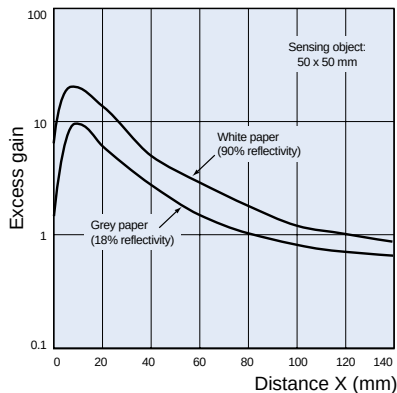


Retroreflective Models (radial)

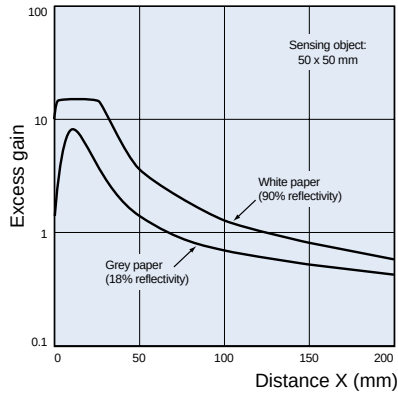
E3F2-R2R□41-□ (polarizing)
and reflectors



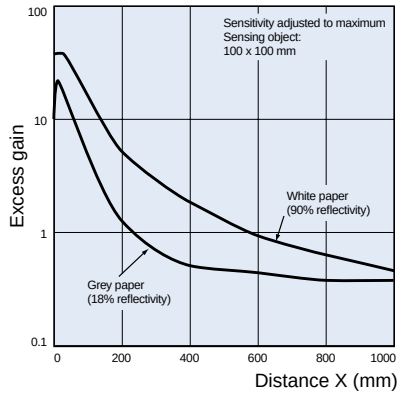
Diffuse reflective Models (axial)
E3F2-DS10□4-□ (wide-beam type)



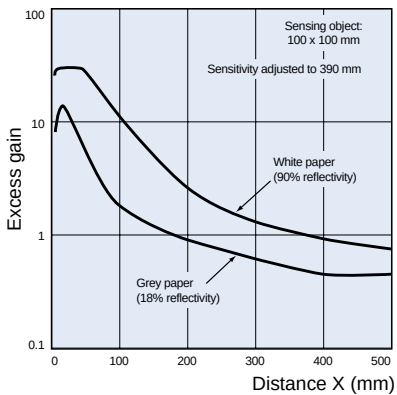
Diffuse reflective Models (axial)
E3F2-DS10Z-□ (wide-beam type)



Diffuse reflective Models (axial)
E3F2-DS30□4-□



Diffuse reflective Models (radial)
E3F2-DS30□41-□

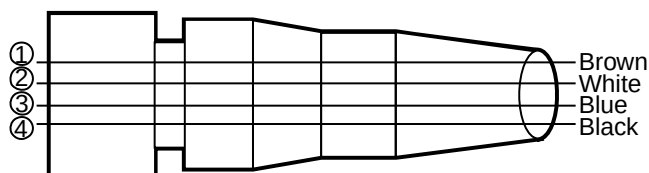


Operation

Output Circuits

Structure of Sensor I/O Connector

Classification	Wire color	Connector pin No.	Use
DC	Brown	①	Power supply (+V)
	White	②	Mode selection Lon/Don
	Blue	③	Power supply (0 V)
	Black	④	Output



XS2F-D42□-D80-□

XS2F-G42□-G80-□

PNP Output

Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-7B4 E3F2-7B4-M E3F2-7B4-M1-M E3F2-7B4-M1-S E3F2-7B4-P1 E3F2-7B4-S E3F2-DS10B4-M E3F2-DS10B4-M1-M E3F2-DS10B4-M1-S E3F2-DS10B4-N E3F2-DS10B4-P1 E3F2-DS10B4-S E3F2-DS30B4 E3F2-DS30B41 E3F2-DS30B41-M E3F2-DS30B41-M1-M E3F2-DS30B41-P1 E3F2-DS30B4-M E3F2-DS30B4-M1-M E3F2-DS30B4-M1-S E3F2-DS30B4-P1 E3F2-DS30B4-S E3F2-R2B4 E3F2-R2B4-P1 E3F2-R2RB41 E3F2-R2RB41-M E3F2-R2RB41-M1-M E3F2-R2RB41-P1 E3F2-R2RB4-M E3F2-R2RB4-M1-M E3F2-R2RB4-M1-S E3F2-R2RB4-S	—	—	—	Through-beam emitter Connector Pin Arrangement
E3F2-DS30B41-M E3F2-DS30B41-M1-M E3F2-DS30B41-P1 E3F2-DS30B4-M E3F2-DS30B4-M1-M E3F2-DS30B4-M1-S E3F2-DS30B4-P1 E3F2-DS30B4-S E3F2-R2B4 E3F2-R2B4-P1 E3F2-R2RB41 E3F2-R2RB41-M E3F2-R2RB41-M1-M E3F2-R2RB41-P1 E3F2-R2RB4-M E3F2-R2RB4-M1-M E3F2-R2RB4-M1-S E3F2-R2RB4-S	ON when light is incident. (Light-ON)		Connect the pink (Pin ②) and brown (Pin ①) cords or open the pink cord (Pin ②).	Connector Pin Arrangement
E3F2-DS30B41-M E3F2-DS30B41-M1-M E3F2-DS30B41-P1 E3F2-DS30B4-M E3F2-DS30B4-M1-M E3F2-DS30B4-M1-S E3F2-DS30B4-P1 E3F2-DS30B4-S E3F2-R2B4 E3F2-R2B4-P1 E3F2-R2RB41 E3F2-R2RB41-M E3F2-R2RB41-M1-M E3F2-R2RB41-P1 E3F2-R2RB4-M E3F2-R2RB4-M1-M E3F2-R2RB4-M1-S E3F2-R2RB4-S	ON when light is interrupted. (Dark-ON)		Connect the pink and blue cords.	Connector Pin Arrangement

Note: Terminal numbers for connector type.

NPN Output

Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-7C4 E3F2-7C4-M E3F2-7C4-M1-M E3F2-7C4-M1-S E3F2-7C4-P1 E3F2-7C4-S E3F2-DS10C4-M E3F2-DS10C4-M1-M E3F2-DS10C4-M1-S E3F2-DS10C4-N E3F2-DS10C4-P1 E3F2-DS10C4-S E3F2-DS30C4 E3F2-DS30C41 E3F2-DS30C41-M E3F2-DS30C41-M1-M E3F2-DS30C41-P1 E3F2-DS30C4-M E3F2-DS30C4-M1-M E3F2-DS30C4-M1-S E3F2-DS30C4-P1 E3F2-DS30C4-S E3F2-R2C4 E3F2-R2C4-P1 E3F2-R2RC41 E3F2-R2RC41-M E3F2-R2RC41-M1-M E3F2-R2RC41-P1 E3F2-R2RC4-M E3F2-R2RC4-M1-M E3F2-R2RC4-M1-S E3F2-R2RC4-S	—	—	—	Through-beam emitter
E3F2-DS30C41-M E3F2-DS30C41-M1-M E3F2-DS30C41-P1 E3F2-DS30C4-M E3F2-DS30C4-M1-M E3F2-DS30C4-M1-S E3F2-DS30C4-P1 E3F2-DS30C4-S E3F2-R2C4 E3F2-R2C4-P1 E3F2-R2RC41 E3F2-R2RC41-M E3F2-R2RC41-M1-M E3F2-R2RC41-P1 E3F2-R2RC4-M E3F2-R2RC4-M1-M E3F2-R2RC4-M1-S E3F2-R2RC4-S	ON when light is incident. (Light-ON)		Connect the pink (Pin ②) and brown (Pin ①) cords or open the pink cord (Pin ②).	
E3F2-DS30C41-M E3F2-DS30C41-M1-M E3F2-DS30C41-P1 E3F2-DS30C4-M E3F2-DS30C4-M1-M E3F2-DS30C4-M1-S E3F2-DS30C4-P1 E3F2-DS30C4-S E3F2-R2C4 E3F2-R2C4-P1 E3F2-R2RC41 E3F2-R2RC41-M E3F2-R2RC41-M1-M E3F2-R2RC41-P1 E3F2-R2RC4-M E3F2-R2RC4-M1-M E3F2-R2RC4-M1-S E3F2-R2RC4-S	ON when light is interrupted. (Dark-ON)		Connect the pink and blue cords.	

Note: Terminal numbers for connector type.

AC Output

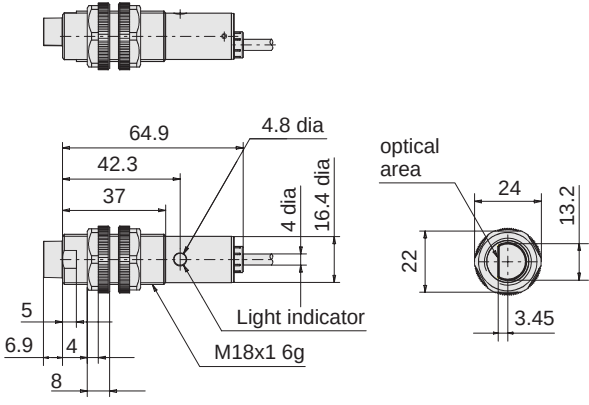
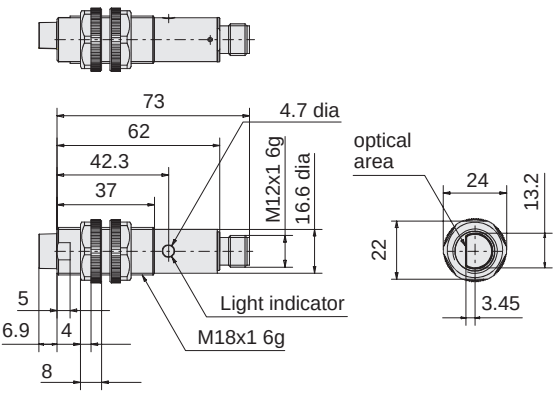
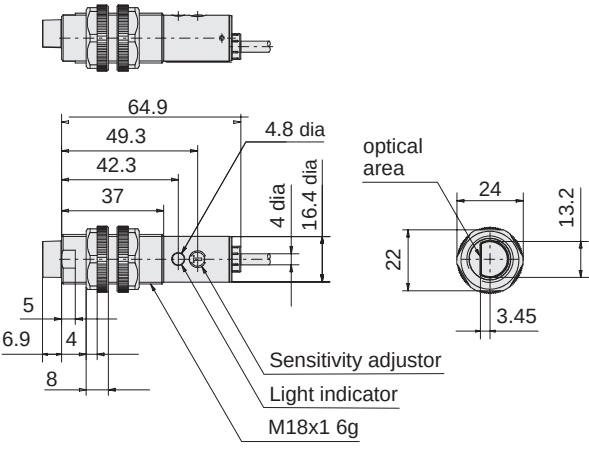
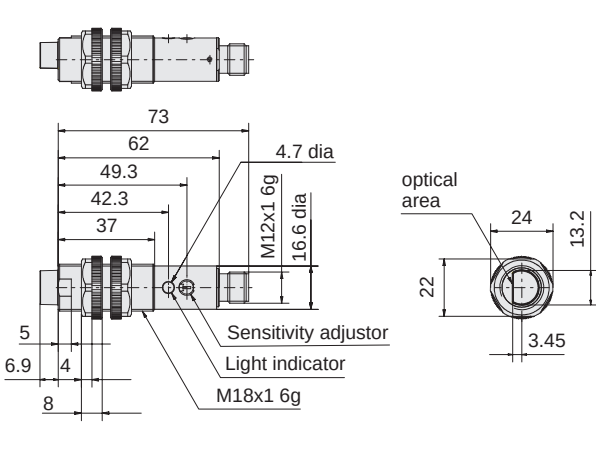
Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-3LZ	—	—	—	Through-beam emitter
E3F2-3Z1 E3F2-R2Z1 E3F2-DS10Z1-N	ON when light is incident. (Light-ON)		—	
E3F2-3Z2 E3F2-R2Z2 E3F2-DS10Z2-N	ON when light is interrupted. (Dark-ON)		—	

Dimensions Note: All units are in millimeters unless otherwise indicated

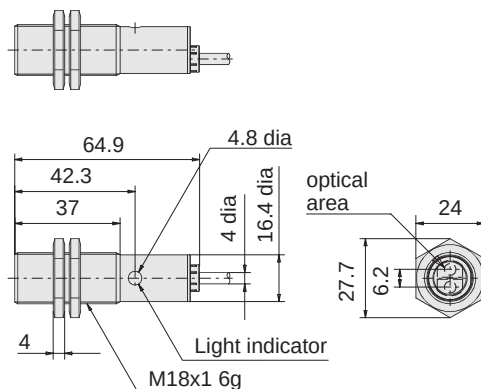
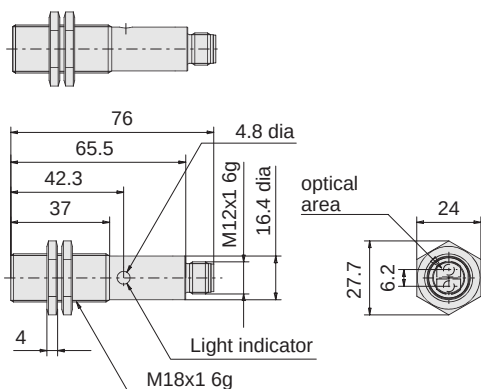
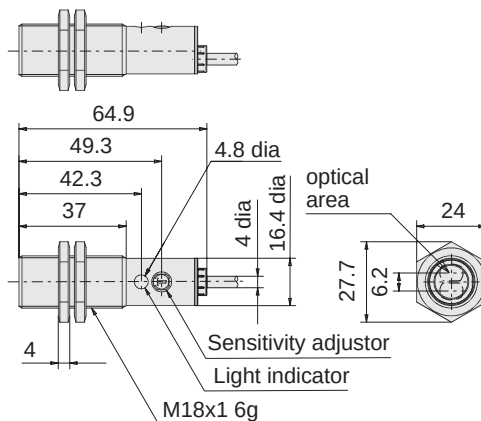
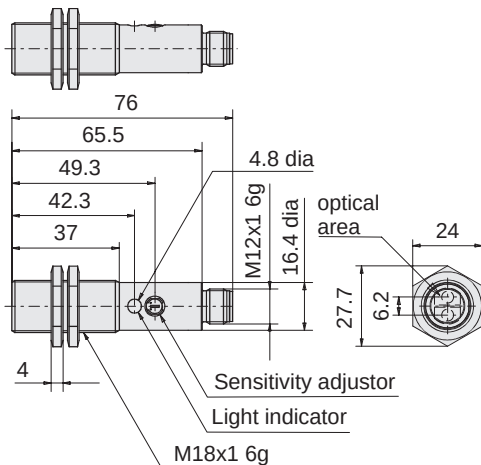
DC-Switching Models, plastic, axial type

Cable type	Connector type
Without potentiometer	
E3F2-7L E3F2-7D□4 E3F2-R2□4 E3F2-DS10□4-N	E3F2-7L-P1 E3F2-7D□4 -P1 E3F2-R2□4-P1 E3F2-DS10□4-P1
With potentiometer	
E3F2-DS30□4	E3F2-DS30□4-P1

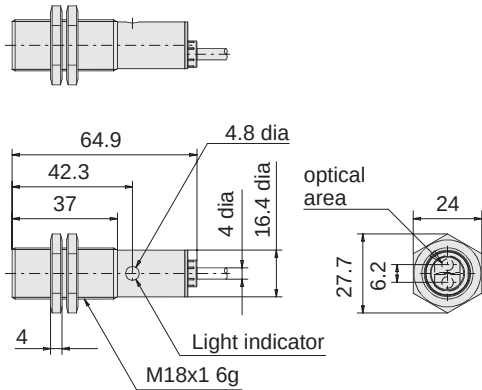
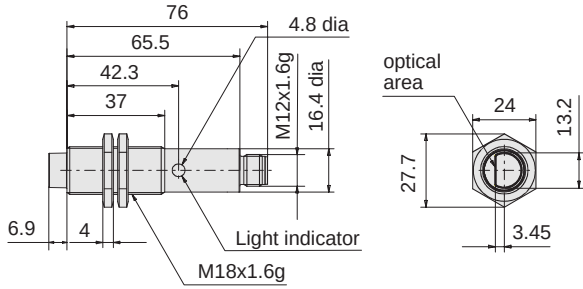
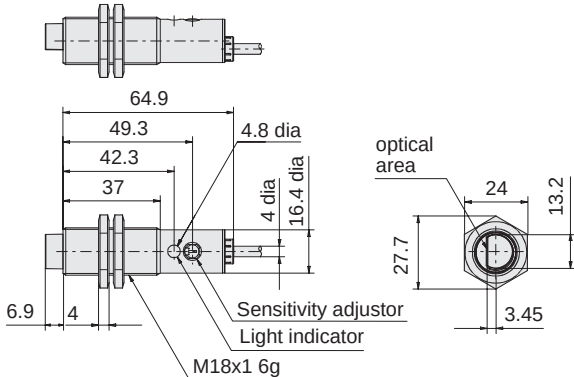
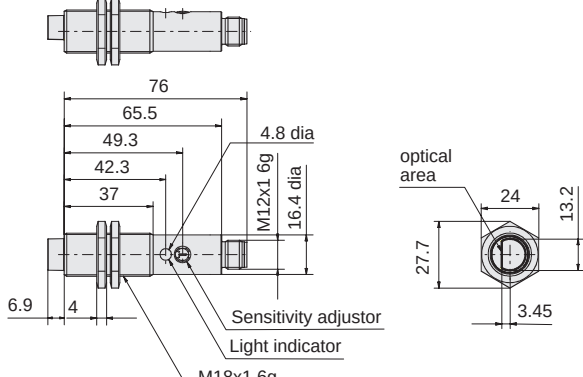
DC-Switching Models, plastic, radial type

Cable type	Connector type
Without potentiometer	
E3F2-R2R□41 	E3F2-R2R□41-P1 
With potentiometer	
E3F2-DS30□41 	E3F2-DS30□41-P1 

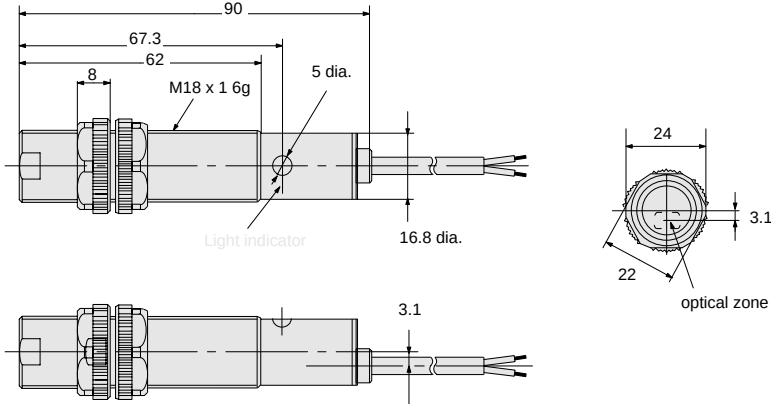
DC-Switching Models, metal (brass and stainless steel), axial type

Cable type		Connector type	
Without potentiometer			
E3F2-7L-M E3F2-7D□4-M E3F2-R2R□4-M E3F2-DS10□4-M	E3F2-7L-S E3F2-7D□4-S E3F2-R2R□4-S E3F2-DS10□4-S	E3F2-7L-M1-M E3F2-7D□4-M1-M E3F2-R2R□4-M1-M E3F2-DS10□4-M1-M	E3F2-7L-M1-S E3F2-7D□4-M1-S E3F2-R2R□4-M1-S E3F2-DS10□4-M1-S
			
With potentiometer			
E3F2-DS30□4-M E3F2-DS30□4-S	E3F2-DS30□4-S	E3F2-DS30□4-M1-M E3F2-DS30□4-M1-S	E3F2-DS30□4-M1-S
			

DC-Switching Models, metal (brass and stainless steel), radial type

Cable type		Connector type	
Without potentiometer			
E3F2-R2R□41-M	E3F2-R2R□41-S	E3F2-R2R□41-M1	E3F2-R2R□41-M1-S
			
With potentiometer			
E3F2-DS30□41-M	E3F2-DS30□41-S	E3F2-DS30□41-M1-M	E3F2-DS30□41-M1-S
			

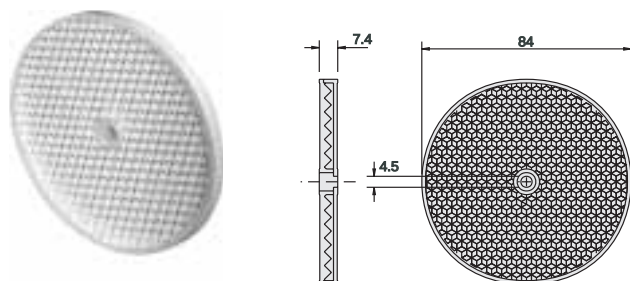
AC-Switching Models, plastic, axial type

Cable type
Without potentiometer
E3F2-3Z□ E3F2-R2Z□ E3F2-DS10Z□-N


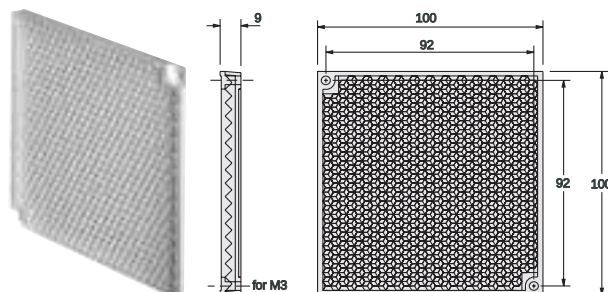
Accessories (Order Separately)

Reflectors

E39-R7



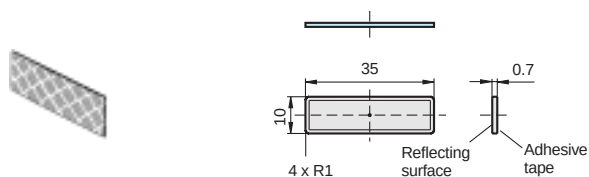
E39-R8



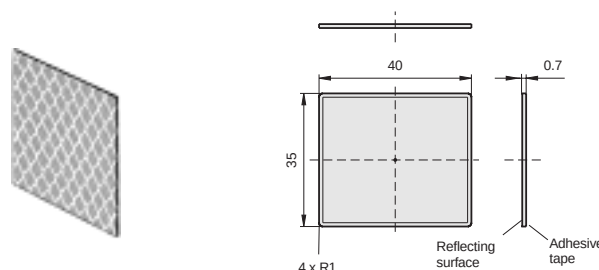
E39-R1 and E39-R3 ‡ A-219

Tape Reflectors

E39-RSA

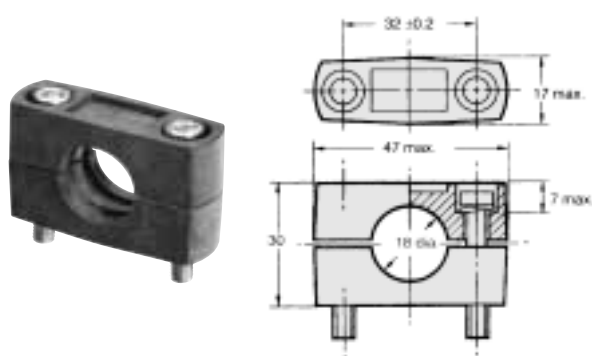


E39-RSB



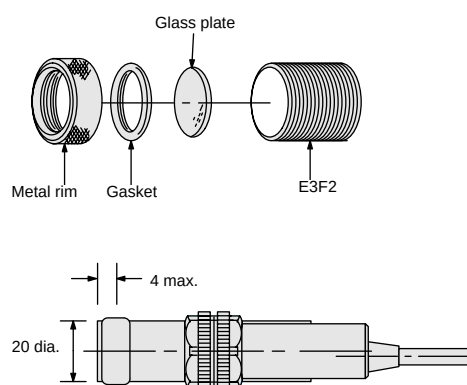
Installation

Mounting Bracket
Y92E-B18



Note:
Hexagon bolt: M5 x 32
Material: plastic

Lens Cap
E39-F31



Precautions

The E3F2 Photoelectric Sensor is not a safety component for ensuring the safety of people which is defined in EC directive (91/368/EEC) and covered by separate European standards or by any other regulations or standards.

Degree of protection

The E3F2 photoelectric sensors have a degree of protection rated with IP67. In this case, the sensors have passed the OMRON heat shock test before the IP67-test of IEC 60529 (submersion at 1m water depth for 30 min). Afterwards the sensors have been tested according to the OMRON waterproof test.

Heat shock: Alternating, fast temperature changes between -25°C and +55°C are executed for 5 cycles and 1 hour for each temperature. Function and isolation are checked.

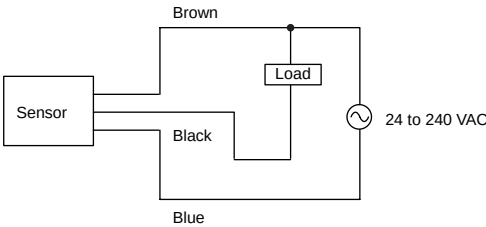
Water proof: The sensors are submerged alternating in water of +2°C and +55°C. 20 cycles with 1 hour for each temperature are executed. Function, water tightness and electrical isolation are checked.

Do not expose the photoelectric sensor to excessive shock during installation, keeping within IP 67 standards.

Wiring

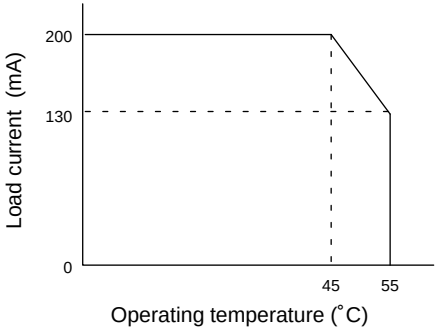
If the input/output lines of the photoelectric sensor are placed in the same conduit or duct as power lines or high-voltage lines, the photoelectric sensor could be induced to malfunction, or even be damaged by electrical noise. Separate the wiring, or use shielded lines as input/output lines to the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

Do not connect the black wire to the brown wire without a load. Direct connection of these wires may damage the photoelectric sensor (AC switching type).



When using the photoelectric sensor in the vicinity of an inverter motor, ensure to connect the protective earth ground wire of the motor to earth. Failure to ground the motor may result in malfunction of the sensor.

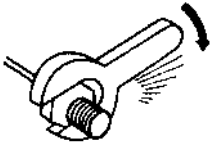
When you use the photoelectric sensor at temperatures exceeding 45°C, the load current must be within the described values as shown in the figure below.



Installation

Do not exceed a torque of

- 2.0 Nm (20 kgf cm) when tightening mounting nuts for plastic models
- 20.0 Nm (200 kgf cm) when tightening mounting nuts for metal models



Built-in power supply photoelectric sensor

E3JK

*Wide range voltage
power supply***Pre-wired type/E3JK**

- Slim body full of functions and economically available



CE

Sensor type	Shape	Connection method	Sensing distance	Output form	Output		Model
Through-beam		Pre-wired models	 5m	Light ON	Relay output		E3JK-5M1
				Dark ON			E3JK-5M2
				Light ON/ Dark ON (selectable)	DC transistor output		NPN: E3JK-5S3
Retroreflective model (with M.S.R. function)			 2.5m (3m)*	Light ON	Relay output		E3JK-R2M1
				Dark ON			E3JK-R2M2
				Light ON/Dark ON (selectable)	DC transistor output	NPN	E3JK-R2S3
						PNP	E3JK-R2R3
Retroreflective model (without M.S.R. function)	 4m (5m)*		Light ON	Relay output		E3JK-R4M1	
			Dark ON			E3JK-R4M2	
			Light ON/Dark ON (selectable)	DC transistor output (NPN)		E3JK-R4S3	
Diffuse-reflective			 300mm	Light ON	Relay output		E3JK-DS30M1
				Dark ON			E3JK-DS30M2
		Light ON/Dark ON (selectable)		DC transistor output (NPN)		E3JK-DS30S3	

* The value within the parentheses indicates the sensing distance applied when the E39-R2 reflector is used.

Note: The UL-listed model ends with "-US". (Example: E3JK-5M1-US). Note that the DC transistor type of the E3JK is UL-unlisted.

Accessories (Order Separately)**Slits**

Slit width	Sensing distance		Minimum sensing object (typical)	Model	Quantity	Remarks
Width 1 mmx20 mm	E3JK-5□□	0.7 m	1 mm dia.	E39-S39	1 pc. each for emitter and receiver (total 2 pcs.)	(Seal type long slit) Can be used with the through-beam model E3JK-5□□.

Reflectors

Name	Sensing distance (typical)		Model	Quantity	Remarks
Reflectors	E3JK-R2□□	2.5 m (rated value)	E39-R1	1	Attached to the E3JK-R2□□. Attached to the E3JK-R4□□.
	E3JK-R4□□	4 m (rated value)			
	E3JK-R2□□	3 m	E39-R2	1	---
	E3JK-R4□□	5 m			
Small reflector	E3JK-R2□□	1 m (5 mm) *	E39-R3	1	---
Tape Reflector	E3JK-R2□□	750 mm (200 mm) *	E39-RS1	1	The M.S.R. function is available.
	E3JK-R2□□	1.2 m (200 mm) *	E39-RS2		
	E3JK-R2□□	1.5 m (200 mm) *	E39-RS3		

* Values in parentheses indicate the minimum required distance between the sensor and reflector.
Note: When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L40	1	Supplied with E3JK

Note: If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

Rating/Performance

E3JK

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)		Retroreflective model (without M.S.R. function)		Diffuse-reflective	
Item	Model	E3JK-5M□	E3JK-5S3	E3JK-R2M□	E3JK-R2□3	E3JK-R4M□	E3JK-R4S3	E3JK-DS30M□	E3JK-DS30S3
Sensing distance		5 m		2.5 m (When using the E39-R1)		4 m (When using the E39-R1)		300 mm (White paper 100x100 mm)	
Standard sensing object		Opaque 14.8 dia. min.		Opaque: 75 mm dia. min.				---	
Differential distance		---						20% max. of sensing distance	
Directional angle		Both emitter and receiver: 3°C to 20°C		1° to 5°				---	
Light source (wave length)		Infrared LED (950 nm)		Red LED (660 nm)				Infrared LED (950 nm)	
Power supply voltage		12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz							
Current consumption	DC	3 W max.		2 W max.					
	AC	3 W max.		2 W max.					
Control output		Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative or positive common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection
Life expectancy (relay output)	Mechanical	50 million times or more (switching frequency 18,000 times/hour)							
	Electrical	100 thousand times or more (switching frequency 18,000 times/hour)							
Response time		30 ms max.	10 ms max.	30 ms max.	5 ms max.	30 ms max.	5 ms max.	30 ms max.	5 ms max.
Sensitivity adjustment		---						Single-turn adjustment	
Ambient illuminance		Incandescent lamp: 3,000 lux max.							
Ambient temperature		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)							
Ambient humidity		Operating: 45% to 85%RH, Storage: 35% to 95%RH (with no condensation)							
Insulation resistance		20 M Ω min. at 500 VDC							
Dielectric strength		1,500 VAC at 50/60 Hz for 1 minute							
Vibration resistance	Destruction	10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							
	Mal-function	10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							

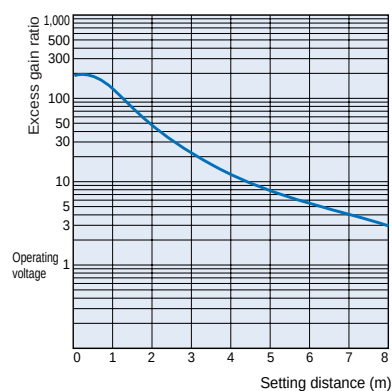
Sensor type		Through-beam		Retroflective model (with M.S.R. function)		Retroflective model (without M.S.R. function)		Diffuse-reflective	
Item	Model	E3JK-5M□	E3JK-5S3	E3JK-R2M□	E3JK-R2□3	E3JK-R4M□	E3JK-R4S3	E3JK-DS30M□	E3JK-DS30S3
Shock resistance	De-struction	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions							
	Mal-function	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions
Protective structure		IEC60529 IP64							
Connection method		Pre-wired models (standard length: 2 m)							
Weight (Packed state)		Approx. 420 g		Approx. 250 g					
Material	Case	ABS							
	Lens	Acrylics							
	Mounting bracket	Steel							
Accessories		Mounting bracket (with screws), nuts, instruction manual, reflector (retroreflective model only)							

Characteristic data (typical)

Excess Gain Ratio vs. Setting Distance

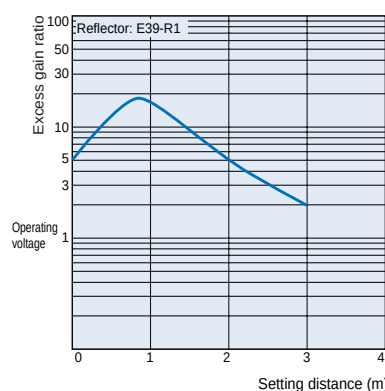
Through-beam model

E3JK-5□□

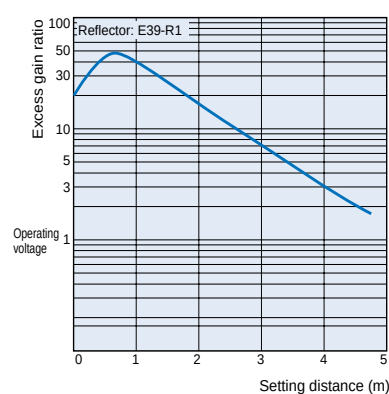


Retroreflective Models

E3JK-R2□□ + E39-R1 (supplied reflector)

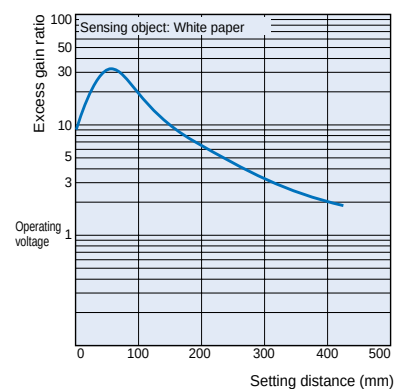


E3JK-R4□□ + E39-R1 (supplied reflector)



Diffuse-reflective

E3JK-DS30□□



Output Circuit Diagram

E3JK

Relay output

Model	Timing chart	Output circuit
E3JK-5M1 E3JK-5M2 E3JK-R2M1 E3JK-R2M2 E3JK-R4M1 E3JK-R4M2 E3JK-DS30M1 E3JK-DS30M2	Incident Interrupted Light indicator (red) ON OFF L-ON(Ta) (E3JK-□□M1) ON OFF D-ON(Ta) (E3JK-□□M2) ON OFF	

DC transistor output

Model	Timing chart	Output circuit
E3JK-5S3 E3JK-R2S3 E3JK-R4S3 E3JK-DS30S3	Incident Interrupted Light indicator (red) ON OFF L-ON mode ON OFF D-ON mode ON OFF	
E3JK-R2R3	Incident Interrupted Light indicator (red) ON OFF L-ON mode ON OFF D-ON mode ON OFF	

Note: Connect to brown and blue on the emitter side.

Operation

Adjustment

Model	Item	Through-beam	Retroreflective Models	Diffuse-reflective
E3JK		Swing the receiver and emitter vertically and/or horizontally and set the adjuster in the center of the range where the indicator of the receiver turns ON.	Like the through-beam model, adjust the reflector and emitter/receiver. Since the directional angle of the emitter/receiver is 1 to 5°, adjust the emitter/receiver especially carefully.	With sensing object Without sensing object Setting Operation (A) MIN Sensitivity (B) MAX Sensitivity (C) Reset (1) If you have a sensing object as shown in the figure, turn the sensitivity adjuster clockwise (increase the sensitivity) until the indicator is turned ON, and define this adjuster position as (A). (2) Remove the sensing object, turn the sensitivity adjuster clockwise until the indicator is turned ON by a background object, and define this position as (B). (3) Turn the sensitivity adjuster counterclockwise (decrease the sensitivity) from (B) until the indicator is turned OFF, and define this position as (C). (4) The position in the middle of (A) and (C) is the optimum position. If the indicator is not turned ON by the background object at the maximum sensitivity, set the adjuster in the middle of (A) and maximum sensitivity. • The sensitivity adjuster may be damaged if an excessive force is applied.

Precautions

Correct Use

E3JK

Design

Power Reset Time

The Sensor is ready to detect an object within 200 ms after it is turned ON. If Sensor and load are connected to separate power supplies, ensure to turn ON the Sensor first.

Wiring Considerations

Connection/Wiring

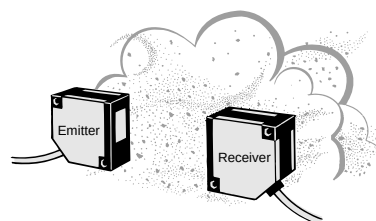
If the DC transistor output type is used, the sum of load currents of L-ON output (NO) and D-ON output (NC) should be within 100 mA. If the sum of load currents exceeds 100 mA, the load short-circuit protection may be activated. (The load short-circuit protection is reset by turning OFF the power of the photoelectric sensor.)

Miscellaneous

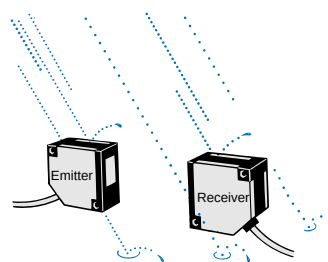
Ambient Conditions (Installation Area)

The E3JK will malfunction if installed in the following places.

- Places where the E3JK is exposed to a dusty environment.
- Places where corrosive gases are produced.



- Places where the E3JK is directly exposed to water, oil, or chemicals.

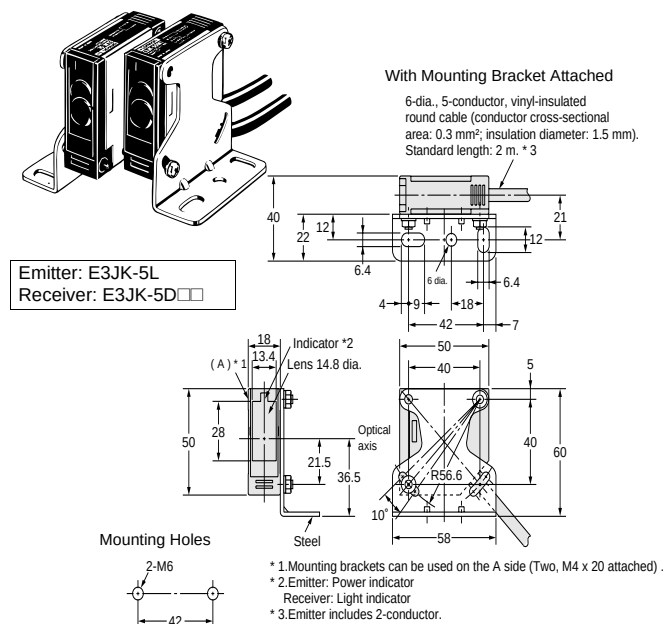


Dimensions (Unit: mm)

Sensors

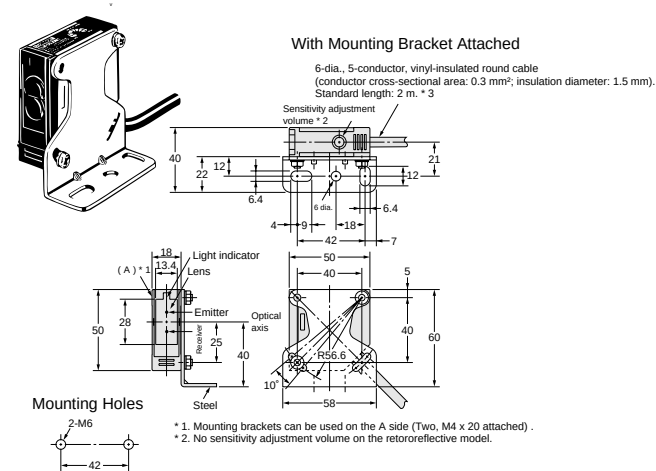
E3JK-5□□

CAD file	E3JK_01



E3JK-R2□□
E3JK-R4□□
E3JK-DS30□□

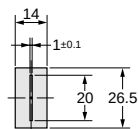
CAD file	E3JK_02



Accessories (Order Separately)

Seal type long slit (for E3JK)

E39-S39



Mark Sensor

E3M-V

- Detects laminated or light-dispersing objects in stable operation without being influenced by mirror reflection.
- Double indication of the detection level and threshold level allows easy grasp of the operating status and easy adjustment.
- Automatically sets to the optimum threshold level while sensing objects are being conveyed and incorporates an auto-teaching function that discriminates between the mark and background and turns ON when the mark is detected.
- IP67 watertight construction with M12 rotary connector
- High response speed of 50 μ s and half the size of OMRON's conventional models.

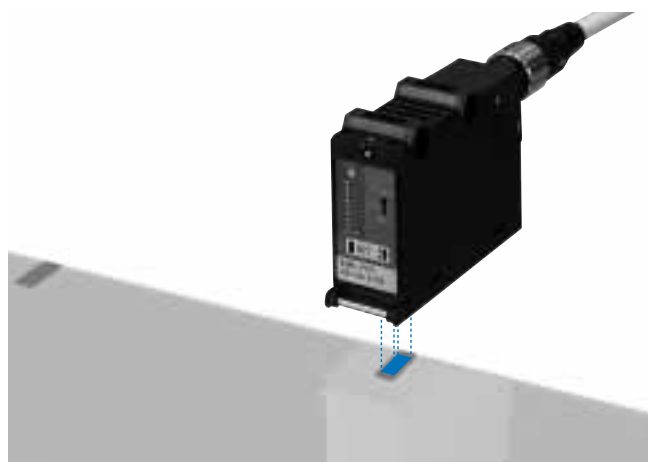


Applications



Dependably Detects Marks on Laminated Sheets

The coaxial optical system ensures a long sensing distance and stable sensing characteristics over a wide angle range, even for objects that are distance-fluctuating or leaning at an angle, or for laminated objects with marks, which conventional models have difficulty in detecting



Auto-Teaching

An auto-teaching function automatically sets the threshold value upon a Remote Control input while the workpiece is moving. There is no need to position the mark at the optical spot.

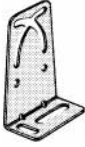
Ordering Information

Sensors

Shape	Connection method	Setting distance	Spot diameter	Model	
				NPN output	PNP output
	Connector type ¹	 10+3 mm	1 x 4 mm	E3M-VG11	E3M-VG16
			4 x 1 mm	E3M-VG21	E3M-VG26
	Pre-wired		1 x 4 mm	E3M-VG12	E3M-VG17
			4 x 1 mm	E3M-VG22	E3M-VG27

¹ Possible to switch between vertical or horizontal connection using the M12 rotary connector

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L131	1	
	E39-L132	1	For rear mounting

Sensor I/O Connectors

Shape	Type	Cord type		Model
	Single-end connector (Straight)	2 m	4-wire cord	XS2F-D421-D80-A
		5 m		XS2F-D421-G80-A
	Single-end connector (L-shaped)	2 m		XS2F-D422-D80-A
		5 m		XS2F-D422-G80-A

Specifications

Ratings/Characteristics

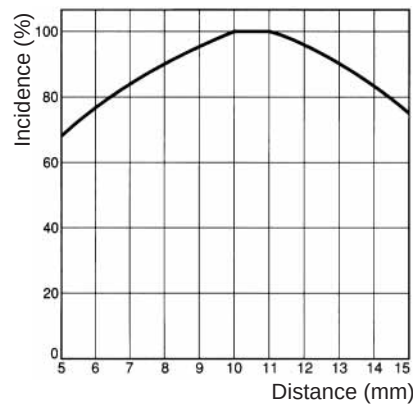
Item	E3M-VG11	E3M-VG12	E3M-VG21	E3M-VG22	E3M-VG16	E3M-VG17	E3M-VG26	E3M-VG27
Sensing distance	10±3 mm							
Spot size (W x H)	1 x 4 mm		4 x 1 mm		1 x 4 mm		4 x 1 mm	
Light source (wave-length)	Green LED (525 nm)							
Power supply voltage	10 to 30 VDC, ripple (p-p) 10% max.							
Current consumption	100 mA max.							
Control output	Load power supply voltage: 30 VDC max. Load current: 100 mA max. (Residual voltage: 1.2 V max.) NPN open collector output type				Load power supply voltage: 30 VDC max. Load current: 100 ma max. (Residual voltage: 2 V max.) PNP open collector output type			
Remote control input ¹	ON: Short-circuited to 0 or 1.5 V max. (with a flow current of 1 mA max.) OFF: Open or V _{cc} - 1.5 V to V _{cc} (with a leakage current of 0.1 mA max.)				ON: V _{cc} - 1.5 V to V _{cc} (with an absorption current of 3 mA max.) OFF: Open or 1.5 V max. (with a leakage of 0.1 mA max.)			
Remote control output ¹	Load power supply voltage: 30 VDC max. Load current: 100 mA max. (Residual voltage: 1.2 V max.) NPN open collector output type				Load power supply voltage: 30 VDC max. Load current: 100 ma max. (Residual voltage: 2 V max.) PNP open collector output type			
Bank selection	Two banks selectable. Available for remote control only. (Refer to Remote Control Function.)							
Circuit protection	Protection from reversed power supply connection and load short-circuit							
Response time	ON: 50 μs max. OFF: 70 μs max.							
Ambient illumination (on receiver lens)	Incandescent lamp: 3,000 lx max. Sunlight: 10,000 lx max.							
Ambient temperature	Operating: -20°C to 55°C/Storage: -30°C to 70°C (with no icing)							
Ambient humidity	Operating: 35% to 85%/Storage: 35% to 95°C (with no condensation)							
Insulation resistance	20 M min. (at 500 VDC)							
Dielectric strength	1,000 VAC, 50/60Hz, 1 min.							
Vibration resistance ²	Destruction: 10 to 55 Hz, 1-mm double amplitude or 150 m/s ² for 2 hrs each in X, Y, and Z directions							
Shock resistance ³	Destruction: 500 m/s ² 3 times each in X, Y, and Z directions							
Degree of protection	IEC60529 IP67 (with protective cover)							
Connection method	Connector	Pre-wired	Connector	Pre-wired	Connector	Pre-wired	Connector	Pre-wired
Weight with package box	Approx. 100 g							
Material	Case: Polybutylene terephthalate Lens: Acrylic (PMMA)							
Others	Instruction manual							

1. Remote controll input and answer-back output share the same signal line.

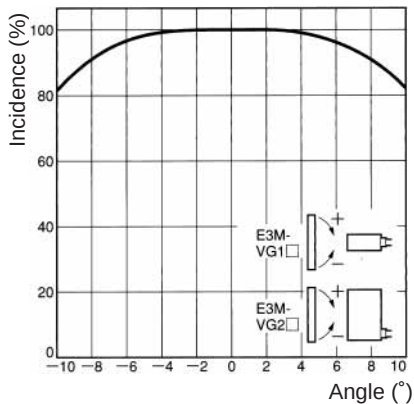
2. The Sensor withstands 0.75 mm double amplitude or 100 m/s² if the mounting bracket is attached to the sensor

3. The Sensor withstands 300 m/s² if the mounting bracket is attached to the sensor.

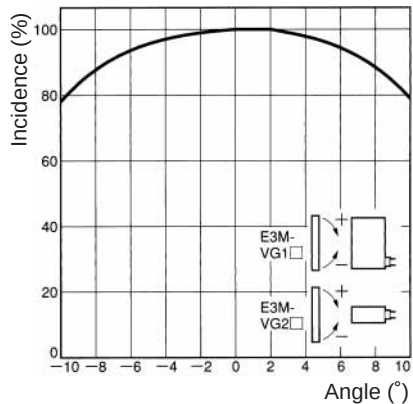
Sensing Distance vs. Incident Characteristics (Typical)
E3M-VG1□



Angle vs. Incident Characteristics (X Direction)
E3M-VG1□/VG2□



Angle vs. Incident Characteristics (Y Direction)
E3M-VG1□/VG2□

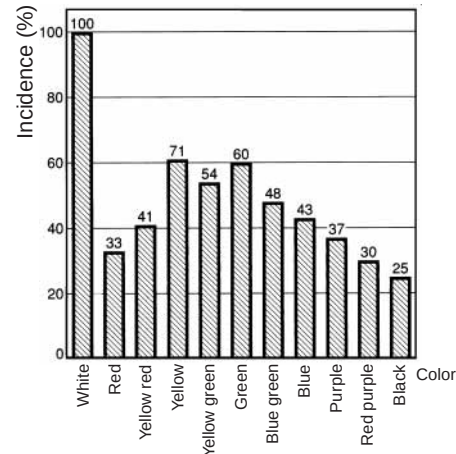


Color Sensing Capacity
E3M-VG□□

	White	Red	Yellow red	Yellow	Yellow green	Green	Blue green	Blue	Purple	Red purple	Black
White	○	○	○	○	○	○	○	○	○	○	○
Red	○	○	○	○	○	○	○	○	○	X	△
Yellow red	○	○	○	○	○	○	○	○	X	○	○
Yellow	○	○	○	○	○	○	○	○	○	○	○
Green yellow	○	○	○	○	○	○	○	○	○	○	○
Green	○	○	○	○	○	○	○	○	○	○	○
Blue green	○	○	○	○	○	○	○	△	○	○	○
Blue	○	○	○	○	○	○	△	○	△	○	○
Purple	○	○	X	○	○	○	○	△	○	○	○
Red purple	○	X	○	○	○	○	○	○	○	○	X
Black	○	△	○	○	○	○	○	○	○	X	○

○: Detectable △: Detectable but unstable X: Not detectable

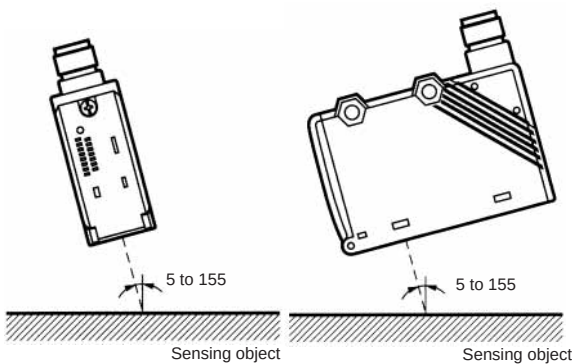
Differences in Incident by Color



Technical Guide

Glossy Sensing Objects

Incline the Sensor to detect glossy objects so that the Sensor will not be influenced by the mirror reflection of light and to ensure the stable sensing operation of the E3M-V.

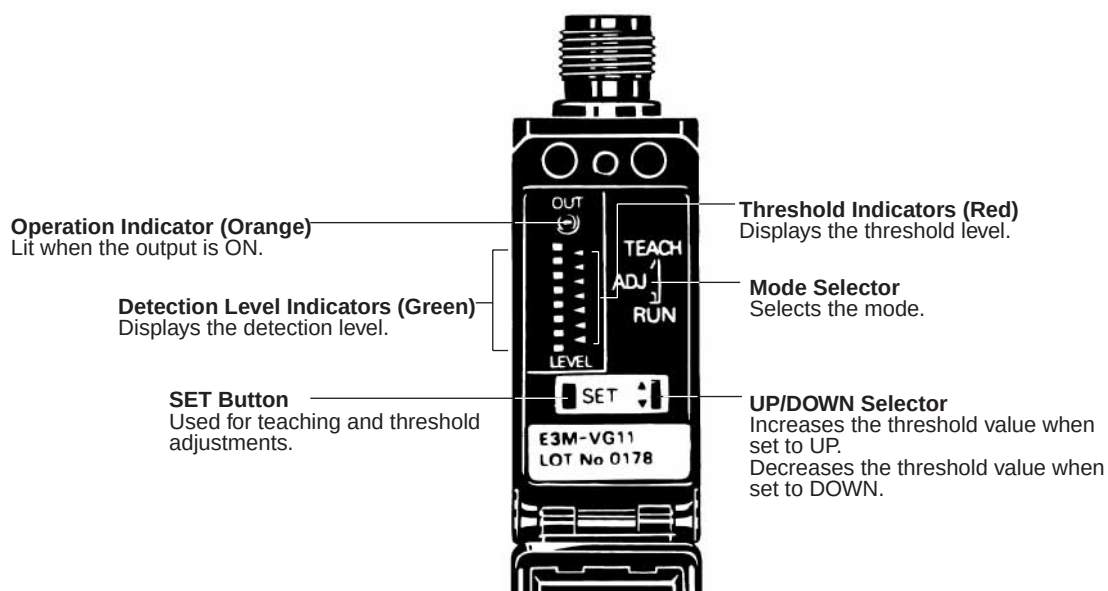


Standard Sensing Object (Color vs. Munsell)

Japan Color Enterprises Standard Color Card 230

11 standard colors	Munsell color notation
White	N9.5
Red	4R, 4.5/12.0
Yellow red	4YR, 6.0/11.5
Yellow	5Y, 8.5/11.0
Yellow green	3GY, 6.5/10.0
Green	3G, 6.5/9.0
Blue green	5BG, 4.5/10.0
Blue	3PB, 5.0/10.0
Purple	7P, 5.0/10.0
Red purple	6RP, 4.5/12.5
Black	N2.0

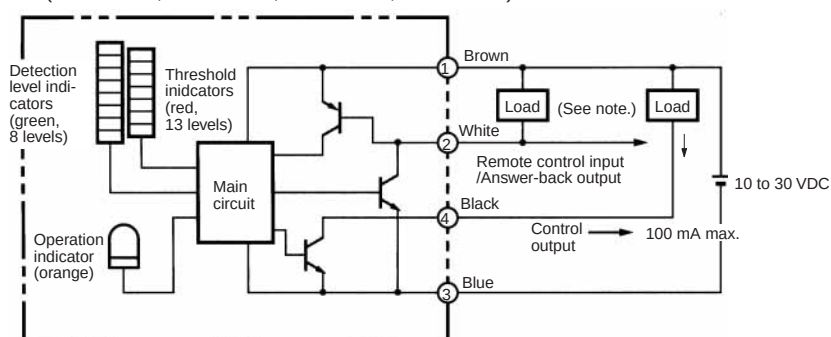
Nomenclature



Operation

Output Circuits

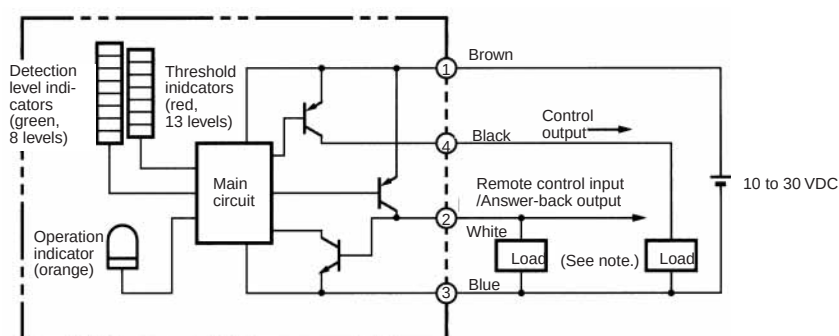
NPN (E3M-VG11, E3M-VG12, E3M-VG21, E3M-VG22)



Connector Pin Arrangement



PNP (E3M-VG16, E3M-VG17, E3M-VG26, E3M-VG27)



Adjustments

Adjustment Steps

1. Install, wire, and turn ON the Photomicrosensor.
2. Perform teaching (mark registration). Refer to *Mark Registration (Teaching)*.

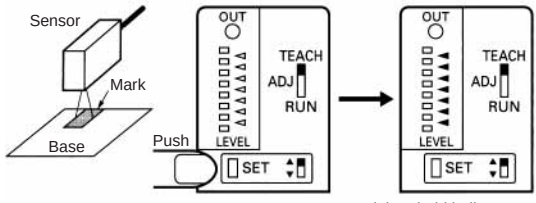
Mark Registration (Teaching)

Refer to the following for ideal teaching.

Application		
The base has a color pattern. The mark and base are clearly different in color.	The base has no color pattern. The mark and base are slightly different in color.	The base has no color pattern. Remote teaching with no positioning is desired.
One-point teaching	Two-point teaching	Auto-teaching
The default level is set and the output is ON when the mark is detected.	The threshold level is set between the color of the mark and base. The output is ON when the mark is detected.	The threshold level is set between color of the mark and base. The output is ON when the mark (i.e., the color with shorter passing time) is detected.

Refer to the following for each teaching method. Remote one- or two-point teaching is possible. Refer to *Remote Control Function*.

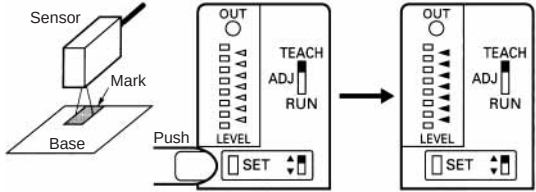
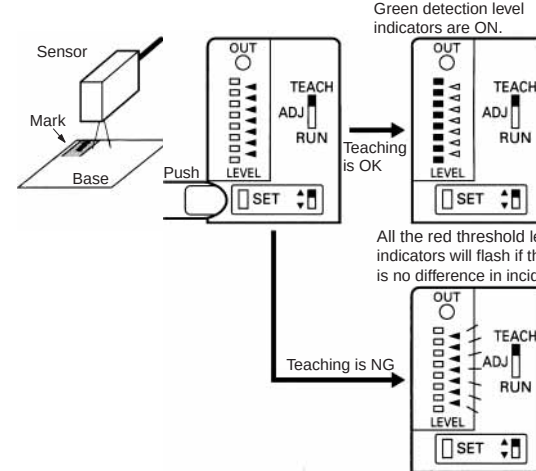
One-point Teaching

1	Set the mode selector to TEACH.
2	Locate the mark to the sensing position and press the SET button. Then all the red threshold indicators are ON.
	
3	Set the mode selector to RUN. The output will be ON whenever the set mark is detected.

Note: By teaching on the base, reversed output as shown above (base: ON, mark: OFF) can be obtained.

3. Make fine adjustments of the threshold level if necessary. Refer to *Threshold Level Adjustments* on page A-134 .
4. Check that the mode selector is set to RUN.

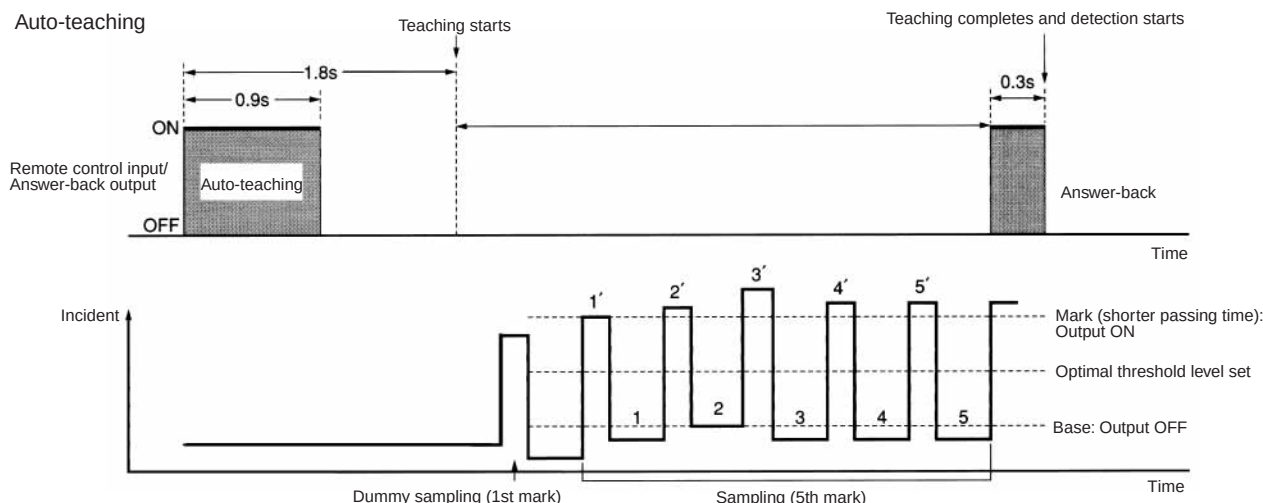
Two-point Teaching

1	Set the mode selector to TEACH.
2	Locate the mark to the sensing position and press the SET button. All the red threshold indicators will turn ON.
	
3	If teaching is successful, move the mark and press the SET button at the base. • If teaching is successful, all the green detection level indicators are ON. • If teaching is unsuccessful, all the red threshold level indicator flash.
	
4	If teaching is successful, set the mode selector to RUN to complete the teaching operation. If teaching is unsuccessful, restart from the above step 2.

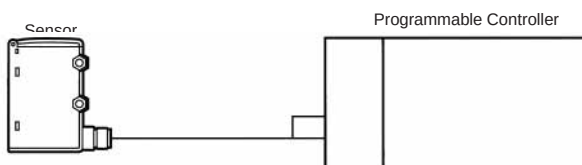
Note: Follow the above steps so that the output will be turned ON whenever the mark is detected. By taking the opposite steps, the output will be turned OFF whenever the mark is detected and turned ON whenever the base is detected.

Auto-teaching

1. Check that the mode selector is set to either RUN or ADJUST.
2. Input a 0.9-s pulse signal into the remote control I/O terminal.¹
3. Auto-teaching starts when the mark is moved. When the mark passes six times, auto-teaching completes.
 - If teaching is successful, answer-back output from the remote control I/O terminal will turn ON for 0.3 s.
 - If teaching is unsuccessful, no answer-back signal will be output. Readjust using two-point teaching.
 (Teaching will be unsuccessful if there is no difference in incident between the mark and base.)
4. If the answer-back signal is ON, the whole teaching operation will be completed. The output will be turned ON whenever the mark (i.e., the color with shorter passing time) is detected.



Example of Connection to Programmable Controller



Note: Be sure to connect the E3M-V to the Programmable Controller as shown above.

Precautions when Using Automatic Teaching

Incorrect discrimination may be caused by automatic teaching in the following cases. Use one-point or two-point teaching in such cases.

- Color patterns exist in the base.
- Sensing objects change their positions.
- Sensing objects have protrusions or surface level differences.

Threshold Level Adjustments

It is possible to make fine adjustments of the threshold level after teaching. Such fine adjustments can be made remotely as well. Refer to *Remote control Function (Bank Selection, Mark Registration, and Threshold Adjustments)* on page A-135.

- 1 Set the mode selector to ADJUST
 Select the upper or lower threshold selector. Whenever the SET button is pressed, the threshold level will move. Two indicators will be lit together when the threshold level is an even level.
- 2

Threshold indicators	1	2	3	4	5	6	7	8	9	10	11	12	13
Threshold level	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲
- 3 After setting the level, set the mode selector to RUN.

¹ Make sure that the input tolerance of each pulse is within ± 0.1 s.

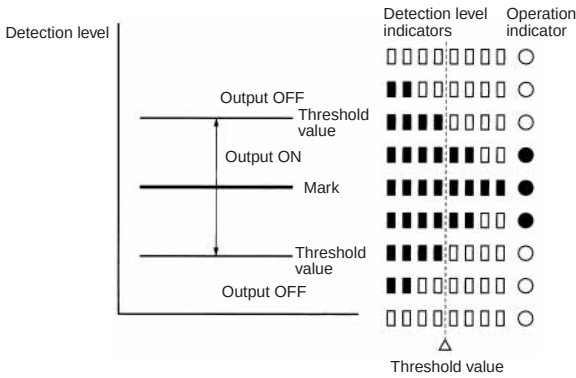
Detection Level Indicator

Detection Level Indicator

The control output of the E3M-V will be turned ON if the detection level exceeds the threshold level. The indication of the detection level varies with the teaching method.

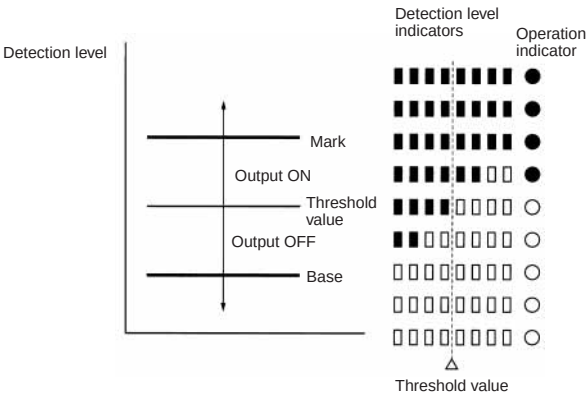
One-point Teaching

The upper and lower threshold values are set on the basis of the mark and the detection level indicators indicate the degree of color conformity to the mark's color.



Two-point or Auto-teaching

A single threshold value is set between the mark (registered first) and the base (registered next). The detection level indicators indicate the tolerance between the mark and base.

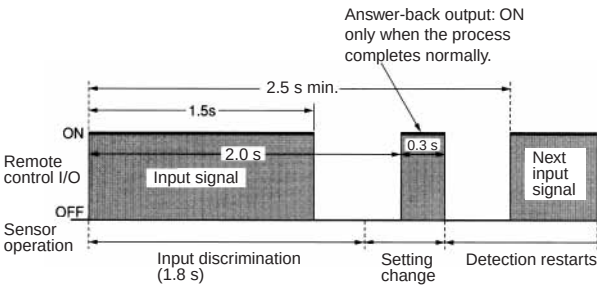


Remote control Function (Bank Selection, Mark Registration, and Threshold Adjustments)

Under Run Mode or Adjust Mode

The input of any of the signals listed in the following table into the remote control I/O terminal allows remote control of the E3M-V. When the signal is accepted, answer-back output will be turned ON for 0.3 s. Only in the case of one-point teaching, however, can the signal be manually input, provided that the input is ON for 1.5 s or more.

Timing Chart



Note: If Signals are sent continuously, make sure that there is an interval of 2.5 s between signal inputs as shown above.

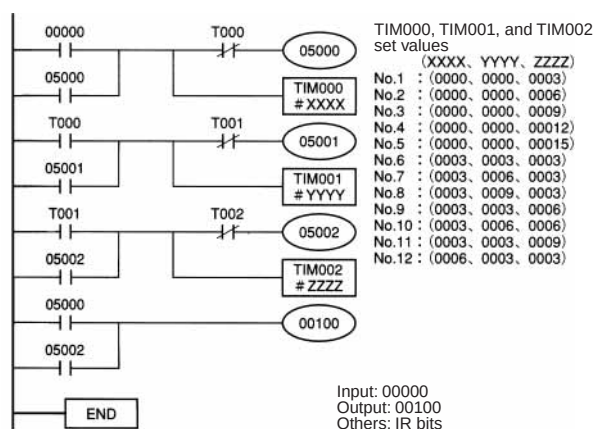
Control Signals

No.	Control signal	Function
1	ON 0.3s OFF	Bank 1 is selected (operation indicator OFF in TEACH mode)
2	ON 0.6s OFF	Bank 2 is selected (operation indicator ON in TEACH mode)
3	ON 0.9s OFF	Auto-teaching
4	ON 1.2s OFF	Two-point teaching (1st and 2nd)
5	ON 1.5s OFF	One-point teaching (or input for 1.5 s min.)
6	ON 0.3s 0.3s 0.3s OFF	Threshold level 1 is selected.
7	ON 0.3s 0.6s 0.3s OFF	Threshold level 3 is selected.
8	ON 0.3s 0.9s 0.3s OFF	Threshold level 5 is selected.
9	ON 0.3s 0.3s 0.6s OFF	Threshold level 7 is selected.
10	ON 0.3s 0.6s 0.6s OFF	Threshold level 9 is selected.
11	ON 0.3s 0.3s 0.9s OFF	Threshold level 11 is selected.
12	ON 0.6s 0.3s 0.3s OFF	Threshold level 13 is selected.

Note: The input error of each signal pulse must be within ± 0.1 s

Ladder Program Example

Control signals are input by a ladder program as shown below.

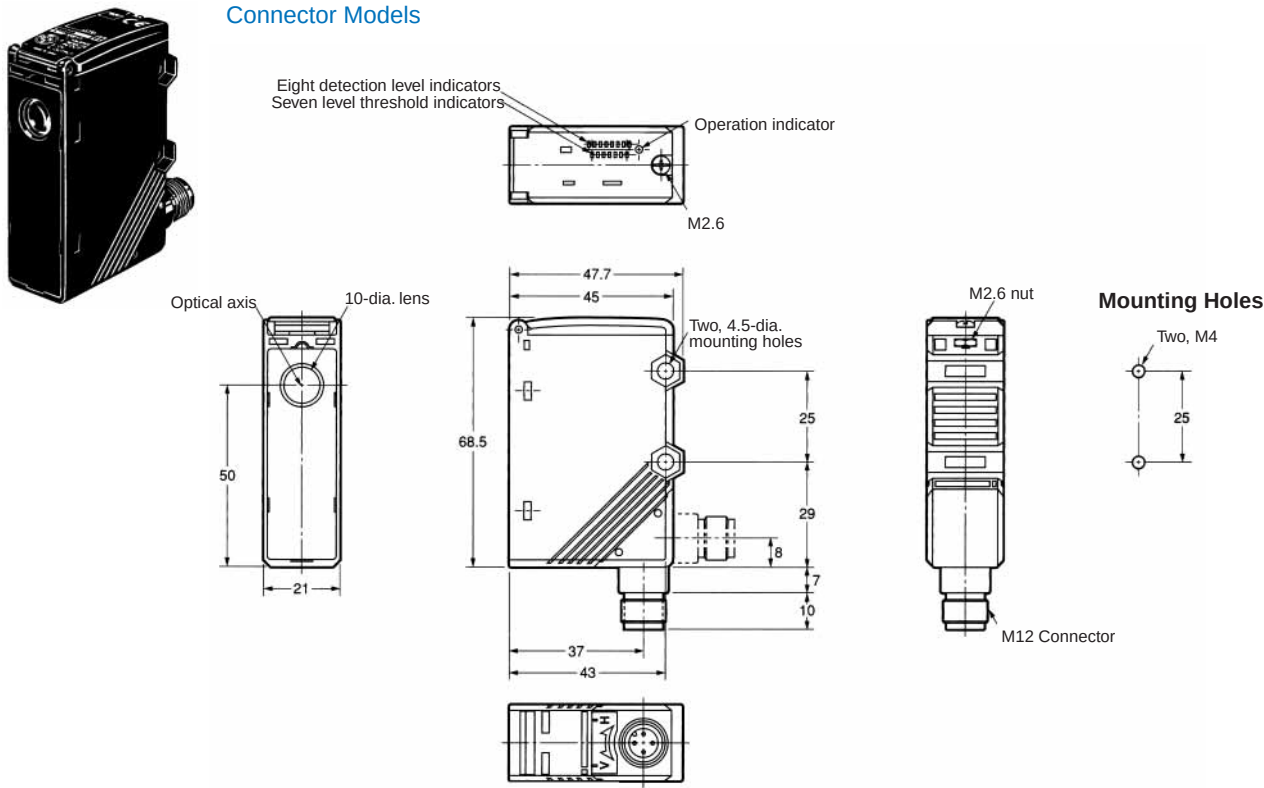


Dimensions

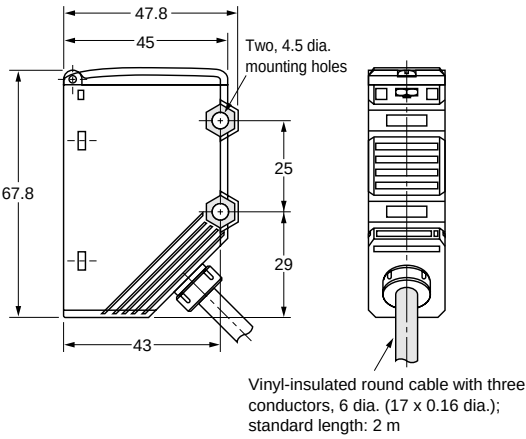
Note: All units are in millimeters unless otherwise indicated.

Mark Sensors

Connector Models



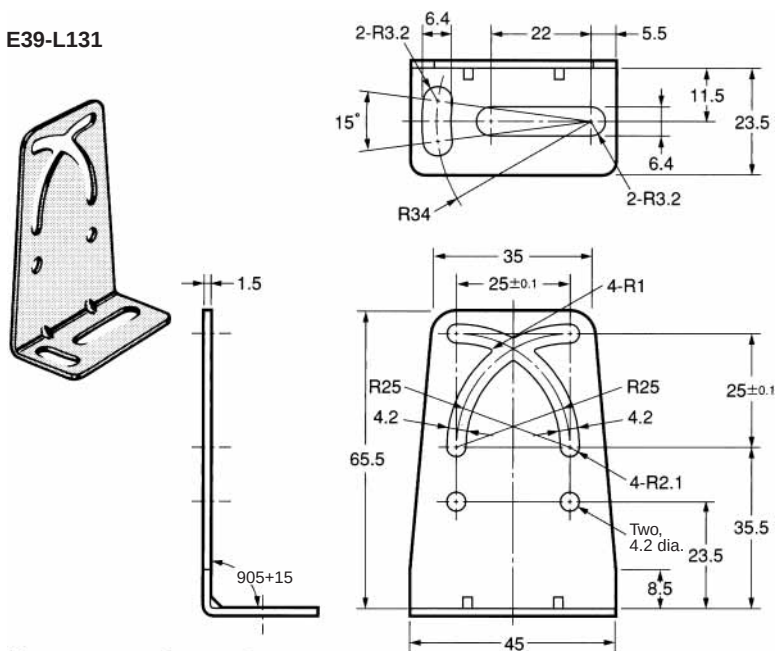
Pre-Wired Models



Accessories (Order Separately)

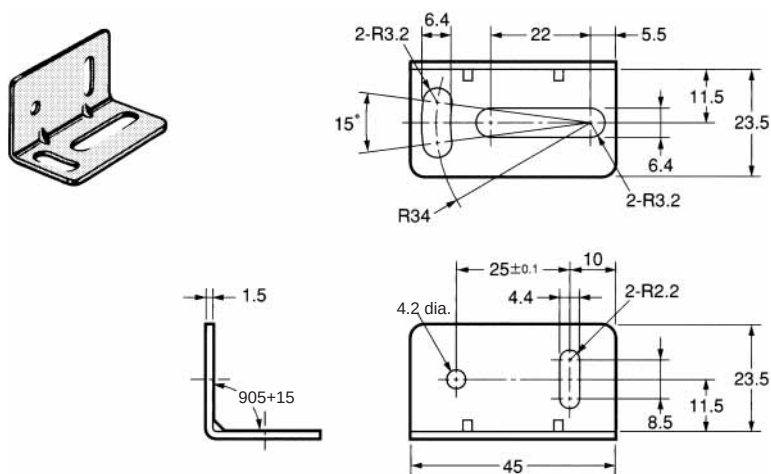
Mounting Brackets

E39-L131



Material: Stainless steel (SUS304)

E39-L132

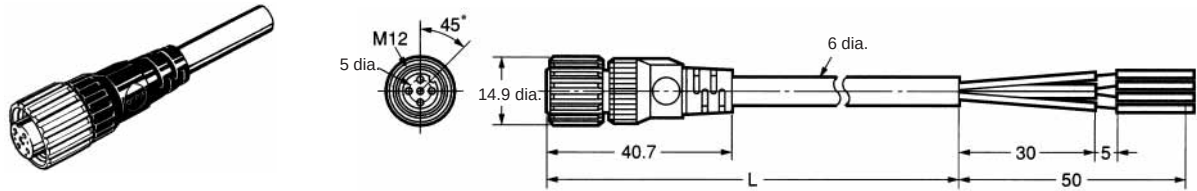


Material: Stainless steel (SUS304)

Sensor I/O Connectors

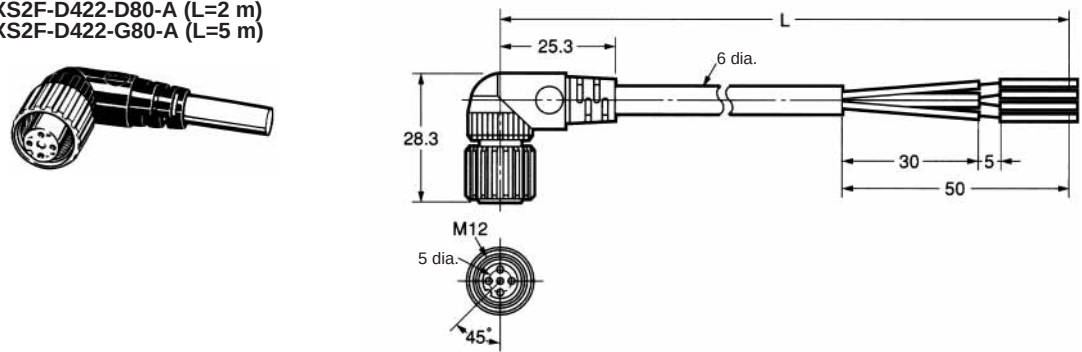
Single-end Connector (Straight Model)

XS2F-D421-D80-A (L=2 m)
XS2F-D421-G80-A (L=5 m)



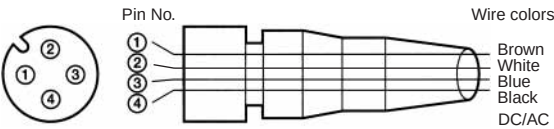
Single-end Connector (L-shaped Model)

XS2F-D422-D80-A (L=2 m)
XS2F-D422-G80-A (L=5 m)



Installation

Sensor I/O Connector



Note: 1. pin No. 2 is not used.
2. For details, refer to the *Sensor I/O Connectors Catalog* (X065)

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

Precautions

Observe the following precautions to ensure safety.

- Do not use the Sensor in locations subject to flammable or explosive gases.
- Do not use the Sensor in water or conductive solution.
- Do not disassemble, repair, or modify the Sensor.
- Use the Sensor under proper power supply specifications such as the use of AC or DC power supply.
- Do not apply any voltage or current exceeding the rated level.
- Be careful with the power supply polarities and wire correctly.
- Connect the loads correctly.
- Do not short-circuit both ends of loads.

Correct Use

Installation

Power Reset Time

Since the E3M-V is ready to detect objects from 100 ms max. after the E3M-V is turned ON, operate the remaining devices 100 ms after the Sensor is turned ON. If power is supplied to the E3M-V and the load independently, be sure to turn on the E3M-V first.

Power OFF

The E3M-V may output a single pulse when the control power supply is turned OFF. If the E3M-V is connected to a timer or counter to which power is supplied from an independent power supply, the E3M-V will be more likely to output a single pulse when the control power supply is turned OFF. Therefore, supply power to the timer or counter from the same power supply for the E3M-V.

Power Supply Type

No full-wave or half-wave rectified power supplies can be connected to the E3M-V.

Power Supply Connection

Be sure to ground the FG (frame ground) and G (ground) terminals if a switching regulator is connected to the E3M-V, otherwise the E3M-V may malfunction due to the switching noise of the switching regulator.

Wiring

Cable

The cable can be extended up to 100 m provided that the thickness of the cable is 0.3 mm² minimum.

Repeated Cable Bending

The cable must not be bent repeatedly.

High-tension Lines

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

Cable Pulling Force

Do not pull cables with pulling forces exceeding 50N.

Mounting

Screw Tightening

Make sure that the casing is tightened to a maximum torque of 1.2 N·m.

Mounting Direction

When Sensors are mounted to face each other, make sure to adjust the optical axes so that the Sensors will not be mutually interfered.

Others

EEPROM Write Error

An EEPROM error may result if power supply to the Sensor fails or the Sensor is influenced by static noise, in which case the threshold level indicators will flash. Perform the teaching and threshold level setting of the E3M-V again.

M12 Metal Connector

Make sure to connect or disconnect the metal connector after turning off the E3M-V.

Make sure to hold the connector cover when connecting or disconnecting the metal connector.

Tighten the metal connector securely by hand. Do not use any tool, such as pliers, otherwise the metal connector may be damaged.

If the metal connector is not tightened securely, the metal connector may be disconnected by vibration and the proper degree of protection of the E3M-V may not be maintained.

Color sensor (LED type)

E3MC

RGB Color Sensor Discriminates Delicate Differences in Color.

CE

Features



Double Indication ensuring high visibility.

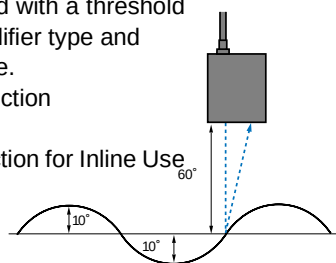
- Conformity with the registered colors can be monitored at eight levels. (Detection level indicators)
- Allows fine adjustment between fine or rough discrimination while monitoring the measured results. (Threshold level indicators)

Stable and Powerful Detection for Inline Use

Stable detection is assured with a threshold of ± 10 mm for built-in amplifier type and ± 4 mm for optical fiber type.

Fiber type and Stable detection ± 4 mm.

Stable and Powerful Detection for Inline Use
Mounting is easy.



Long-distance Sensing with Built-in Amplifier Type

Built-in amplifier type with a sensing distance of 60 ± 10 mm is available for a wide range of color discriminating applications.

Highly Resistant to Changes in Sensing Object Brightness and Ambient Temperature.

- OMRON's unique Free Angle Optics (FAO: multi-layer polarized filter) is highly resistant to changes in the tint or brightness of sensing objects. Capable of discriminating over 90 different colors.
- Wide temperature range from -20°C to 55°C and excellent detection stability.

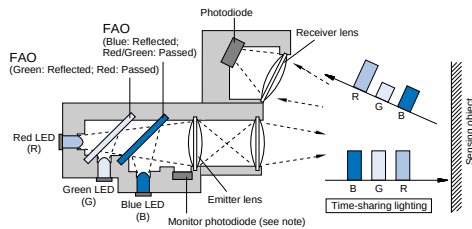
Maintenance-free LED Light Source

Incorporates RGB LED light sources with a long service life more than several tens of thousand hours.

Great maintenance-cost saver ensuring high performance (Halogen lamps used as light sources must be replaced or re-adjusted every nine months or so.)

Principle of Detection

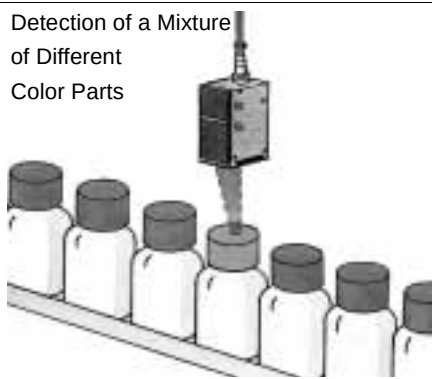
The E3MC detects colors by making use of the fact that the reflection ratio of a primary color (i.e. red, green or blue) reflected by an object varies with the chromatically of the object. By using a high-tech, multi-layer polarized filter called FAO (free angle optics), the E3MC emits red, green and blue light on a single optical axis. The E3MC receives the light reflected by the sensing objects through the receiver and processes the red-green-blue ratio of the light to discriminate the color of the sensing object.



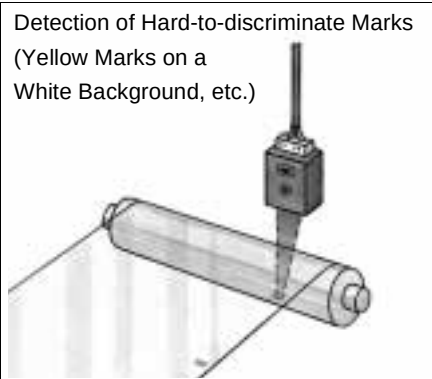
Note: The monitor photodiode compensates LED output deviation that may be caused by a temperature change. (Patent pending)

Application

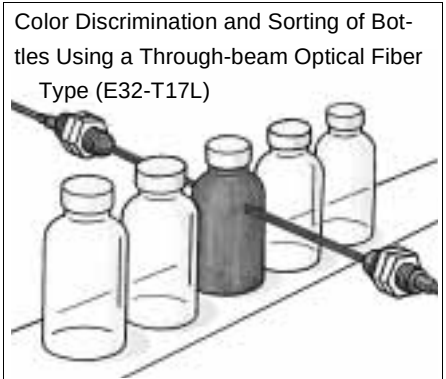
Detection of a Mixture of Different Color Parts



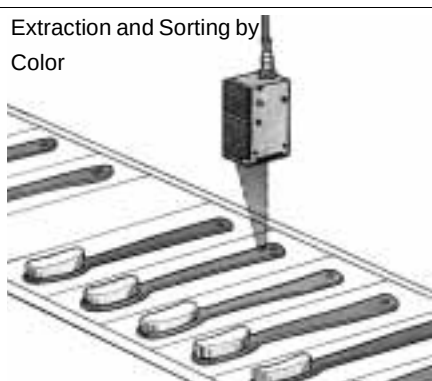
Detection of Hard-to-discriminate Marks (Yellow Marks on a White Background, etc.)



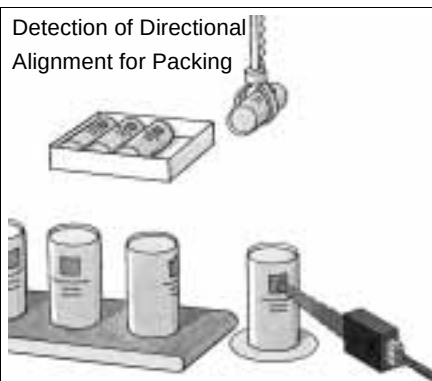
Color Discrimination and Sorting of Bottles Using a Through-beam Optical Fiber Type (E32-T17L)



Extraction and Sorting by Color



Detection of Directional Alignment for Packing



Detection of Small Marks Using a Reflective Optical Fiber Type (E32-CC200)



Features

Excellent Protective Structure and Maintenance Performance

The amplifier unit uses a sturdy metal body. The unit including the fiber head satisfies the water resistance of IEC Standard IP66. You can use the E3MC without any problems in a wide range of applications. In addition to this, the M12 metal connector has improved maintenance performance.

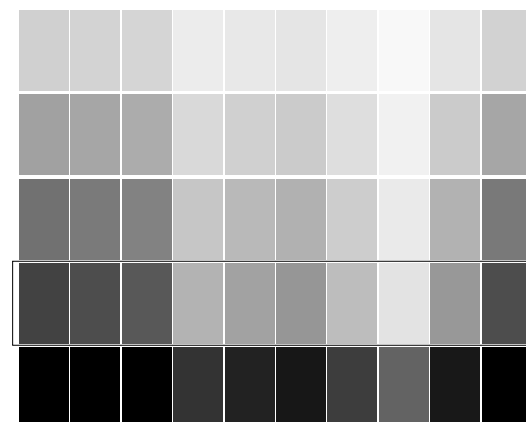
Discriminating Delicate Color Differences

The detection level indicators are lit according to the degree of conformity between registered and detected colors. Delicate color differences are discriminated by setting the threshold to a superior level. (Fine discrimination is expected.)

Sensor errors that may be caused by minor tint differences or dirt retention are prevented by setting the threshold to a lower level. (Rough discrimination is expected)



Color Chart



 For details, refer to the standard sensing object.

Conversion of Color Data into RGB Analog Data

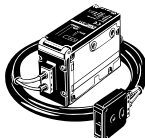
The analog output type can control the color change history and distribution in analog form. Different type discrimination can also be performed without bank restrictions by CPU processing.

Ordering Information

Sensors

ON/OFF type

 Red light, Green light, Blue light

Structure	No. of outputs	Shape	Connection method	Sensing distance		Model	
						NPN output	PNP output
Built-in Amplifier Type	1		Connector type Sensor I/O connector (cable length 2 m) is supplied.	 60±10mm		E3MC-A11	E3MC-A41
	4					E3MC-MA11	E3MC-MA41
Optical Fiber Type	1			 20±4mm		E3MC-X11	E3MC-X41
	4					E3MC-MX11	E3MC-MX41
General-purpose Optical Fiber Type	1			E32-CC200  5mm	*	E3MC-Y11	E3MC-Y41
	4			E32-T16  200mm		E3MC-MY11	E3MC-MY41

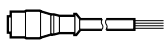
* Distance where 11 colors of standard sensing objects can be discriminated. As a typical example, 9 colors can be discriminated when 12 mm is set. Please contact us since the sensing distance should be defined.

Analog output type

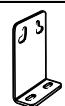
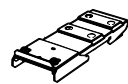
Structure	Shape	Sensing distance	Model
Built-in Amplifier Type		 60±10mm	E3MC-A81
Optical Fiber Type		 20±4mm	E3MC-X81
General-purpose Optical Fiber Type		Using E32-CC200  5±1mm	E3MC-Y81

Accessories (Order Separately)

Sensor I/O Connectors

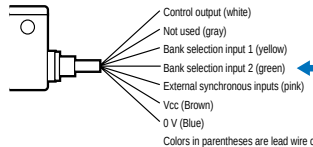
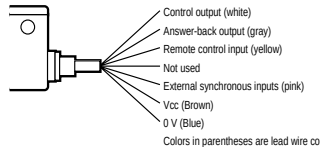
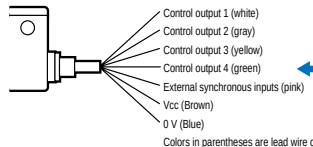
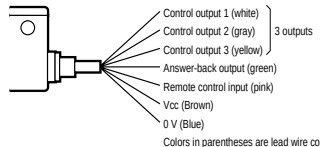
Shape	Model	Quantity	Remarks
	E39-C1 2M (2 m)	1 pc.	Supplied with the product.
	E39-C1 5M (5 m)	1 pc.	Please place an order when extending the cable.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L114	2	For E3MC installation. (Can be inclined to 15°)
	E39-L115	1	For DIN track installation.

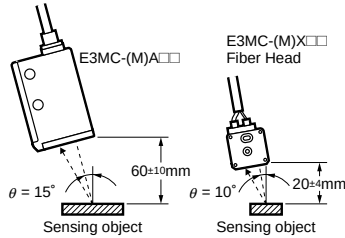
Rating/performance

ON/OFF type

Item	Structure Model	Built-in Amplifier Type		Optical Fiber Type		General-purpose Optical Fiber	
		E3MC -A□1	E3MC -MA□1	E3MC -X□1	E3MC -MX□1	E3MC -Y□1	E3MC -MY□1
Sensing distance		60±10 mm*1		20±4 mm		Depends on the recommended fiber. Refer to page AB- for details.	
Standard sensing object		*2					
Spot diameter		12 dia.		3-mm dia.		-	
Light source (wave length)		Red LED (680 mm), green LED (525 mm), blue LED (450 mm)					
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) : 10% max.					
Current consumption		100 mA max.					
Control output		Load supply voltage 24 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2.0 V max.) Open collector output type					
Color discrimination mode		Mode C: RGB ratio detection, Mode I: RGB light intensity detection Switch selectable					
Output type		Conformity output: Output is ON when the detected color coincides with the registered color. Non-conformity output: Output is ON when the detected color does not coincide with the registered color. Switch selectable					
Mode selection		E3MC-□11/-□41 Mode A (Factory-set)  Colors in parentheses are lead wire colors. Mode B (for remote teaching)  Colors in parentheses are lead wire colors. E3MC-M□11/-M□41 Mode A (Factory-set)  Colors in parentheses are lead wire colors. Mode B (for remote teaching)  Colors in parentheses are lead wire colors.					
Remote control input (B mode only)		The following control is performed according to the control signal input. • E3MC-□11/-□41□ Bank selection, remote teaching, or threshold selection • E3MC-M□11/-M□41□ channel selection, remote teaching, threshold changing					
Answer-back output (B mode only)		Load current: 100 mA max. • NPN open collector output with a residual voltage of 1.2 V max. • PNP open collector output with residual voltage 2.0 V max. (E3MC-(M)A41/-(M)X41/-(M)Y41)					
Bank selection input (1 output only)		Selected between 4 banks (switching with the bank selection input and select button) Bank selection input response time: 50 ms max.					
External synchronous input		Response time: 1 ms max. (Note that the 4 output type cannot be used when the B mode is selected)					
Protective circuits		Protection from load short-circuit and reversed power supply connection					
Response time		1 output type: Standard mode: 3 ms max., high-speed mode: 1 ms max. (switch selectable) 4 output type: Standard mode: 6 ms max., high-speed mode: 2 ms max. (switch selectable)					
Discriminating color registration		4 colors can be registered, teaching system (threshold permits fine adjustment)					
Timer function		OFF delay fixed at40 ms (ON/OFF switch selectable)					
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.					
Ambient temperature		Operating: -20 to 55°C, Storage: -30 to 70°C (with no icing)					
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
Permissible fiber bending radius		-		10 mm min.		Varies with the type of recommended fiber	
Insulation resistance		20 M Ω min. at 500 VDC					
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute					
Vibration (resistance) *3		Destruction: 10 to 55 Hz, 1.0 mm double amplitude or 150 m/s ² for 2 hrs each in X, Y, and Z directions					

Structure Model		Built-in Amplifier Type		Optical Fiber Type		General-purpose Optical Fiber	
		E3MC -A□1	E3MC -MA□1	E3MC -X□1	E3MC -MX□1	E3MC -Y□1	E3MC -MY□1
Shock (resistance) *4		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions					
Protective structure		IEC 60529 IP66 (with Protective Cover attached)					
Connection method		Connector type [sensor I/O connector (cable length 2 m)]					
Weight (Packed state)		Approx. 350 g		Approx. 400 g		Approx. 350 g	
Material	Case	Zinc die-cast					
	Operation panel cover	PES					
	Fiber head	-		ABS		-	
Accessories		Cross-shaped recess screw M5x6 (with spring washer), sensor I/O connector (cable length 2 m), instruction manual					

*1. C mode, standard mode (response time), threshold: Distance range where 11 colors of standard sensing objects can be discriminated when $\theta = 15^\circ$ (E3MC-(M) A□□) or $\theta = 10^\circ$ (E3MC-(M) X□□) in the following figure in the standard mode.



*2. Standard Sensing Objects

Color (11 standard colors)	Munsell color notation
White	N9.5
Red	4R 4.5/12.0
Yellow/red	4YR 6.0/11.5
Yellow	5Y 8.5/11.0
Yellow/green	3GY 6.5/10.0
Green	3G 6.5/9.0
Blue/green	5BG 4.5/10.0
Blue	3PB 5.0/10.0
Blue/purple	9PB 5.0/10.0
Purple	7P 5.0/10.0
Red/purple	6RP 4.5/12.5

*3. 0.75-mm double amplitude or 100 m/s² when using a mounting bracket

*4. 300 m/s² when using a mounting bracket

Rating/Performance

Analog output type

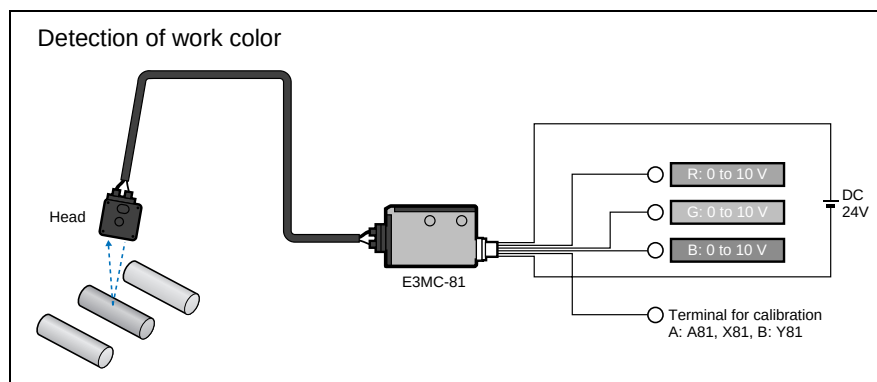
Item	Structure Model	Built-in Amplifier Type	Optical Fiber Type	General-purpose Optical Fiber Type
		E3MC-A81	E3MC-X81	E3MC-Y81
Sensing distance *1		60±10 mm	20±4 mm	5 ±1mm (When using the E32-CC200)
Spot diameter		12 dia.	3-mm dia.	Varies with the recommended fiber.
Light source (wave length)		Red LED (680 nm), green LED (525 nm), blue LED (450 nm)		
Power supply voltage		24 V DC ±10%, ripple (p-p) 10% or less		
Power consumption		100 mA max.		
Control output		3 analog independent outputs (RGB) 0 to 10 VDC without output short-circuit protection		
	Resolution	300 mV max.		
	Load current	5 mA max.		
	Response speed	1.7 ms max.		
	Temperature drift	±0.3% FS/°C max.		
	Power restoration time	100 ms max. after power-on		
Calibration input A, B		24 VDC		
	Signal	1 ms (24 VDC, HIGH active)		
	Response time	600 ms max.		
	Calibration value	Terminal A: 10±0.2V		Terminal B: 7±0.2V
Protective circuits		Reverse polarity protection		
Ambient illuminance		Incandescent lamp: Illumination on optical spot: 1,000 lux max.		
Ambient temperature		Operating: 0°C to 50°C, Storage: -30°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)		
Permissible fiber bending radius		---	10 mm min.	Varies with the type of recommended fiber
Insulation resistance		20 M Ω min. at 500 VDC		
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute		
Vibration (resistance) *2		Destruction: 10 to 55 Hz, 1.0 mm double amplitude or 150 m/s ² for 2 hrs each in X, Y, and Z directions		
Shock (resistance) *3		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions		
Protective structure		IEC 60529 IP66 (with Protective Cover attached)		
Connection method		M12 dedicated connector type		
Weight (Packed state)		Approx. 300 g	Approx. 350 g	Approx. 300 g
Material	Case	Zinc die-cast		
	Cover	PES		
	Fiber head	ABS		
Accessories		Connection cable 2 m (E39-C1), instruction manual		

*1. Distance range where calibration can be made with standard white paper (N9.5).

*2. 0.75 mm double amplitude or 100 m/s² when using a mounting bracket

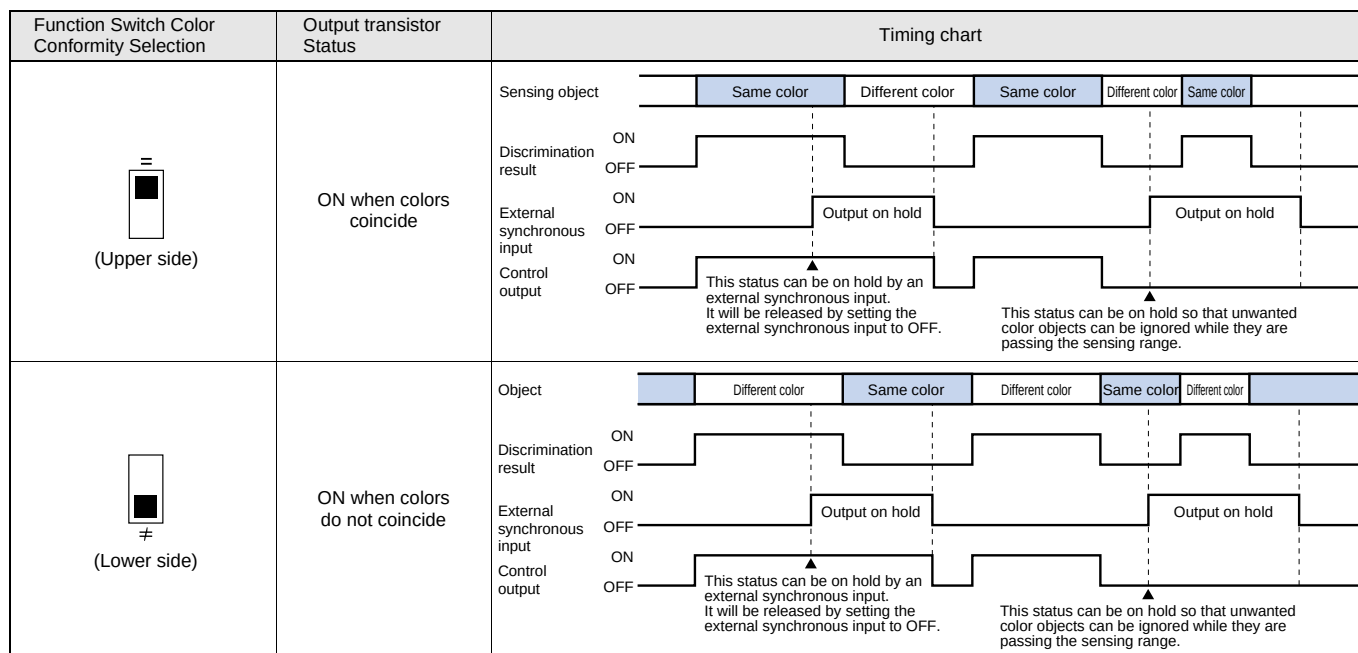
*3. 300 m/s² when using a mounting bracket

Use (Typical)

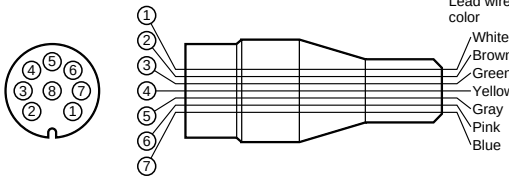


Timing chart

ON/OFF type



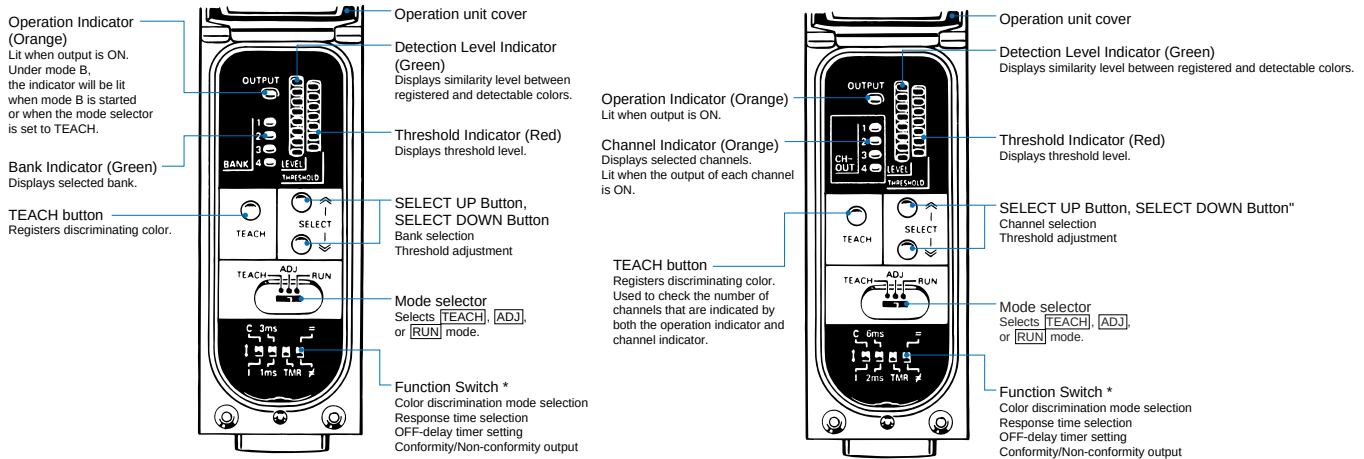
Connectors (Sensor I/O connectors)

Model	Internal Wiring	Pin No.	Wire color	ON/OFF type A mode		Analog output
				E3MC-□11, E3MC-□41	E3MC-M□11, E3MC-M□41	
E39-C1 2M (2 m) E39-C1 5M (5 m)	 Note: Pin 8 is not used.	①	White	Output	Output 1	Calibration B
		②	Brown	Power supply (+V)	Power supply (+V)	Power supply (+V)
		③	Green	Bank selection input 2	Output 4	Analog output G (green)
		④	Yellow	Bank selection input 1	Output 3	Calibration A
		5	Gray	-	Output 2	Analog output B (blue)
		6	Pink	External synchronous input	External synchronous input	Analog output R (red)
		7	Blue	Power supply (0 V)	Power supply (0 V)	Power supply (0 V)

Part Names/Functions

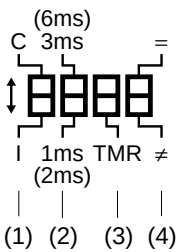
ON/OFF type

E3MC-A□□ (1 output Models)
 E3MC-X□□ (1 output Models)
 E3MC-Y□□ (1 output Models)
 E3MC-MA□□ (4 output Models)
 E3MC-MX□□ (4 output Models)
 E3MC-MY□□ (4 output Models)



* Function Switches (Setting of various functions)

The following settings can be made with the function switches. (Settings can be made in the [RUN] mode or [ADJ] mode.)
 (For the 4 output type, all channels are the target of settings.)



① Color Discrimination Mode Selection (Mode C is recommended for normal applications.)

- ☐ Mode C: Color discrimination is performed according to R (red), G (green), and B (blue) ratio of the reflection light even if the sensing objects fluctuate up and down within the rated sensing range.
- ☐ I (Mode I): Color discrimination is performed according to the light intensity. This mode ensures a finer color (similar colors or neutral color such as white, gray or black) discrimination than mode C.

2. Response Time Selection (Note: Figures in parentheses are for the 4 output models.)

- ☐ 3 ms (6 ms): E3MC provides a stable detection of minute differences of color. Set the response time to 3 ms for usual applications.
- ☐ 1 ms (2 ms): E3MC will be in quick-response operation. Set the response time to 1 ms if high-speed response is required.

3. OFF-delay Timer Setting

- ☐ No indication: No timer setting
- ☐ TMR: A 40 ms OFF delay timer is set for control output.

4. Conformity/Non-conformity Output

- ☐ =: Output is ON when the detected color coincides with the registered color.
- ☐ ≠: Output is ON when the detected color does not coincide with the registered color.

Note: Each pin of the function switch is factory-set to the upper position.

Analog output type

Power indicator only

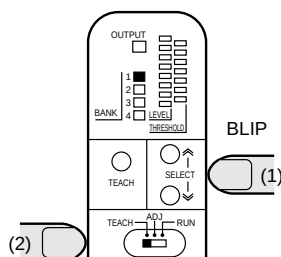
Operation

ON/OFF type

Setting Procedure

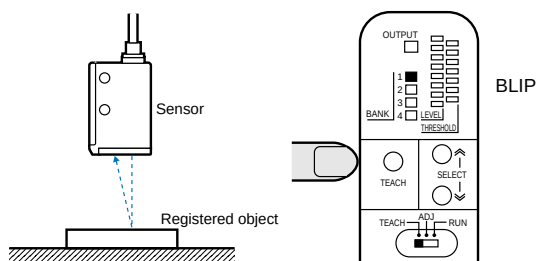
1-output Models (E3MC-A□□/E3MC-X□□/E3MC-Y□□)

1. Bank Selection



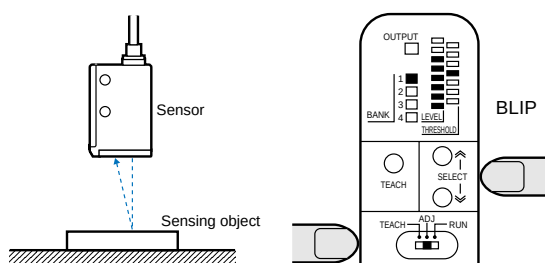
Set the Mode Selector to the **TEACH** mode and then select the BANK using the SELECT button.

2. Color Registration



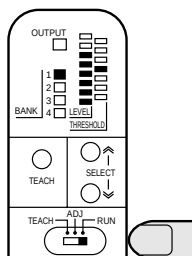
Locate the registered object at the detection point and press the TEACH button.

3. Threshold Adjustment (If Required)



Place the sensing object, press the SELECT button in the **ADJ** mode, and make adjustment. (Adjustment can be made without a sensing object.) The bank selected in the **ADJ** mode is the bank selected in the **TEACH** or **RUN** mode.

Operation

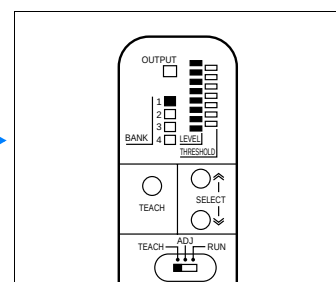


Make measurement in the **RUN** mode. The registered color can be selected with bank selection input.

OK

No
Good

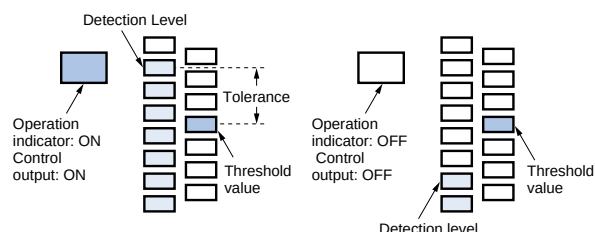
If color registration has not been completed, all red threshold indicators (red) flicker.



All detection level indicators (green) turn ON. At this time, the threshold is set to 4.

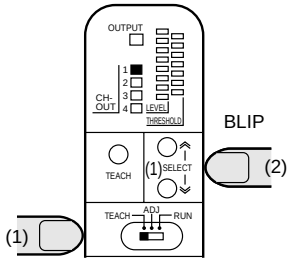
Detection Level and Tolerance

As the detected color becomes closer to the registered color (colors look alike), the number of lit detection level indicators (green) increase. The control output will turn ON if the detection level (green) exceeds the threshold level (red) and turn OFF if the detection level does not exceed the threshold level. (For conformity output setting) Set the threshold to a higher level for highly-precise color discrimination or to a lower level to allow margins for discriminated colors (ignore minor tint differences, dirt retention or like).



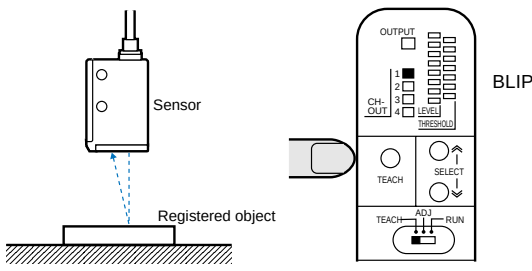
4 output Models (E3MC-MA□□/E3MC-MX□□/E3MC-MY□□)

1. Channel Selection



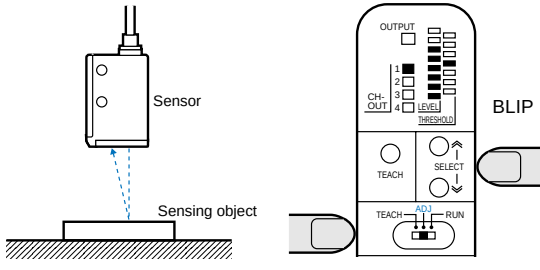
Set the Mode Selector to the **TEACH** mode and then select the channel using the **SELECT** button.

2. Color Registration



Locate the registered object at the detection point and press the **TEACH** button.

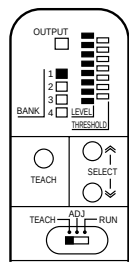
3. Threshold Adjustment (If Required)



ADJ

(Adjustment can be made without a sensing object)
The bank selected in the **ADJ** mode or **TEACH** mode will become the bank for the **RUN** mode.

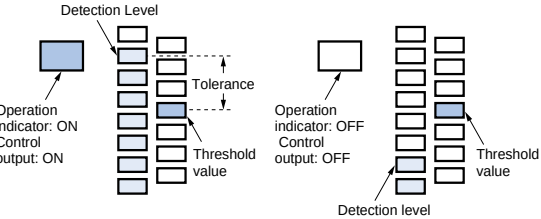
OK



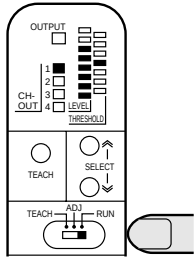
All detection level indicators (green) turn ON.
The threshold is set to 4.

Detection Level and Tolerance

As the detected color becomes closer to the registered color (similar colors), the number of lit detection level indicators (green) increase. The control output will turn ON if the detection level (green) exceeds the threshold level (red) and turn OFF if the detection level does not exceed the threshold level. (For conformity output setting) Set the threshold to a higher level for highly-precise color discrimination or to a lower level to allow margins for discriminated colors (ignore minor tint differences, dirt retention or like).



Operation



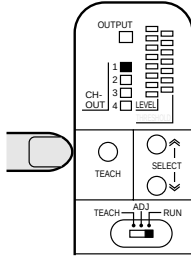
Detection is made in the **[RUN]** mode. The output ON/OFF status of each channel is displayed on the channel indicators. Double-displayed channels can be checked and selected by pressing the button.

For indicating detection level and threshold value for other channels

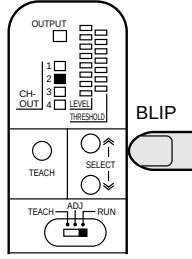
Press the SE-
LECT button.

For checking
which channel is
indicated

Press the
TEACH button



Displays the channel the detection level of which is currently indicated in (CH-OUT). (For three seconds)



Displays the selected channel in (CH-OUT) (for three seconds) and indicates the detection level and threshold value of the selected channel.

Registered Color Selection (Bank Selection Input)

1-output Models Only

In the **[RUN]** mode, bank selection can be made externally with the bank selection input 1 (yellow) and input 2 (green). The selected bank is indicated by the bank selection indicator.

NPN (E3MC-A11/-X11/-Y11)

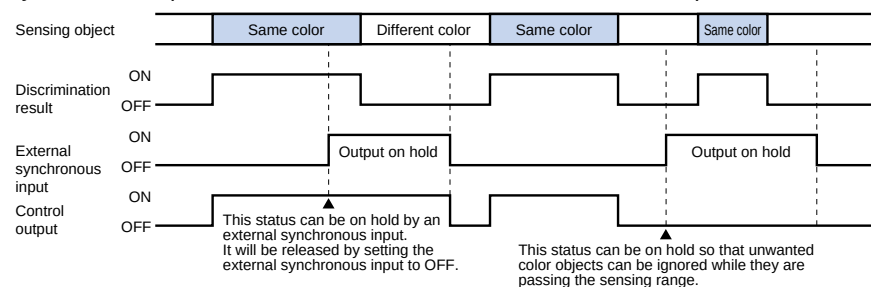
Bank	Input 1	Input 2
1	OPEN	OPEN
2	GND	OPEN
3	OPEN	GND
4	GND	GND

PNP (E3MC-A41/-X41/-Y41)

Bank	Input 1	Input 2
1	OPEN	OPEN
2	Vcc	OPEN
3	OPEN	Vcc
4	Vcc	Vcc

External synchronous input function

The measurement results will be directly output to the control output if the input from the external synchronous input terminal (pink) is set to OFF. The output will hold the previous status if the input of the external synchronous input terminal is set to ON. External synchronous input is valid in **[RUN]** or **[ADJ]** mode. As for the 4-output models, this function applies to the output of all the channels.



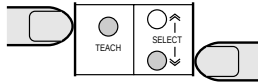
Remote teaching (remote control function)

Mode Setting

When using remote teaching (remote control function), you must set the Sensor to mode B.

Setting Method

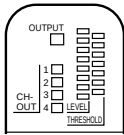
Apply power to the Sensor while pressing the SELECT DOWN button and TEACH button at the same time.



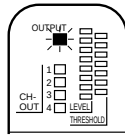
Checking Method

Whether the E3MC is operating in mode A or B can be checked with the operation indicator after mode setting (indicated for 3 s) or in the **TEACH** mode.

Mode A:
Operation
indicator is OFF.



Mode B:
Operation
indicator is ON.



- Note: 1. The Sensor is set to mode A before shipment.
2. The current mode selected does not change after the Sensor is turned OFF.
3. The remote control function is available in the **RUN** mode or **ADJ** mode only.
4. When mode B is selected, the E3MC-M□ has three outputs. In addition to this, the external synchronous input function is unusable.
5. The same switching procedure can be used for changing to mode A.

Remote Teaching Method

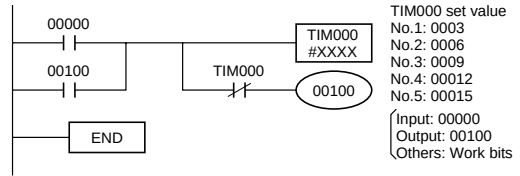
- 1 Remote teaching with manual input through a mechanical switch
Short-circuit the remote control input for 1.5 s or more to either of the following terminals according to the E3MC model.

NPN type (E3MC-□□11)	Connected to GND (blue)
PNP type (E3MC-□□41)	Short-circuit to Vcc (Brown) terminal.

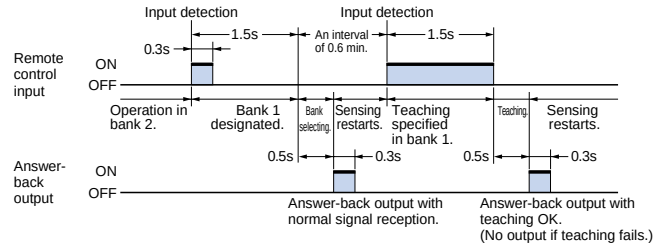
- 2 Remote control of teaching and bank selection through the PLC or PT
Input one of the following signals as a remote control input. Only when the signal is accepted properly, an answer-back output is provided for 0.3 s .

No.	Control signal	E3MC-□	E3MC-M□□
1		Bank 1 selected.	Channel 1 selected.
2		Bank 2 selected.	Channel 2 selected.
3		Bank 3 selected.	Channel 3 selected.
4		Bank 4 selected.	Not used.
5		To the selected bank Teaching	To the selected channel Teaching

The following is an example of ladder programming.



The following is an example of a timing chart of teaching after bank selection.

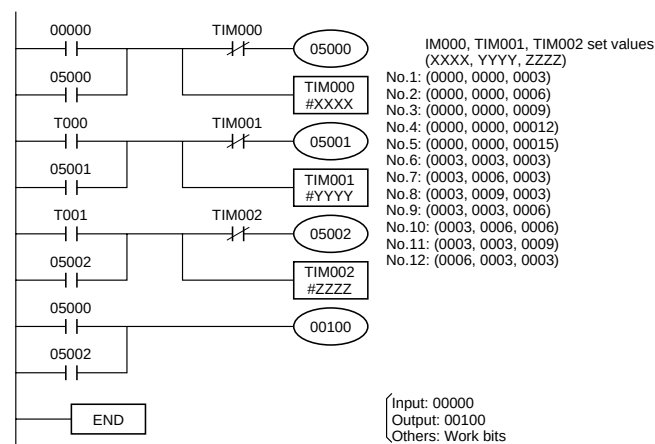


3 Remote control of threshold adjustments through the PLC or PT

Input one of the following signals as a remote control input. Only when the signal is accepted properly, the threshold is changed and an answer-back output is provided for 0.3 s .

No.	Control signal	All E3MC models	Threshold level and indication
6		Threshold 1 selected.	Tolerance 1
7		Threshold 2 selected.	Tolerance 2
8		Threshold 3 selected.	Tolerance 3
9		Threshold 4 selected.	Tolerance 4
10		Threshold 5 selected.	Tolerance 5
11		Threshold 6 selected.	Tolerance 6
12		Threshold 7 selected.	Tolerance 7

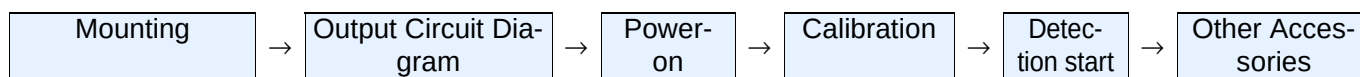
The following is an example of ladder programming for setting control signals. Full control of the E3MC is possible using this function together with function 2.



Note: 1. The admissible error of each signal pulse is ± 0.1 s max.
2. A minimum interval of 0.6 s is required between signals.
3. Threshold 4 is set after teaching.

Analog output type

Setting Procedure for Setting the E3MC-MA□81



Start detection after making setting in order of the above.

Calibration

This sensor has a calibration function that sets the output voltages of RGB to the same value using the standard white. For the A and X types, use the No. 4 terminal (yellow) to set the output values to 10 V. For the Y type, use the No. 1 terminal (white) to set them to 7 V.

- ① Set the standard white to the detection position.
- ② Input a 24V 1 ms or more signal to the calibration terminal.
- ③ It takes about 600 ms to make calibration.
- ④ Check the RGB outputs.
- ⑤ Remove the standard white and start detection.

Precautions

- If the color used for calibration operation is other than white-based colors, the operation is canceled to return to the previous status since the outputs cannot be set to the same value.
- Note that if the No. 1 terminal (white) is used to perform the calibration operation of the A or X type, the output values are set to 7 V and its capability cannot be exhibited fully.
- If the No. 4 terminal (yellow) is used to perform the calibration operation of the Y type, the operation will be insufficient since output compensation cannot be made. Therefore, always use the No. 1 terminal (white).

Precautions

Correct Use

Common to E3MC series

Design

Power Reset Time

E3MC is ready to sense an object in 100 ms after power-on. Therefore, use the devices connected to E3MC 100 ms after power-on. If the load and E3MC are connected to different power supplies, always power on E3MC first. Especially for fine detection after power-on, warm up the system for about 15 minutes.

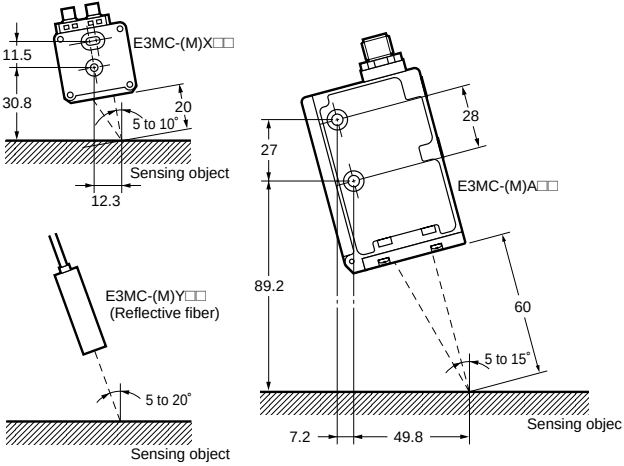
Power OFF

The E3MC may output a single pulse when the control power supply is turned OFF. If E3MC is connected to a timer or counter to which power is supplied from an independent power supply, E3MC will be more likely to output a single pulse when the control power supply is turned OFF. Therefore, supply power to the timer or counter from the same power supply for the E3MC.

Technical Guide

Detection of Metal or Glossy Objects

The color detection capability will be improved by changing the mounting angle of the Sensor so that regularly reflected light will not enter. The mounting angle of the E3MC-(M)X□□ can be adjusted about 10° with its mounting holes.



On the other hand, sensing objects such as metal or transparent plastic cases may be detected by allowing regular reflection.

Detection of White, Gray or Black Objects

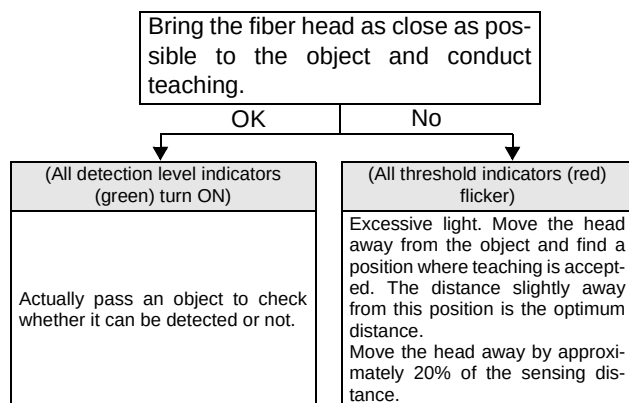
When registering white, gray, black or other neutral-color objects, change the color discrimination mode to the **Mode 1** mode to achieve a more stable intensity discrimination.

External Light

The E3MC may malfunction if it directly receives external light interference. Provide a cover to shut-out such external light interference.

Adjustment of Sensing Distance of General-purpose Optical Fiber Type

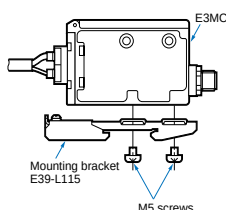
Unlike the E3MC-A or E3MC-X, the E3MC-Y may require adjustment of its sensing distance depending on the reflection rate. This also applies to the through-beam type.



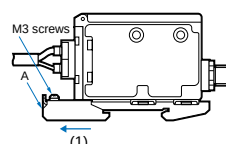
DIN Track Mounting/Removal with the E39-L115

Mounting

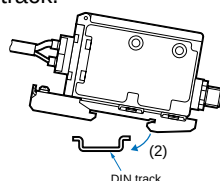
1. Attach the E39-L115 Mounting Bracket to the E3MC with four M5 screws.



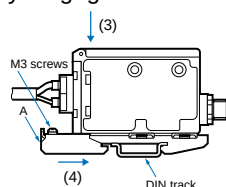
2. When mounting the E3MC to the DIN track, loosen the M3 screw of the Mounting Bracket and slide part A in the direction indicated by arrow ①.



3. Mount part (2) to the DIN track.



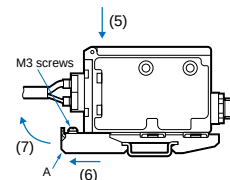
4. Press the E3MC in the direction indicated by arrow ③ and slide part A in the direction indicated by arrow ④ until the Mounting Bracket correctly engages with the DIN track.



5. Tighten the M3 screw of the Mounting Bracket to secure the Mounting Bracket.

(Dismantling)

Loosen the M3 screw of the E39-L115, press the E3MC in the direction indicated by arrow (5) and slide part A in the direction indicated by arrow (6). Then lift up the E3MC in the direction indicated by arrow (7) to remove the E3MC with the E39-L115.



Others

EEPROM Error

If a write error occurs (the buzzer beeps and the operation indicator and bank indicator flicker) due to power-off, static electricity or other noise during write to EEPROM, perform teaching or threshold level setting again.

Protective Cover

Tighten the operation cover to a torque of 0.2 to 0.3 Nm to ensure proper waterproofing.

Built-in Amplifier Type

installation

Tightening Force

For case installation, tighten it to the torque of 2.3 Nm max.

Sensor installation

This Sensor does not have the mutual interference prevention. When performing precision detection, use the Sensor with a cover for protection against disturbance light to ensure that the beams of incandescent and fluorescent lamps do not enter the fiber head and lens surface directly.

Optical Fiber Type

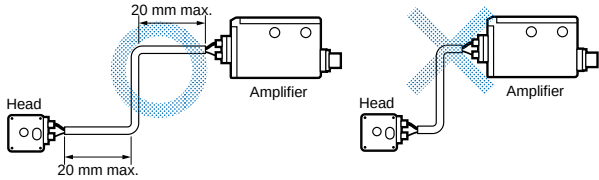
Installation

Tightening Force

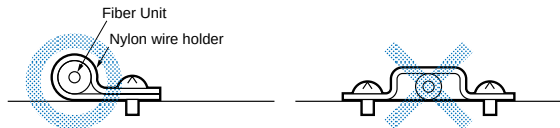
For head installation, tighten it to the torque of 0.54 Nm max.

Handling the Fiber Unit

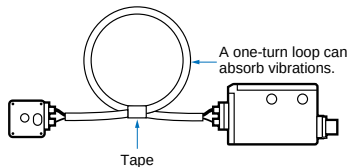
- Do not pull or press the Fiber Unit.
- The bending radius of the fiber should be not less than the admissible bending radius given in Ratings/performance.
- Do not bend the fiber within 20 mm from the head or amplifier coupling portion.



- Do not give compression or load.



- The Fiber Head could be break by excessive vibration. To prevent this, the following is effective:

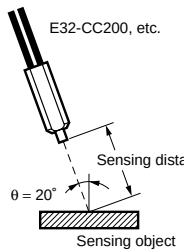


General-purpose Optical Fiber Type

Design

Definition of Sensing Distance of a Reflective Fiber

- The sensing distance of reflective fiber is the sensing distance of the Sensor located obliquely to the sensing object as shown in the following illustration.
- Set to C mode and standard mode (response time), and threshold set to the standard level with an inclination angle of 20 degrees



Recommended Fiber: Reflective Optical Fiber

The following optical fibers are recommended for use with the E3MC-(M)Y□□.

Model	Sensing distance*1
E32-DC200	5 mm
E32-CC200*2	5 mm
E32-D32L*3	4.5 mm
E32-D11L	5 mm

- *1. Distance where 11 colors of standard sensing objects can be discriminated. As a typical example, 9 colors can be discriminated when 12 mm is set.
- *2. The fiber to be inserted into the emitter is indicated with white lines. Insert the amplifier fiber into the lower emitter section.
- *3. The fiber to be inserted into the emitter is indicated with dotted yellow lines. Insert the amplifier fiber into the lower emitter section.

Recommended Fiber: Through-beam Fiber

The following optical fibers are recommended for use with the E3MC-(M)Y□□.

Model	Sensing distance
E32-TC200	30 mm
E32-T11L	60 mm
E32-T16	200 mm
E32-T17L	1.1 m

- * Distance where red, yellow and blue films can be discriminated stable.

Mounting

Insertion

The inserted Fiber Unit comes in contact with the internal rubber packing first. Insert the Fiber Unit further unit it comes in contact with the innermost end.

Sensor installation

Tighten the Fiber Unit with a screwdriver to a torque of 0.2 Nm.

Fibers

Among the recommended fibers, the E32-CC200 and E32-D32L have white or dotted yellow lines on the fiber to be inserted into the emitter. When using the E3MC-(M)Y□□, insert the fiber with the line into the emitter section at the bottom of the amp.

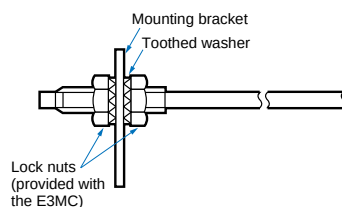
Common to Fiber Units

Mounting

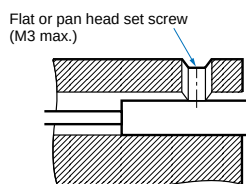
Tightening Force

- The tightening force applied to the Fiber Unit should be as follows:

(Screwed type)

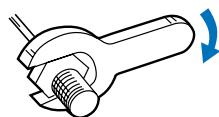


(Columnar type)



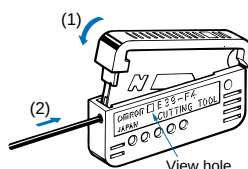
Fiber Units	Clamping torque
M3/M4 screw	0.78 Nm max.
M6 screw	0.98 Nm max.
2-dia. column	0.29 Nm max.
3-dia. column	0.29 Nm max.
E32-T16	0.49 Nm max.

- Use a proper-sized wrench.



Cutting Fiber

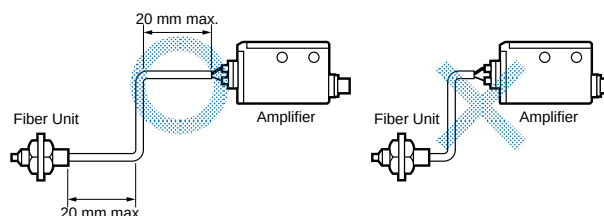
- Insert a fiber into the Fiber Cutter and determine the length of the fiber to be cut.
- Press down the Fiber Cutter in a single stroke to cut the fiber.



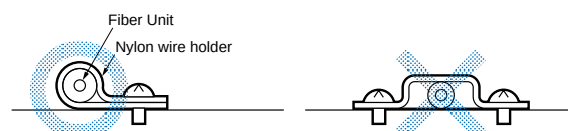
- The cutting holes cannot be used twice. If the same hole is used twice, the cutting face of the fiber will be rough and the sensing distance will be reduced. Always use an unused hole.

Connection

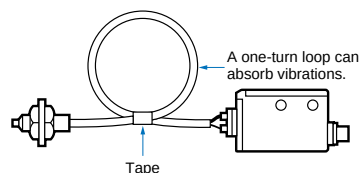
- Do not pull the Fiber Unit with force exceeding 9.8 N or press the Fiber Unit with force exceeding 29.4 N. The fiber is so thin that the utmost attention will be required to handle the fiber.
- Do not bend the end of the Fiber Unit.



- Do not apply excess force on the Fiber Units.



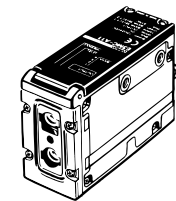
- The Fiber Head could break by excessive vibration. To prevent this, the following is effective:



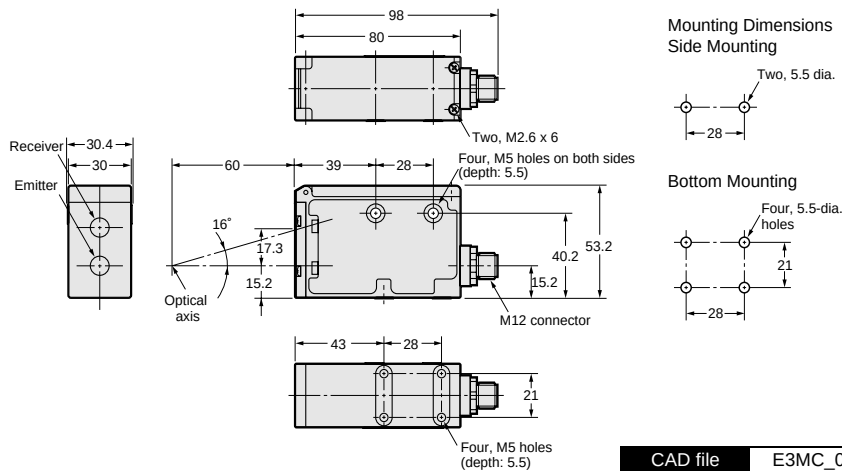
Dimensions (Unit: mm)

Sensors

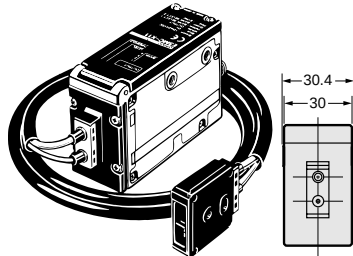
E3MC-A□□
E3MC-MA□□
E3MC-A81



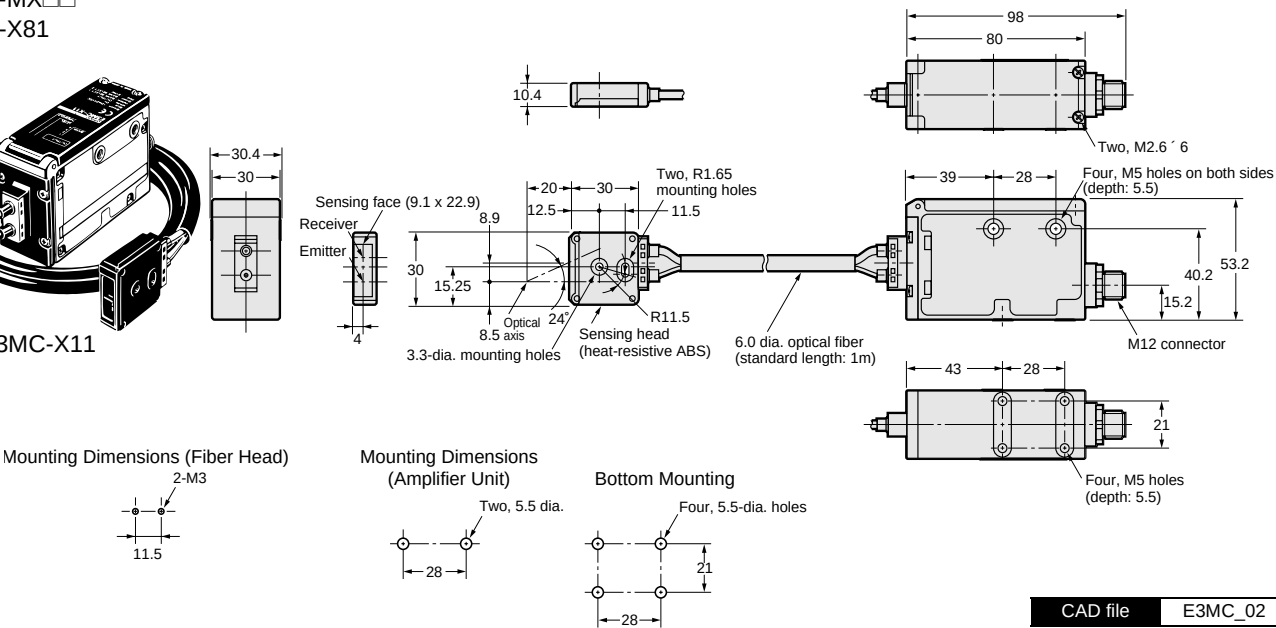
E3MC-A11



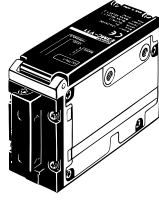
E3MC-X□□
E3MC-MX□□
E3MC-X81



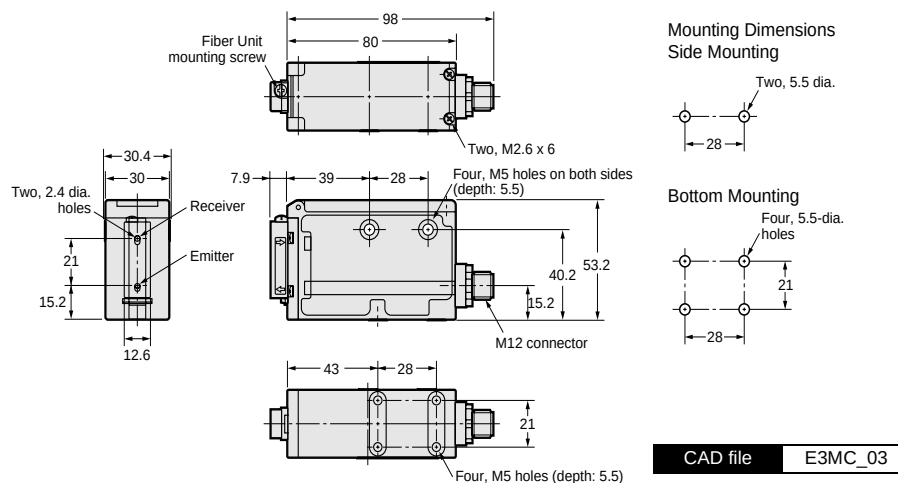
E3MC-X11



E3MC-Y□□
E3MC-MY□□
E3MC-Y81



E3MC-Y11



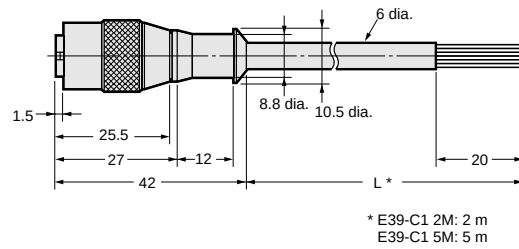
Fiber Units

Accessories (Order Separately)

Sensor I/O Connectors

E39-C1 2M (included)

E39-C1 5M



* Attached to the product.

CAD file

E39_38

Mounting Brackets

A-216

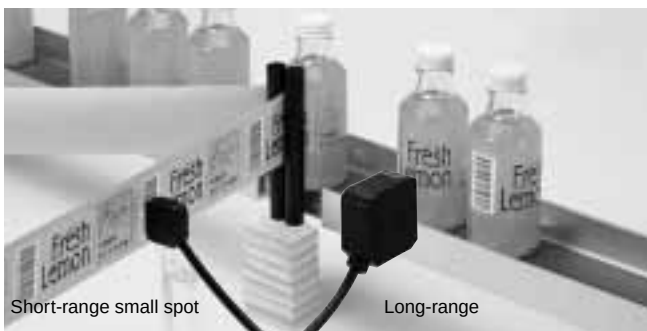
Optical Fiber Glossy Object Sensor

E3X-NL

Utilization lightwave technology has innovated glossiness detection. OMRON's glossy object sensor can discriminate a wide variety of glossiness differences. The fiber-optic system has achieved the small, non-contact models.

**Features**

Employs OMRON's unique FAO (Free Angle Optics) technology which enables delicate sensing of object glossiness without influence from colors and patterns. Transparent films on boxes and labels on transparent films can be detected.

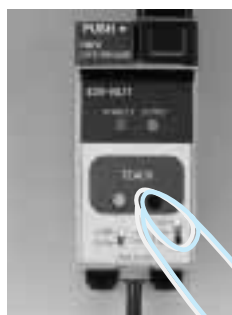


Short-range small spot

Long-range

The teaching system ensures easy adjustment just by pressing the button.

- Adjustment man-hour saving type requiring only a one-time pressing of the button
- Teaching system only requires to push the button, ensuring sensitivity adjustment without individual differences.



Two different types of fiber heads meet a wide range of applications.

Two different fiber heads are available.

According to applications, you can choose the short-distance, small spot type ideal for detection of small objects or the long-distance type that can perform in-line standard detection.

Short-distance, small spot type

E32-S15-1/-2

Ideal for precision detection and small object detection.

Long-distance type

E32-S15L-1/-2

Resistant to object shake and enables in-line standard detection.



Small spot in 2 mm dia.



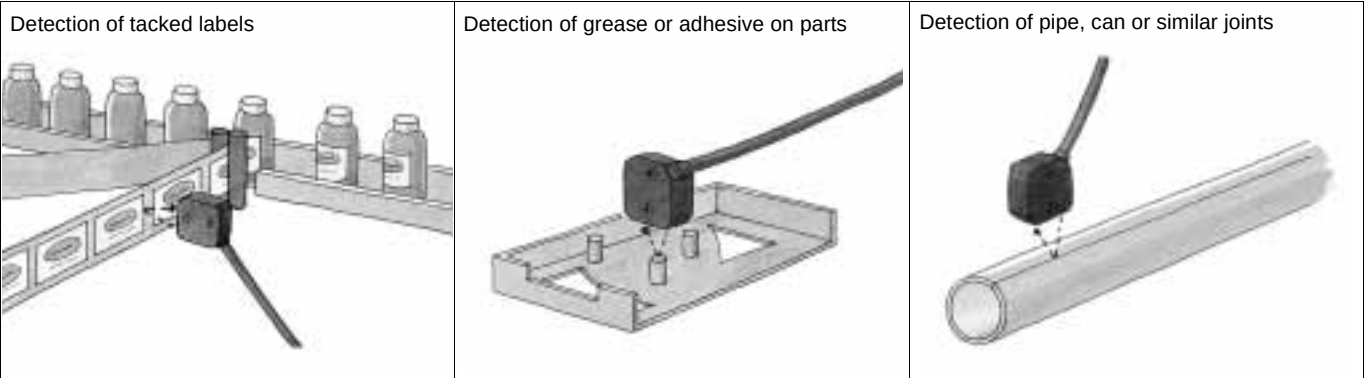
Adopts the pulse-ON system that is insensitive to disturbance light

The emitter (red LED) in the fiber head uses a pulse-ON system to minimize the influence of disturbance light. The Sensor provides stable sensing characteristics if disturbance light occurs from fluorescent lamps in-line.

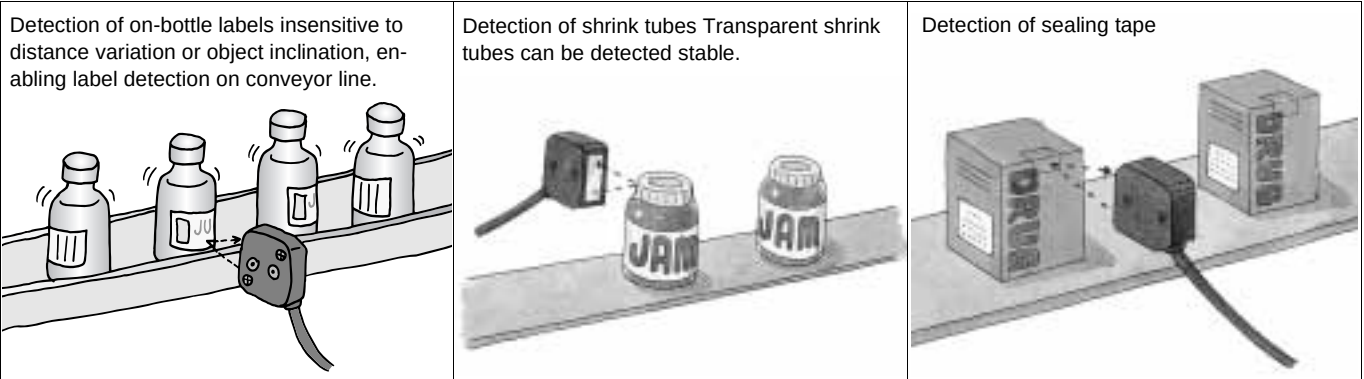


Application

Short-distance, small spot type



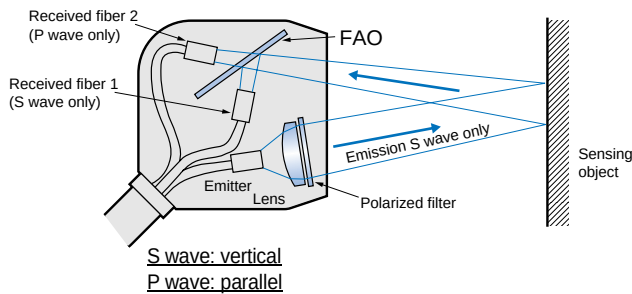
Long-distance type



Features

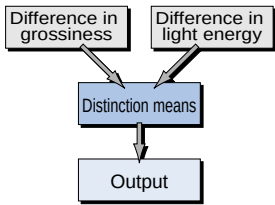
Principles for Glossiness Detection by FAO

First, the light from a red LED passes through a polarizing filter so only the S wave is emitted. If the detectable object is glossy, the S wave is reflected regularly and is transmitted as is to the Fiber Receiver 1. If the detectable object is not glossy, there is more diffuse reflection, thus the polarization direction is randomized and a P wave is generated. The S and P waves are divided by the FAO (special polarized beam splitter), the waves travel to their respective fiber receivers, and the variation in the glossiness is determined by comparing the two received signals.



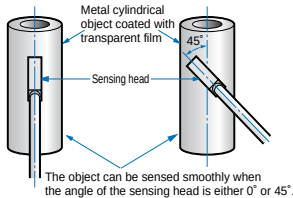
Fuzzy Teaching Function Backs up Stable Detection

Supported by the fuzzy teaching function if objects have no difference in glossiness. If the glossiness difference goes below than the minimum sensing level, the microprocessor in the amplifier determines the discrimination means automatically. Sensing by light energy difference like an ordinary mark sensor. (When 2-point teaching is selected)



Measures against Double Refraction

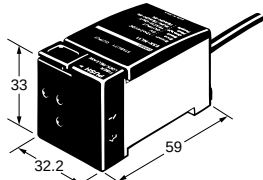
There are transparent films and transparent plastic objects that change the direction of polarized light when it passes through the transparent films and transparent plastic objects. This is called double refraction. Using the optional rotary mounting bracket (E39-L109), the sensor unit can be inclined 45 degrees to take measures against double refraction. (Example) Metal cylindrical object coated with transparent film



Ordering Information

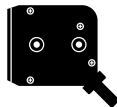
Sensors

Amplifier Units

Connection method	Shape	Model
Pre-wired type		E3X-NL11

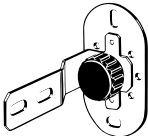
Fiber Units

 Red light

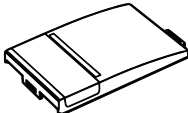
Sensor type	Shape	Sensing distance	Fiber length	Model
Reflective model		 10 ± 3 mm	0.5 m	E32-S15-1
			1 m	E32-S15-2
		 20 ± 7 mm	0.5 m	E32-S15L-1
			1 m	E32-S15L-2

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L109	1	Can be used with the fiber unit E32-S15-□. Mounting bracket variable in rotary angle (0°, 45°) for stable detection of transparent films (double-refractive objects) on glossy objects such as metal or glass plates.

Covers

Shape	Model	Quantity	Remarks
	E39-G9	1	Attached to the amplifier unit E3X-NL11. Please place an order when the protective cover is damaged or lost.

Rating/Performance

Amplifier Units

Item	Model	E3X-NL11
Light source (wave length)	Red LED (680 nm)	
Power supply voltage	12 to 24 VDC $\pm 10\%$, ripple (p-p) : 10% max.	
Current consumption	100 mA max.	
Control output	Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (NPN output) Light-ON/Dark-ON switch selectable	
Answer-back output	Load power supply voltage 30 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (NPN output)	
Remote teaching input	Purple and blue (0 V) are connected when remote input turns ON: 0 V short-circuit current 1 mA max. Purple and blue (0 V) are disconnected when remote input turns OFF: Open or 9 V min. (max. input voltage 24 V). Note that the input is valid only when remote RUN/TEACH selection input (across pink-blue) is provided.	
Protective circuits	Protection from load short-circuit and reversed power supply connection	
Response time	Operation or reset: 1 ms max.	
Sensitivity adjustment	Teaching system	
Timer function *	OFF-delay fixed at 40 ms	
Ambient illuminance	Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.	
Ambient temperature	Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)	
Ambient humidity	Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)	
Insulation resistance	20 M Ω min. at 500 VDC	
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude or 300 m/s ² (approx. 30G) for 2 hrs each in X, Y, and Z directions	
Shock resistance	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	
Protective structure	IEC 60529 IP50 (with Protective Cover attached)	
Connection method	Pre-wired models (standard length: 2 m)	
Weight (Packed state)	Approx. 200 g	
Material	Case	PBT (polybutylene terephthalate)
	Cover	Polycarbonate
	Mounting Brackets	Stainless steel (SUS304)
Accessories	Mounting bracket, instruction manual	

* The OFF-delay timer can be reset by setting the switch.

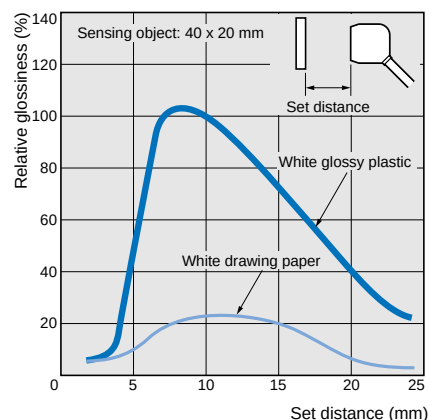
Fiber Units

Sensing method Features		Reflective model			
		Short-range small spot		Long-range	
Item	Model	E32-S15-1	E32-S15-2	E32-S15L-1	E32-S15L-2
Sensing distance		10±3 mm (white paper, white glossy plastic 40x20 mm)		20±7 mm (white paper, white glossy plastic 40x20 mm)	
Min. sensing object		0.5-mm		2-mm	
Sensing object angle		Glossiness determination is possible at ± 4° inclination from the mounting hole (at sensing distance of 10 mm)		Glossiness determination is possible at ± 7° inclination from the mounting hole (at sensing distance of 20 mm)	
Spot diameter		Approx. 2-mm dia./approx. 2-mm dia. (at sensing distance of 10 mm)		Approx. 15-mm dia./approx. 4-mm dia. (at sensing distance of 20 mm)	
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 90% RH (with no condensation)			
Permissible bending radius		4 mm min.			
Protective structure		IEC 60529 IP50			
Fiber length		500 mm	1 m	500 mm	1 m
Weight (Packed state)		Approx. 50 g	Approx. 60 g	Approx. 80 g	Approx. 90 g
Material	Sensor case	Heat-resistant ABS resin			
	Sensor window	transparent glass		Acrylics	
	Fiber cladding	urethane			

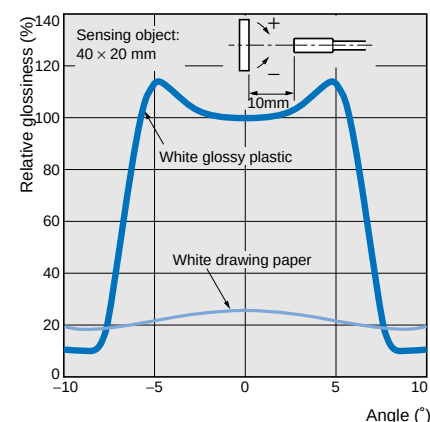
Characteristic data (typical)

Glossiness vs. Operating Range (Typical) Glossiness vs. Angle (Typical)

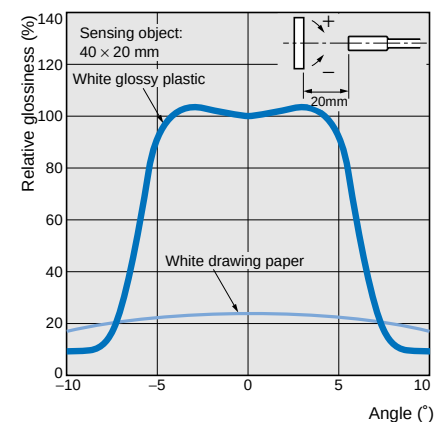
E3X-NL11 with E32-S15-□



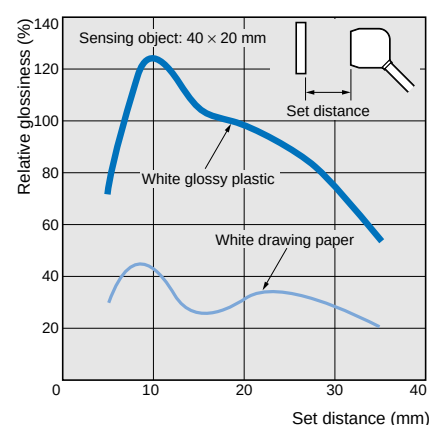
E3X-NL11 + E32-S15-□ (X direction)



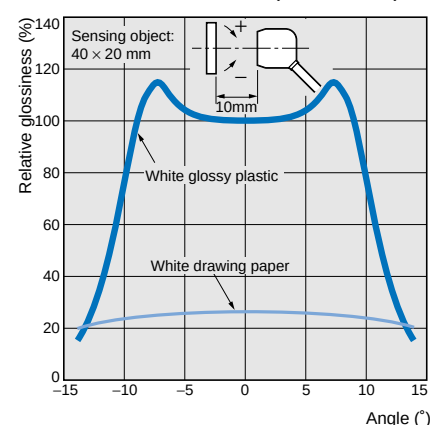
E3X-NL11 + E32-S15L-□ (X direction)



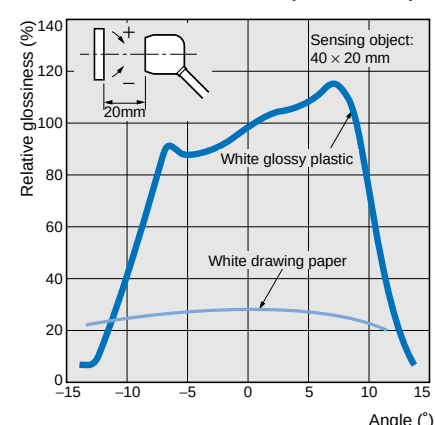
E3X-NL11 with E32-S15L-□



E3X-NL11 + E32-S15-□ (Y direction)



E3X-NL11 + E32-S15L-□ (Y direction)



Output Circuit Diagram

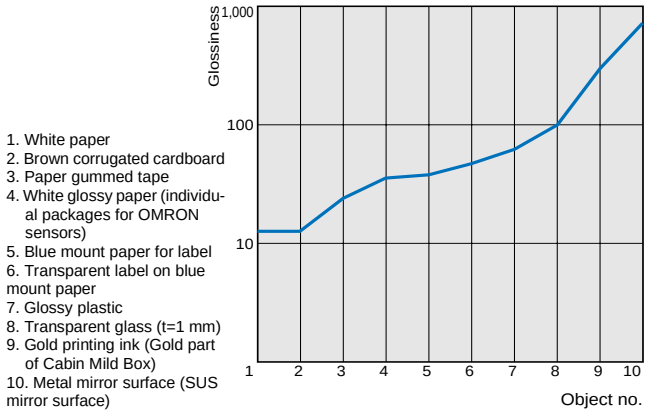
NPN output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-NL11	Light ON	Incident Interrupted Light indicator (orange) ON OFF Output transistor ON OFF Load Operate (e.g., relay) Reset (Between brown and black terminals) T: OFF delay timer The change for 0 or 40ms (fixed) is possible.	L•ON	
	Dark ON	Incident Interrupted Light indicator (orange) ON OFF Output transistor ON OFF Load Operate (e.g., relay) Reset (Between brown and black terminals) T: OFF delay timer The change for 0 or 40ms (fixed) is possible.	D•ON	

Technical Guide

Glossiness

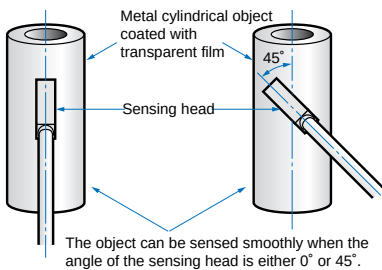
When light is applied to the sensing object, the reflected light is generally a mixture of regular reflection components and diffuse reflection components. Glossiness is directly proportional to the light intensity of the regular reflection components. In JIS, the glossiness of a glass plate surface having 1.567 reflectivity is defined 100 as the basis of glossiness. Glossiness of Typical Object Sensed by E3X-NL11 + E32-S15



Sensing of Transparent Objects with Rotating Fiber Unit Mounting Bracket

There are transparent films and transparent plastic objects that change the direction of polarized light when it passes through the transparent films and transparent plastic objects. When E3X-NL senses these transparent films and transparent plastic objects on glossy background objects, such as glossy paper or metals, E3X-NL will not sense these objects smoothly in case of an incorrect angle of the sensor head. The most suitable angle of the sensor head varies with the transparent object. The angle of the sensor head can be, however, 0° or 45° for the smooth sensing of such transparent objects due to the characteristic of polarized light. There is no need for the angle to be midway between 0° and 45°. E39-L109, which is sold separately, is a mounting bracket that rotates to angles of 0° or 45° and enables E3X-NL to sense such transparent objects smoothly with its sensing head set at 0° or 45° without changing the sensing positive.

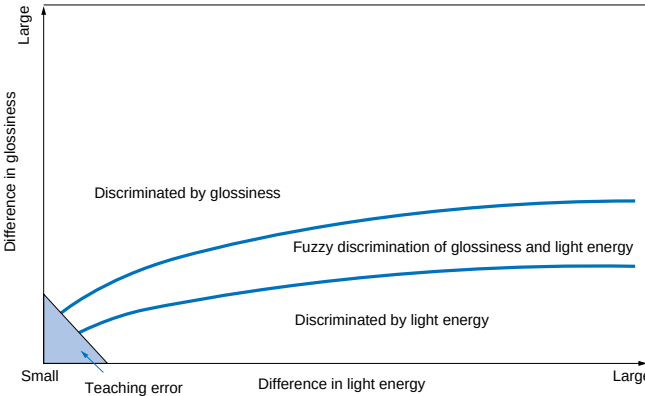
(Example) Metal cylindrical object coated with transparent film



Fuzzy Teaching Function

E3X-NL in two-point teaching operation will perform fuzzy computation using the difference in glossiness and the difference in light energy between the two teaching points to determine the thresholds setting with E3X-NL. As shown in the following table, if there is only a small difference in glossiness but there is a large difference in light energy between the two teaching points, the thresholds set with E3X-NL will be determined by the light energy values.

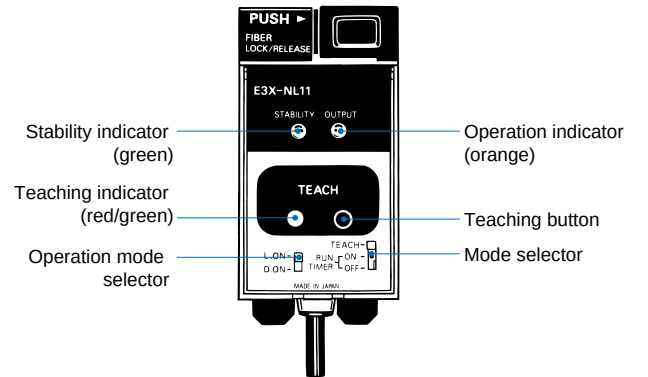
Taught Difference in glossiness between two teaching points	Taught Difference in light energy between two teaching points	Discriminating method
Large	Large	Discriminated by glossiness.
Large	Small	Discriminated by glossiness.
Small	Large	Discriminated by light energy.
Small	Small	Discriminated by glossiness. A teaching error will result if the difference in glossiness and that in light energy are both less than the sensing levels of E3X-NL.



Countermeasures against Teaching Errors Resulted with Transparent Labels on Sheets

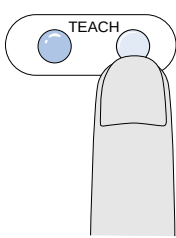
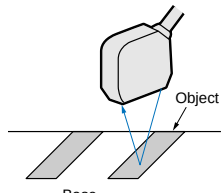
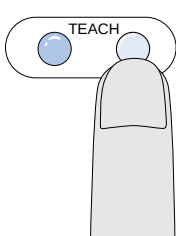
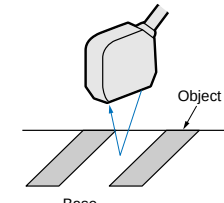
The material of the sheets must not be too glossy.

Nomenclature:



Operation

Sensitivity setting

Two-point teaching		
Pro- ce- dur e	Setting	Operation
1	---	Locate the sensor head within the sensing distance.
2	TEACH- RUN- TIMER- ON- OFF- ↑	Move the mode selector to the TEACH position.
3		Press the teaching button once with a sensing object located under the sensor as shown in the following illustration.  ↓ Teaching indicator ... Lit red The built-in buzzer beeps once.
4		With an object absent (ground), press the TEACHING button (second time).  ↓ If teaching is OK Teaching indicator ... Lit red → Lit green The built-in buzzer beeps once. If teaching is NG Teaching indicator ... Lit red → Flickers red The built-in buzzer beeps 3 times. ↓ Change the object position and setting distance again and make setting in order of 1 to 4.
5	TEACH- RUN- TIMER- ON- OFF- ↓	Move the mode selector to the RUN position. Sensitivity setting is complete. Teaching indicator ... Lit green → Extinguished
6	L.ON- D.ON- ↑↓	Light Dark Select the desired operation format with the operation mode selector (L.ON/D.ON).

One-point teaching		
Pro- ce- dur e	Setting	Operation
1	TEACH- RUN- TIMER- ON- OFF- ↑	Move the mode selector to the TEACH position.
2		Press the teaching button with one of the sensing objects or the background object located under the sensor for sensing. ↓ Teaching indicator ... Lit red The built-in buzzer beeps once.
3	TEACH- RUN- TIMER- ON- OFF- ↓	Move the mode selector to the RUN position. 1-point teaching setting is complete as soon as the first object passes. Teaching indicator ... Lit red → Lit green
4	L.ON- D.ON- ↑↓	Select the desired operation format with the operation mode selector (L.ON/D.ON).

Precautions

Correct Use

Fiber Units

Installation

Tightening Force

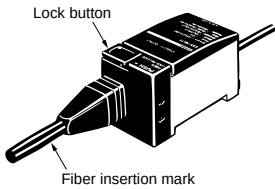
For the fiber unit installation, tighten it to the torque of 0.3 Nm max.

Fiber Connection and Disconnection

E3X-NL amplifier has a push lock. Connect or disconnect the fibers to or from E3X-NL amplifier using the following procedures:

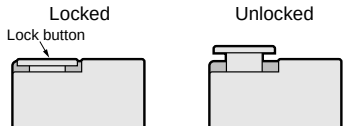
1. Connection

After inserting the fiber into the Amplifier, push the lock button until a click sound is heard so that the fiber is securely connected.



2. Disconnection

Ensure to press the push lock again to unlock before pulling out the fiber, otherwise the fiber may be deteriorated. (To maintain the fiber characteristics, remove the fiber after making sure that the lock has been released.)



3. The fiber must be locked or released in a temperature range of -10° to 40°.

Since face-to-face installation of the fiber units may cause mutual interference, mount them so that the optical axes of the sensors are not opposed.

Mounting the sensor

If two or more sensors are used, face-to-face installation of the fiber units or the regularly reflected light from the sensing object may cause mutual interference. At this time, adjust the fiber units to be mounted at the angles where the light of each sensor is not received by the fiber unit of the other sensor.

● For adjustment

Two-point Teaching and One-point Teaching

Refer to the following information to select the most suitable sensitivity setting method for the application.

Sensitivity setting method	Two-point teaching	One-point teaching
Difference	In general, use 2-point teaching. The fuzzy teaching function (refer to Technical Guide) is activated to set the optimum algorithms automatically, drawing an operation level just about between the two points taught.	One-point teaching should be performed for the sensing of different objects on a single background object or a single type of objects on a variety of glossy background objects. The operating level will be set 15% above or below the teaching point, depending on the glossiness of the first sensing object. The fuzzy teaching function is not activated for 1-point

Selection of Teaching Point(s)

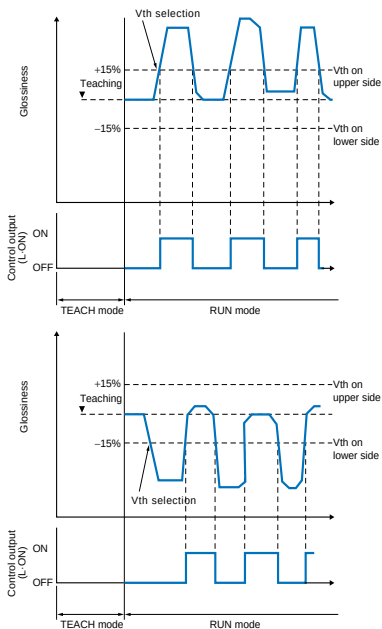
Two-point Teaching

If E3X-NL is used to sense sensing objects that are only a little different in glossiness from the background object and the sensing objects have color patterns, the difference in glossiness among the inks on the sensing objects may influence the sensing operation of E3X-NL. Therefore perform two-point teaching with E3X-NL at a place where E3X-NL can sense the sensing objects smoothly while considering the characteristics of glossiness versus distance of E3X-NL if the sensing position of each of the sensing objects is different from each other.

One-point Teaching

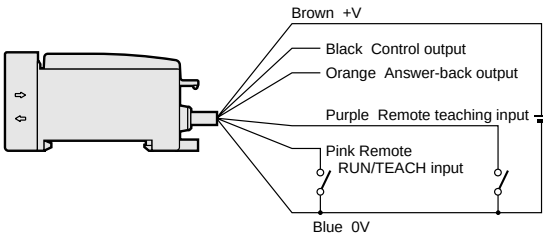
If E3X-NL is used to sense sensing objects different from each other in glossiness on a single background object, perform one-point teaching with E3X-NL using the background object. If E3X-NL is used to sense identical sensing objects on a variety of glossy background objects, perform one-point teaching with E3X-NL using one of the sensing objects.

Operation Level Setting and Control Output for One-point Teaching

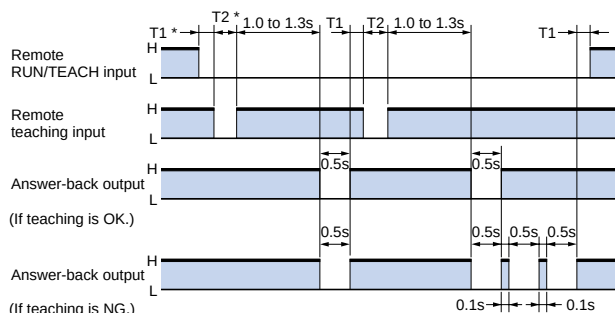


Remote teaching function

In remote teaching, the remote RUN/TEACH input signal is used for teaching instead of the mode selector and the remote teaching input signal is used instead of the teaching button.

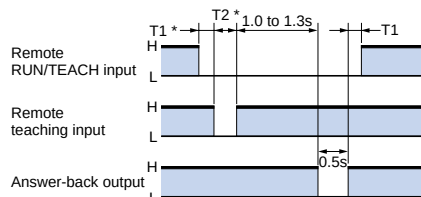
Pro- ce- dure	Operation
1	Set the mode selector to RUN .
2	The following signal conditions must be given as remote teaching input conditions.  ① If there is a teaching error after performing remote two-point teaching with E3X-NL, try performing remote two-point teaching again. If the remote RUN/TEACH input is set from L to H after the teaching error, the thresholds set with E3X-NL will not be refreshed. ② When remote teaching is not performed, cut the pink and purple wires at the root of the cable or connect them to the + side (+V) of the power supply, and cut the orange wire at the root of the cable or connect it to GND (0 V). ③ About 1 s after remote teaching is over, the Sensor is made ready to detect an object.

(Remote 2-point teaching)



* Note: T1 must be 20 ms minimum and T2 must be 500 ms minimum at the time of remote teaching.

(Remote 1-point teaching)



Miscellaneous

EEPROM Write Error

If a write error occurs (buzzer beeps, red and green teaching indicators flicker at the same time, operation and stability indicators flicker) due to power-off, static electricity or other noise in the teaching mode (until the initial operation level compensation completion of teaching without object), perform teaching again with the unit button.

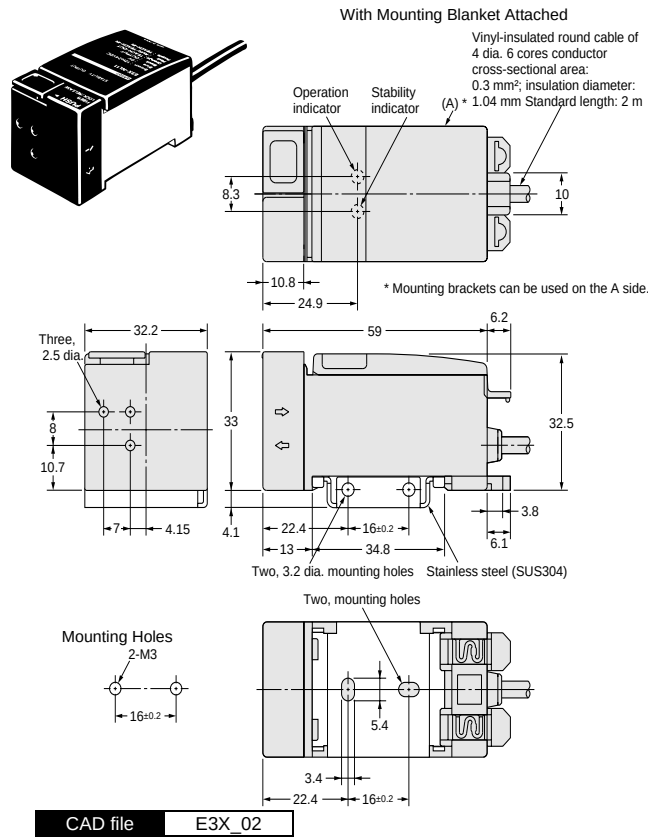
Note: If a memory error occurs, the red and green teaching indicators flicker at the same time and the stability indicator flickers, unlike the teaching error.

Dimensions (Unit: mm)

Sensors

Amplifier Units

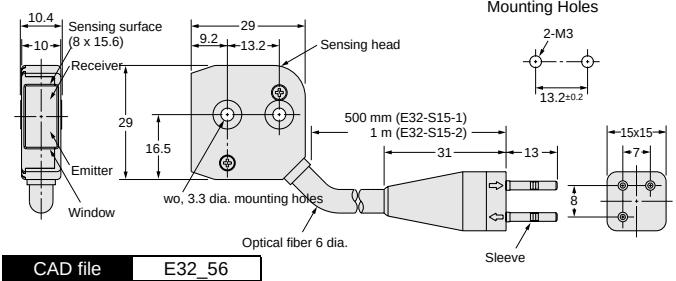
E3X-NL11



Fiber Units

Short-distance, small spot type

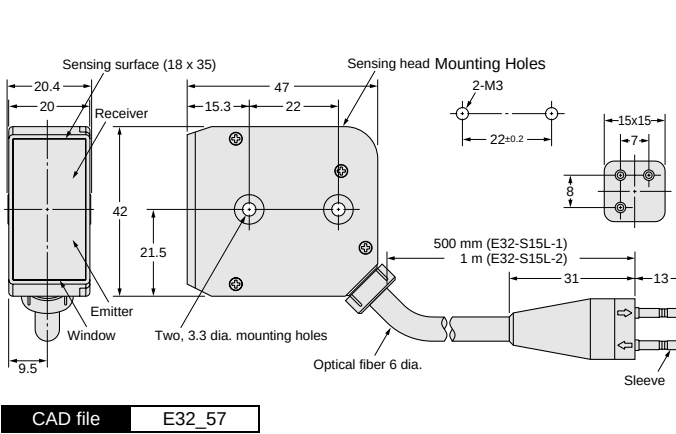
E32-S15-□



Fiber Units

Long-distance type

E32-S15L-□



Accessories (Order Separately)

A-216

Transparent bottle sensor

E3S-CR62/67

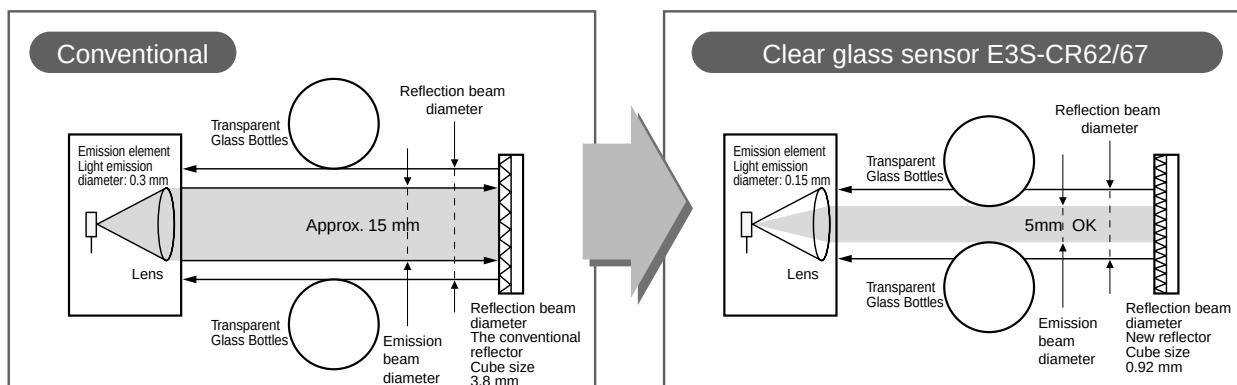
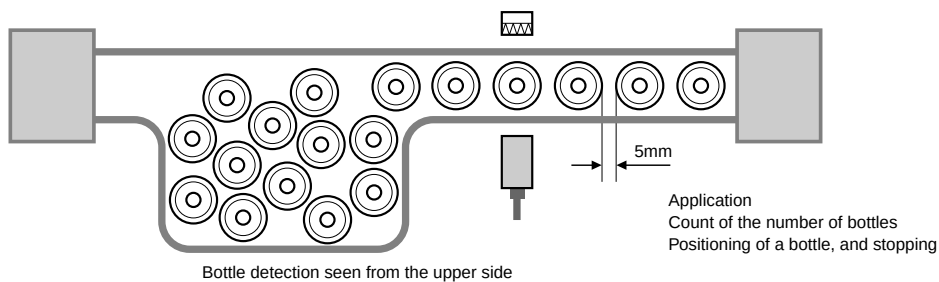
Ideal for detecting transparent glass and plastic containers

CE

Features

Stable operation even if container interval is shortened for higher productivity.

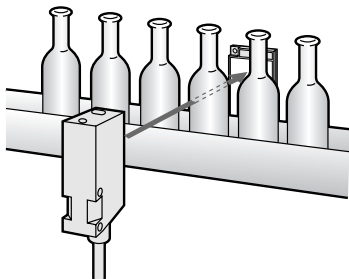
Stable detection of 5 mm gaps that previous regression reflection models were unable to detect because of a speed increase for higher productivity.



Application

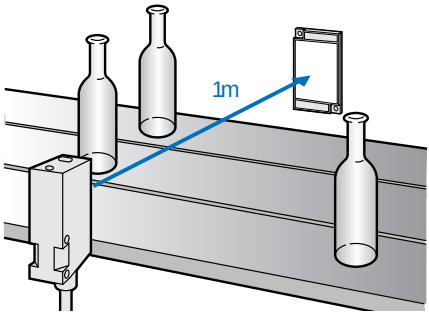
Narrow pin interval detection

Stable detection of 5 mm gaps that are not detectable by previous regression reflection models.



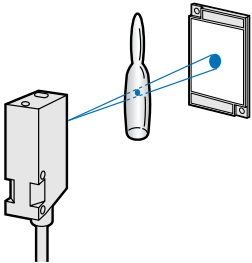
Wide detection range. Stable detection even at long distances.

Use of hyper-point LED as light source (1/2 light emission diameter of previous models) enables stable long-distance detection.



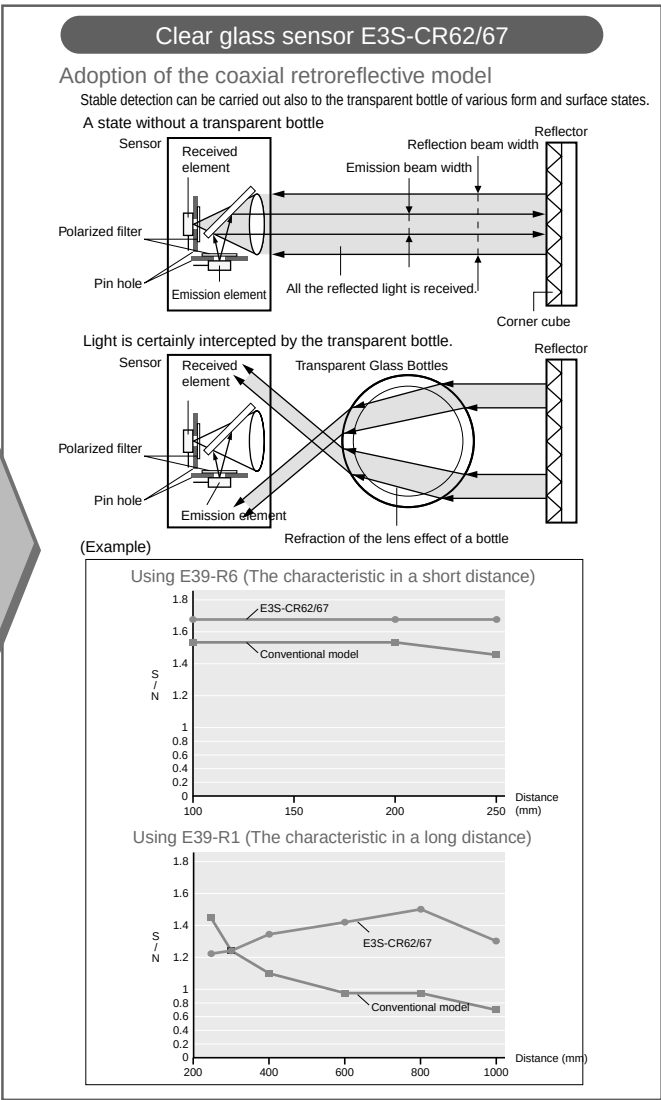
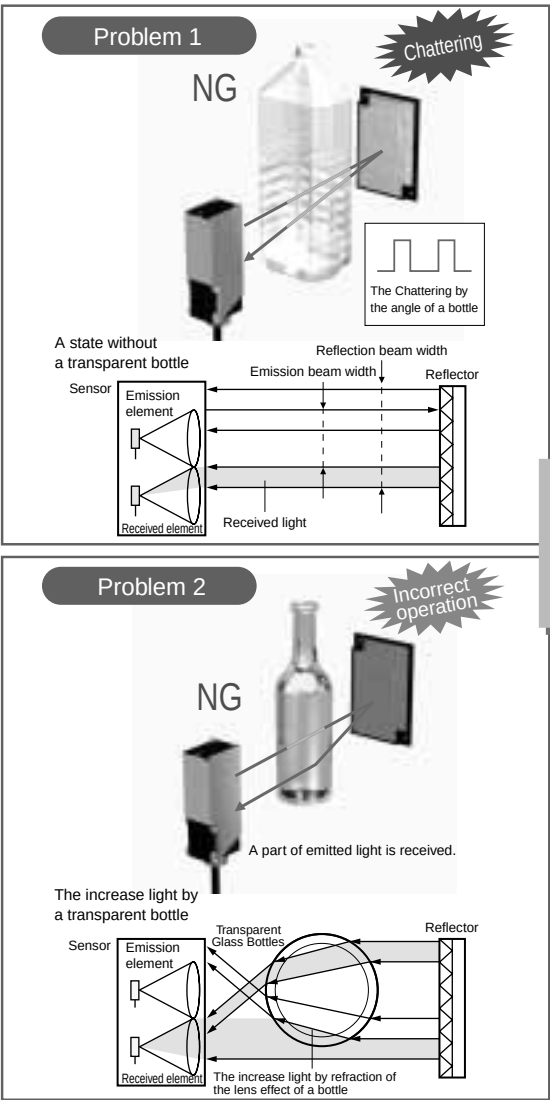
Stable detection of ampoules and other small containers.

Visible spotlight for easy adjustment.



Features

We significantly increased the S/N ratio to enable a stable detection of PET bottles and various other transparent containers



Ordering Information

Sensors

 Red light

Sensor type	Shape	Connection method	Sensing distance						Model
			Reflector E39-R6			Reflector E39-R1			
Retroreflective Models		Pre-wired type	 250mm				 1m	*	E3S-CR62-C
		Connector type					[250mm]		E3S-CR67-C

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

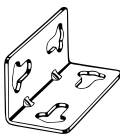
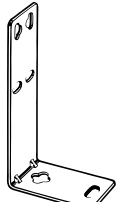
Accessories (Order Separately)

Reflectors

Name	Sensing distance	Model	Quantity	Remarks
Reflectors	250 mm	E39-R6	1	---
	1 m (250 mm) *	E39-R1	1	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L103	1	Supplied with the product.
	E39-L87	1	---

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shape 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/performance

Sensor type		Retroreflective Models (M.S.R. function)	
Item	Model	E3S-CR62-C	E3S-CR67-C
Sensing distance		250 mm (When using the E39-R6), 1 m (250 mm)*1 (When using the E39-R1)	
Standard sensing object		30 mm dia. X 150 mm glass tube (thickness: 1.8 mm)	
Directional angle		2 to 6°	
Light source (wave length)		Red LED (660 nm)	
Power supply voltage		10 to 30 VDC, ripple (p-p) : 10 % max.	
Current consumption		40 mA max.	
Control output		Load supply voltage: 30 VDC or less; load current 100 mA or less (residual voltage: NPN output 1.2 V or less, PNP output 2 V or less); open collector model (NPN/PNP output switching) light ON / dark ON switching	
Protective circuits		Load short protection, reverse connection protection, mutual interference protection function	
Response time		Operation or reset: 1 ms max.	
Sensitivity adjustment		2-turn endless adjuster (with indicator)	
Ambient illuminance		Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.	
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)	
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance		Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s ² (approx. 30G) for 0.5 hrs each in x, y, and Z directions	
Shock resistance		1000 m/s ² (approx. 100G) 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP67 NEMA 6P (restricted to indoor use) *2	IEC Standard IP67 NEMA 6P (restricted to indoor use)
Connection method		Pre-wired models (standard length: 2 m)	Connector type
Weight (Packed state)		Approx. 115 g	Approx. 80 g
Material	Case	Zinc diecast	
	Lens	Acrylics	
	Display operation panel	Polyethyl sulfon	
	Mounting Brackets	Stainless steel (SUS304)	
Accessories		Brackets (with screws), adjustment driver, operation manual	

*1. Values in parentheses indicate the minimum required distance between the sensor and reflector.

*2. NEMA (National Electrical Manufacturers Association) Standard

Output Circuit Diagram

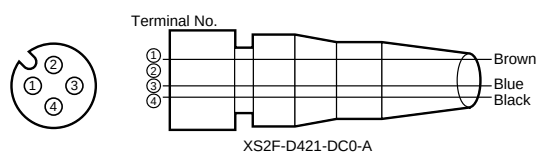
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CR62-C E3S-CR67-C	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate (Relay) Reset (Between brown and black)	L•ON (LIGHT ON)	* Please make a changeover switch into the NPN side.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate (Relay) Reset (Between brown and black)	D•ON (DARK ON)	Connector Pin arrangement Note: Pin 2 is not used.

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CR62-C E3S-CR67-C	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate (Relay) Reset (Between blue and black)	L•ON (LIGHT ON)	* Please make a changeover switch into the PNP side.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operate (Relay) Reset (Between blue and black)	D•ON (DARK ON)	Connector Pin arrangement Note: Pin 2 is not used.*

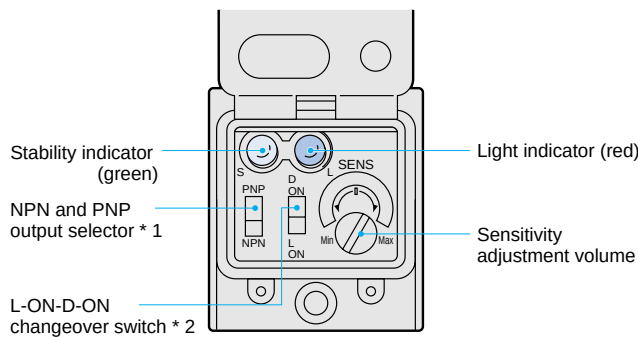
Connectors (Sensor I/O connectors)



Class	Wire, outer	Connector pin	Application
For DC	Brown	①	+V
	-	②	-
	Blue	③	0V
	Black	④	Output

Note: Pin 2 is open.

Nomenclature

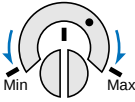
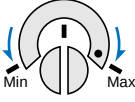


*1. Output transistor switching is possible by means of NPN/PNP output switch.
*2. Operation mode can be switched using L•ON/D•ON switch.

Operation

Sensitivity adjustment

The light source switch and reflective plate can be moved horizontally and vertically to set them in the center of the illumination area of the red incident light indicator lamp, allowing the operator to check whether the green stability indicator lamp is illuminated.

Sensing object	Detection state	Sensitivity adjuster	Indicator state	Adjustment procedure
Transparent pin or glass plate	Without sensing object		ON  Stability indicator (green)  Light indicator (red)	Turn sensitivity control from minimum to maximum and set at point where incoming light stabilizes.
Opaque object	Object detected, object not detected		ON  Stability indicator (green)  Light indicator (red)	If the object is larger than the lens diameter, set the sensitivity control to the maximum setting. If the object is the same size or smaller, turn the sensitivity control from minimum to maximum and set at point where incoming light stabilizes.

Precautions

Correct Use

Design

Fuzzy mutual interference prevention

- If the light source switches for the reflective plates are arranged in a row, light from a neighboring light source switch may be received, causing erroneous light reception signals and errors.
- The fuzzy reciprocal interference prevention function monitors interference light for a certain period of time before illumination, and gathers data on the strength of the interference light and the frequency of incidence. It then determines the risk of error due to these two factors using fuzzy logic and controls the timing of illumination to reduce the risk.

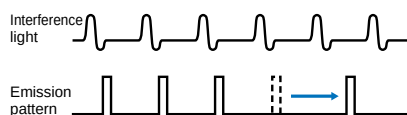
(When risk is low)

- Light is emitted after interfering light is gone.



(In case of high risk)

- Light is emitted after shifting to a gap of interfering light.



Bottles

In some cases, factors such as the shape of a bottle prevent stable detection. Please confirm that a correct detection is performed before use.

Wiring Considerations

Cable

- An oil resistant cable is used to ensure oil resistance. Avoid repeated bending of the cable.
- The bending radius should be 25 mm or more.

Avoiding Malfunctions

When using a photoelectric switch with an inverter or sub-motor, be sure to connect FG (frame ground pin) and G (ground pin). If not connected, errors may result.

Installation

Sensor installation

- When installing a photoelectric switch, avoid tapping with a hammer. This may damage the water resistance function.
- Use an M4 screw, tightened to a torque of no more than 1.18 Nm.

(When using the mounting bracket)

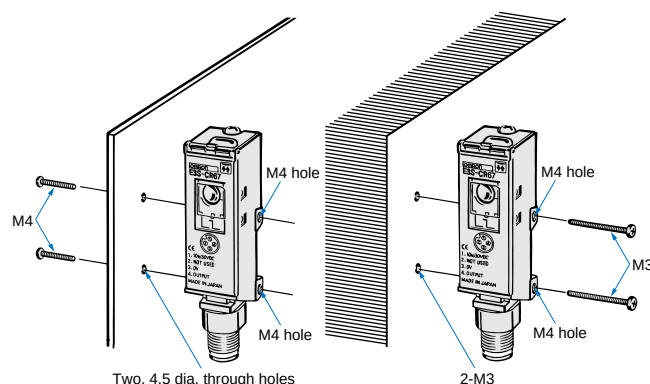
- To set the sensor on the mechanical axis, use the optical axis locking holes.
- When it is not possible to mount on the mechanical shift, move the photoelectric switch vertically or horizontally so that it is located in the center of the area illuminated by the incident light indicator lamp. Verify that the stability indicator lamp is on.

(Direct installation)

Install the photoelectric switch as shown in the following diagram.

Tighten M4 screw

Tighten M3 screw



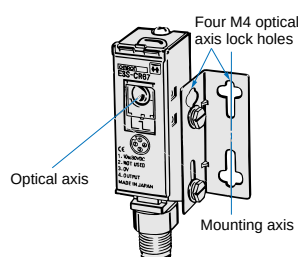
- For adjustment

Light axis adjustment

Adjust the optical axis of the clamp to the direction of detection object approach. The optical axis of the photoelectric switch is the same as the mounting axis of the clamp, enabling easy adjustment.

Optical axis locking hole

By fitting screws into the optical axis locking holes, the mounting bracket is set onto the mounting shaft of the mounting bracket.



Dimensions (Unit: mm)

Sensors

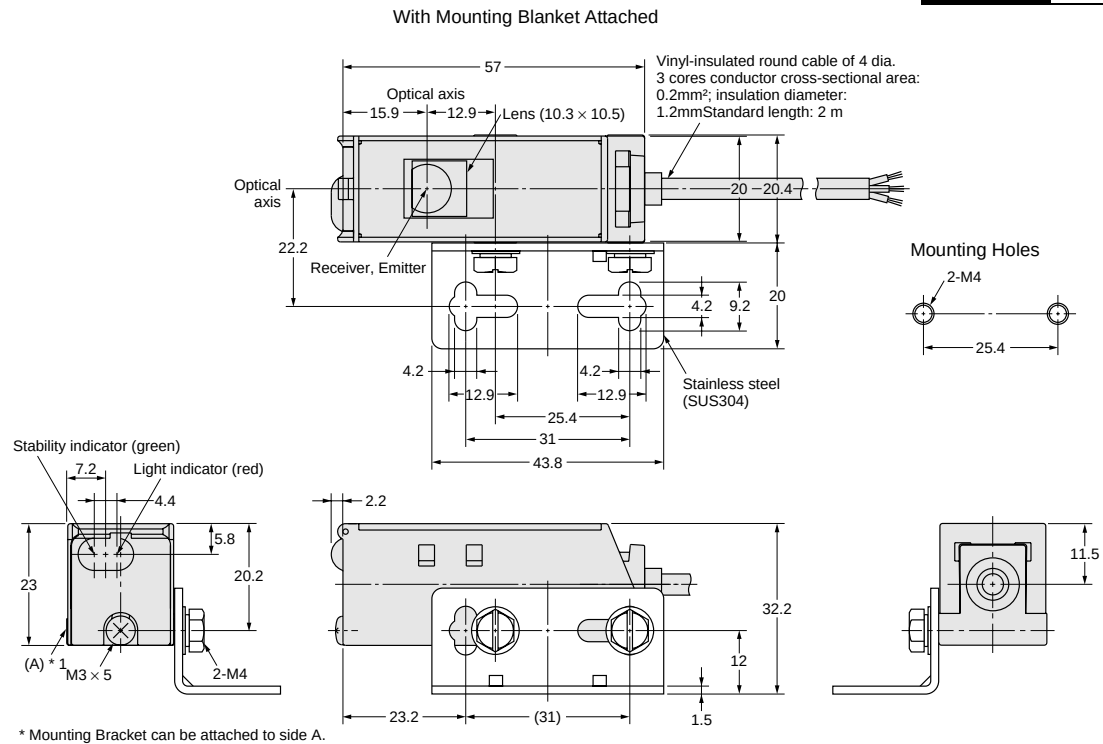
Retroreflective Models

Pre-wired

E3S-CR62-C

CAD file E3S_49

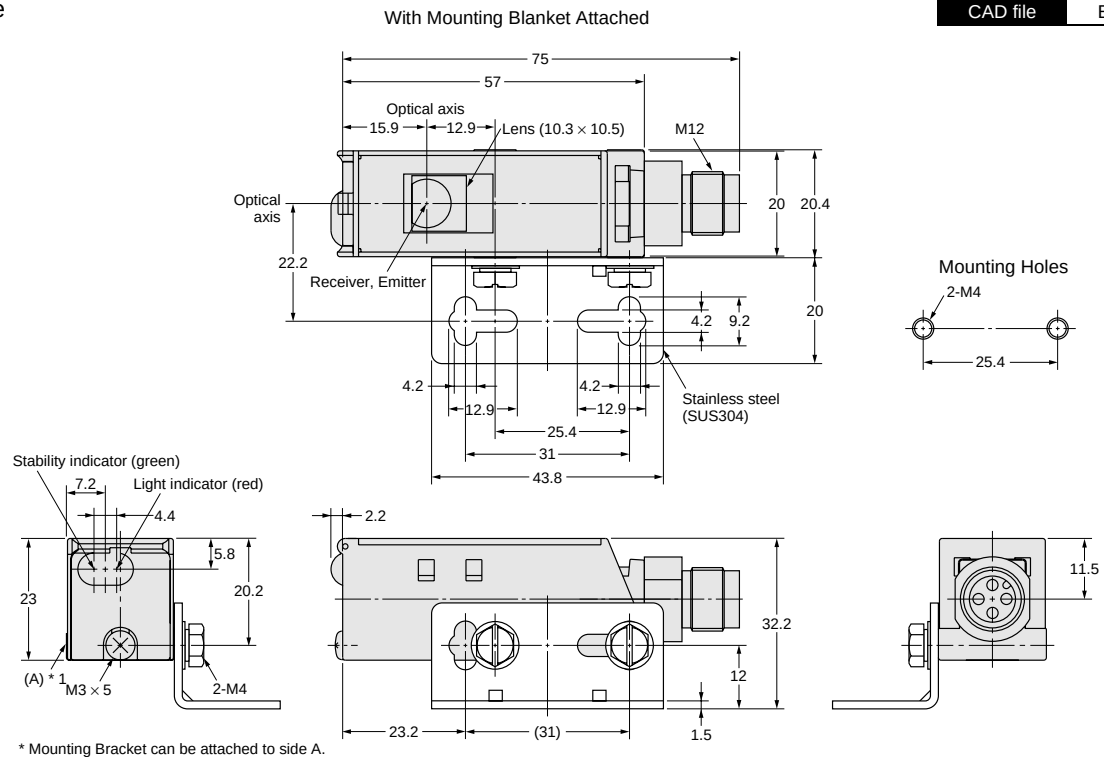
E3S-CR62/67



Connector type

E3S-CR67-C

CAD file E3S_50



Accessories (Order Separately)

A-216

Transparent Object Detection Sensor

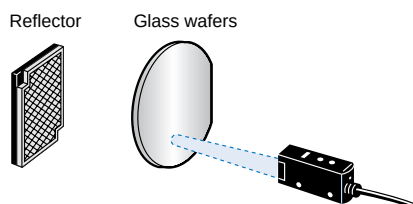
E3S-R

- Senses glass wafers and LCD glass circuit boards.



Applications

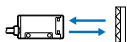
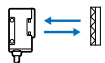
Sensing of Glass Wafers and LCD Glass Circuit Bottles



Ordering Information

Sensors

 Red light

Sensor type	Shape	Connection method	Sensing distance	Model	
				NPN output	PNP output
Retroreflective Models	Horizontal 	Pre-wired	 1m [100mm] *	E3S-R11	E3S-R31
		Connector type		E3S-R16	E3S-R36
	Vertical 	Pre-wired		E3S-R61	E3S-R81
		Connector type		E3S-R66	E3S-R86

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

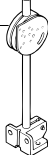
Note: Stable detection may not be possible of some glass wafer materials. Be sure to test whether the work can be detected.

Accessories (Order Separately)

Reflectors

Name	Sensing distance	Model	Quantity	Remarks
Reflectors	Refer to ratings/performance	E39-R1	1	Supplied with the product.

Clamps/Other

Shape	Model	Quantity	Remarks
	E39-L69	1	Included as an accessory for the horizontal model.
	E39-L70	1	Included as an accessory for the vertical model.
	E39-L93	One set	Sensor adjuster: Easy mounting and adjustment on aluminum frame and rail of conveyors and other equipment.
	E39-L97	1	Horizontal protective cover clamp.
	E39-L98	1	Vertical protective cover clamp.
	E39-L60	1	Contact mounting plate: Accessory to E3S-R□.

Note: 1. If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.
2. For details, refer to "Mounting bracket list".

Sensor I/O Connectors

Cable	Shape	Cable length	Model
Standard cable	Straight 	2 m	XS2F-D421-DC0-A
		5 m	XS2F-D421-GC0-A
	L-shape 	2 m	XS2F-D422-DC0-A
		5 m	XS2F-D422-GC0-A

Rating/performance

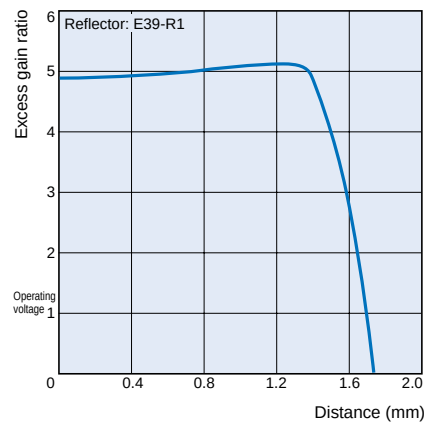
Sensor type		Retroreflective Models (with M.S.R)
Item	Model	
	NPN output	E3S-R11/-R16/-R61/-R66
	PNP output	E3S-R31/-R36/-R81/-R86
Sensing distance		1 m (100 mm) *1(When using the E39-R1)
Standard sensing object		75-mm dia. or larger opaque LCD glass plate (thickness: 0.7 mm)
Directional angle		3 to 10°
Light source (wave length)		Red LED (700 nm)
Power supply voltage		10 to 30 V DC (including 10% ripple (p- p))
Current consumption		30 mA max.
Control output		Load supply voltage: 30 VDC or less, load current: 100 mA or less (residual voltage of 1 V or less), NPN open collector output, Light ON / Dark ON switching
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention
Response time		Operation or reset: 1 ms max.
Sensitivity adjustment		2-revolution endless volume
Ambient illuminance		Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.
Ambient temperature		Operating: 0 to +40°C, storage: -40 to +70°C (no ice formation or condensation)
Ambient humidity		Operating: 35 to 85% RH, Storage: 35 to 95% RH (no condensation)
Insulation resistance		20 M Ω min. at 500 VDC
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions
Protective structure		IEC 60529 IP67
Connection method		Pull-out cable type (standard cord length: 2 m) / connector type
Weight (Packed state)		Approximately 110 g (pull-out cable type) Approximately 60 g (connector type)
Material	Case	PBT (polybutylene terephthalate)
	Lens	Denatured polyarylate
	Mounting Brackets	Stainless steel (SUS304)
Accessories		Clamps (with screws), operation manual, reflector

*1. Values in parentheses indicate the minimum required distance between the sensor and reflector.

Characteristic data (typical)

Operating Range

E3S-R11, E3S-R61+ E39R1



Changes in light intensity when detecting various transparent objects (Note 1)

The following are the permeation rates of a various transparent objects on condition that a permeation rate of 100 means that there is no object within the sensing distance of the E3S-R. The permeation rate of any type of object sensed by the E3S-R must be as low as possible for the stable sensing of the object. Before using the E3S-R to sense objects, use samples of the objects to check if the E3S-R can sense the samples easily.

Sensing object		Model
Shape		Center
Glass plate	50 x 50 t = 0.5	82
	50 x 50 t = 1	74
	50 x 50 t = 2	73
	50 x 50 t = 3	62
	50 x 50 t = 5	53
Liquid crystal glass	50 x 50 t = 10	38
	t = 0.5 (98% transparency)	86
	t = 0.7 (95% transparency)	81
	t = 1.1 (91% transparency)	75
Operating range		95 max.
Stable operating range		90 max.

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

Output Circuit Diagram

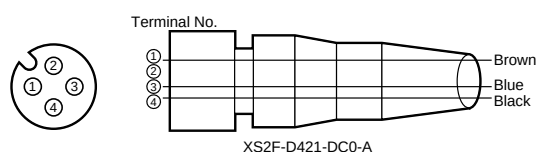
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-R11 E3S-R61 E3S-R16 E3S-R66	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor OFF ON Load (Relay) Operate Reset (Between brown and black)	L•ON	Connector Pin arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor OFF ON Load (Relay) Operate Reset (Between brown and black)	D•ON	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-R31 E3S-R36 E3S-R81 E3S-R86	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between blue and black)	L•ON	Connector Pin arrangement Note: Terminal 2 is not used.
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor OFF ON Load (Relay) Operate Reset (Between blue and black)	D•ON	

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	+V
	---	②	---
	Blue	③	0V
	Black	④	Output

Note: Pin 2 is not used.

Precautions

Correct Use

- For adjustment
 - The passage point of the detection object should be the central point between the reflective plate and the photoelectric switch. If too close to the reflective plate, an error may result.
 - To obtain sufficient detection performance, the E39-R1 must be used for the reflective plate unless otherwise specified.

Dimensions (Unit: mm)

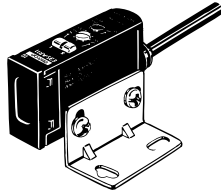
Sensors

Horizontal type

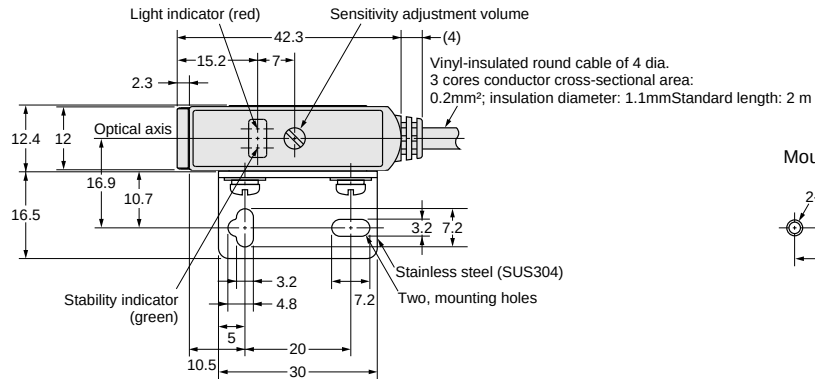
Pre-wired

E3S-R11

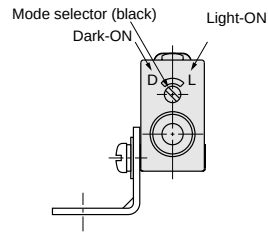
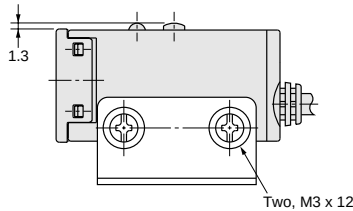
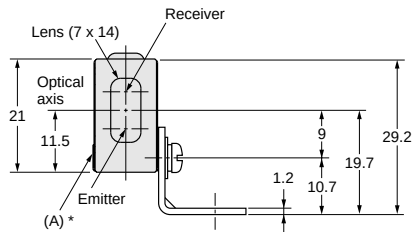
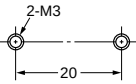
E3S-R31



With Mounting Blanket Attached



Mounting Holes



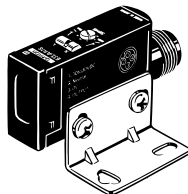
* The Mounting Bracket can also be used on side A.

CAD file E3S_29

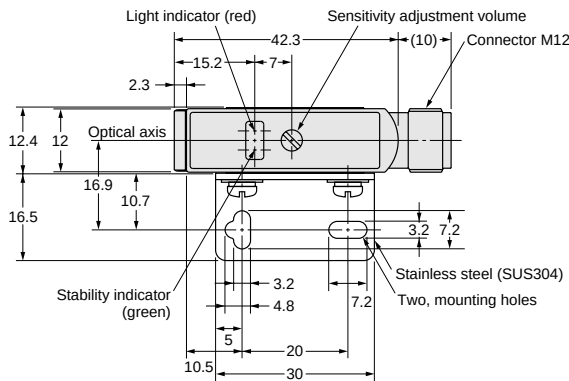
Connector type

E3S-R16

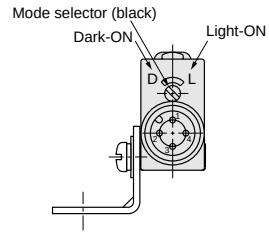
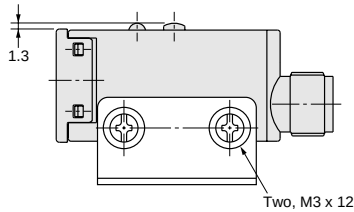
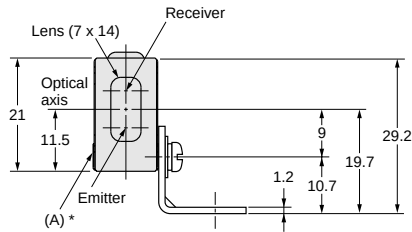
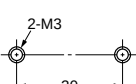
E3S-R36



With Mounting Blanket Attached



Mounting Holes



* The Mounting Bracket can also be used on side A.

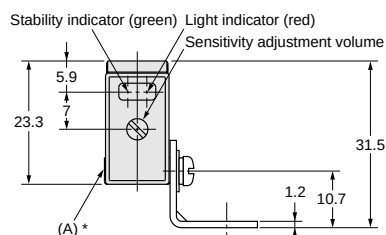
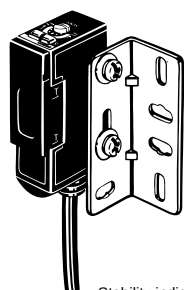
CAD file E3S_30

Vertical type

Pre-wired

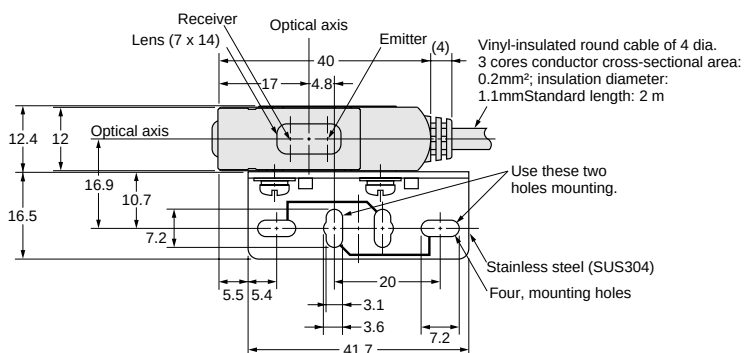
E3S-R61

E3S-R81

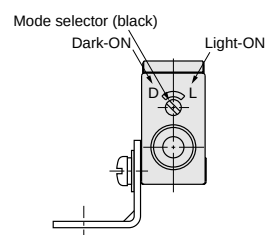
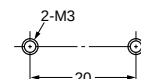


* Mounting Bracket can be attached to side A.

With Mounting Blanket Attached



Mounting Holes

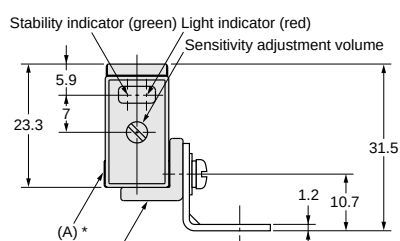
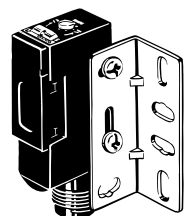


CAD file E3S_32

Connector type

E3S-R66

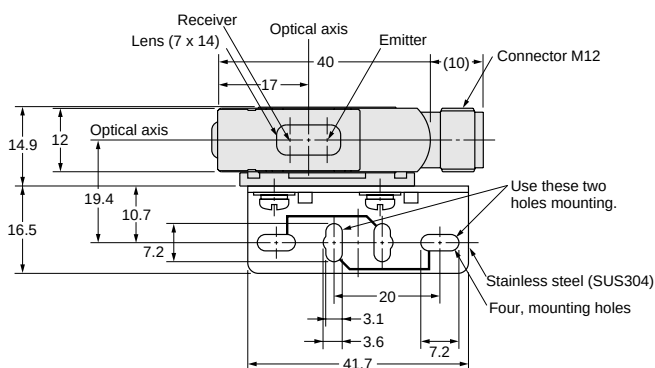
E3S-R86



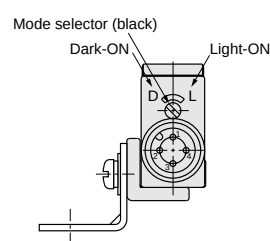
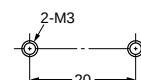
E39-L60 Close Mounting Plate (attachment)
(Attach the mounting plate or the plug cannot be connected.)

* Mounting Bracket can be attached to side A.

With Mounting Blanket Attached



Mounting Holes



CAD file E3S_33

Accessories (Order Separately)

A-212

MEMO

Printed Circuit Board Sensor

E3S-LS3

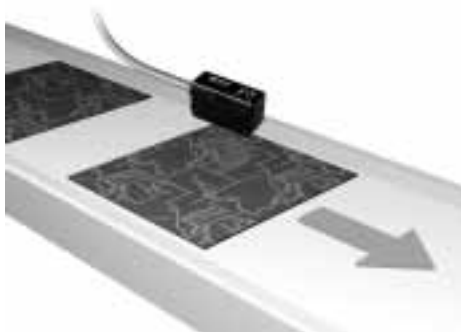
Printed circuit board sensor capable of stable detection without being affected by holes or notches.

- Suitable for incorporation in devices (E3S-LS3□).
- Wide range is suitable for component boards with high or irregularly shaped components (E3S-LS3□W).



Applications

Detecting for PCBs



Transparent Film Sheet Detection



Detection for Wafer-cassette Mounting



Ordering Information

Red light

Sensor type	Shape	Connection method	Detection distance *	Timer function	Model	Output
Limited reflective		Pre-wired (2 m)	 20 to 35 mm	Without	E3S-LS3N	NPN Light ON
			 10 to 60 mm		E3S-LS3NW	
		Pre-wired (2 m)	 20 to 35 mm	Without	E3S-LS3P	PNP Light ON
		Pre-wired M8 3-pin connector (0.3 m)		With	E3S-LS3PT	
		Pre-wired M8 4-pin connector (0.3 m)		Without	E3S-LS3P-M5J	
				With	E3S-LS3PT-M5J	
		Pre-wired M8 4-pin connector (0.3 m)		Without	E3S-LS3P-M3J	
				With	E3S-LS3PT-M3J	
		Pre-wired (2 m)	 10 to 60 mm	Without	E3S-LS3PW	
				With	E3S-LS3PWT	
		Pre-wired M8 3-pin connector (0.3 m)		Without	E3S-LS3PW-M5J	
				With	E3S-LS3PWT-M5J	
		Pre-wired M8 4-pin connector (0.3 m)		Without	E3S-LS3PW-M3J	
				With	E3S-LS3PWT-M3J	

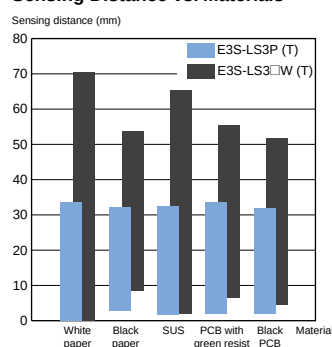
* Using 80 x 80 mm white art paper

Rating/performance

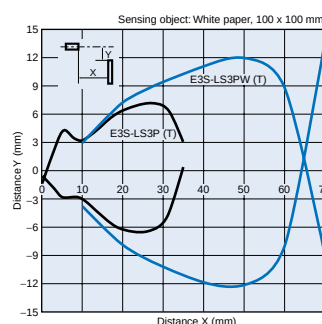
Sensor type		Limited reflective			
Model		E3S-LS3□	E3S-LS3PT	E3S-LS3□W	E3S-LS3PWT
Sensing	White art paper	20 to 35 mm		10 to 60 mm	
	Black paper *	20 to 30 mm		15 to 50 mm	
Light source (wave length)		Red LED (660 nm)			
Power supply voltage		12 to 24 VDC±10%, ripple (p-p) 10% max.			
Current consumption		25 mA max.			
Control output		Load power supply voltage: 24 VDC max.; Load current: 100 mA max., Residual voltage: 2 V max.; Operating mode: Light ON			
Response time		1 ms max. for operation and reset respectively			
Timer function		Available with E3S-LS3P(W)T models only. Time range: 0.1 to 1.0 s (adjustable)			
Ambient illuminance		Receiver side: Incandescent lamp: 5,000 lux max.			
Ambient temperature		Operating: -10 to 55°C (with no icing or condensation)			
Ambient humidity		Operating:35% to 85% (with no condensation)			
Insulation resistance		20 MΩ min. (at 500 VDC) between charged parts and the case			
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute between charged parts and the case			
Vibration resistance		10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions			
Shock resistance		500 m/s ² , 3 times each in X, Y and Z directions			
Protective structure		IEC60529 IP40			
Connection method		Pre-wired (standard length: 2 m)/Pre-wired M8 connector (standard length: 0.3 m)			
Indicators		Operation indicator (orange)			
Weight (Packed state)		Pre-wired models: Approx. 80 g; Pre-wired M8 connector: Approx. 45 g			
Material	Case	ABS			
	Lens	Acrylic			
Accessories		Instruction sheet, M3 screws,			

Characteristic data (typical)

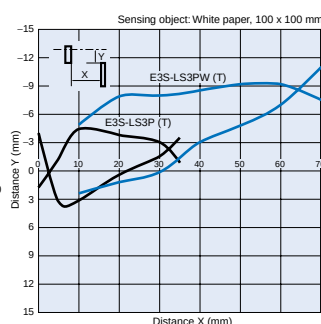
Sensing Distance vs. Materials



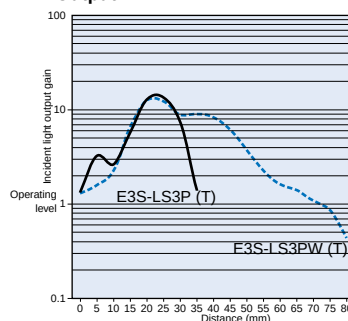
Operating Range (Left and Right)



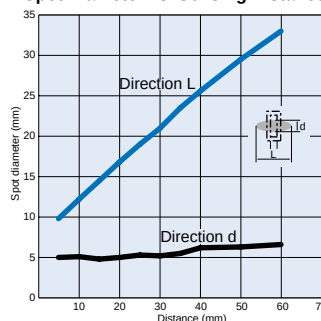
Operating Range (Up and Down)



Output vs. Set Distance



Spot Diameter vs. Sensing Distance



Output Circuit Diagram

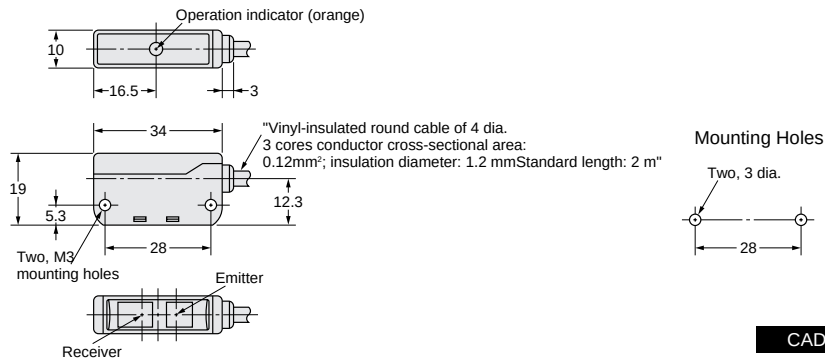
NPN output (PNP output will be available soon)

Model	Operating status of output transistor	Timing chart	Output circuit
E3S-LSN3 E3S-LS3NW	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF	
E3S-LS3P E3S-LS3PW		Incident light No Incident light Operation indicator (orange) ON OFF Output transistor ON OFF	
E3S-LS3PT E3S-LS3PWT		Incident light No Incident light Operation indicator (orange) ON OFF Output transistor ON OFF T: Off-delay timer (0.1 to 1.0 s)	

Dimensions (Unit: mm)

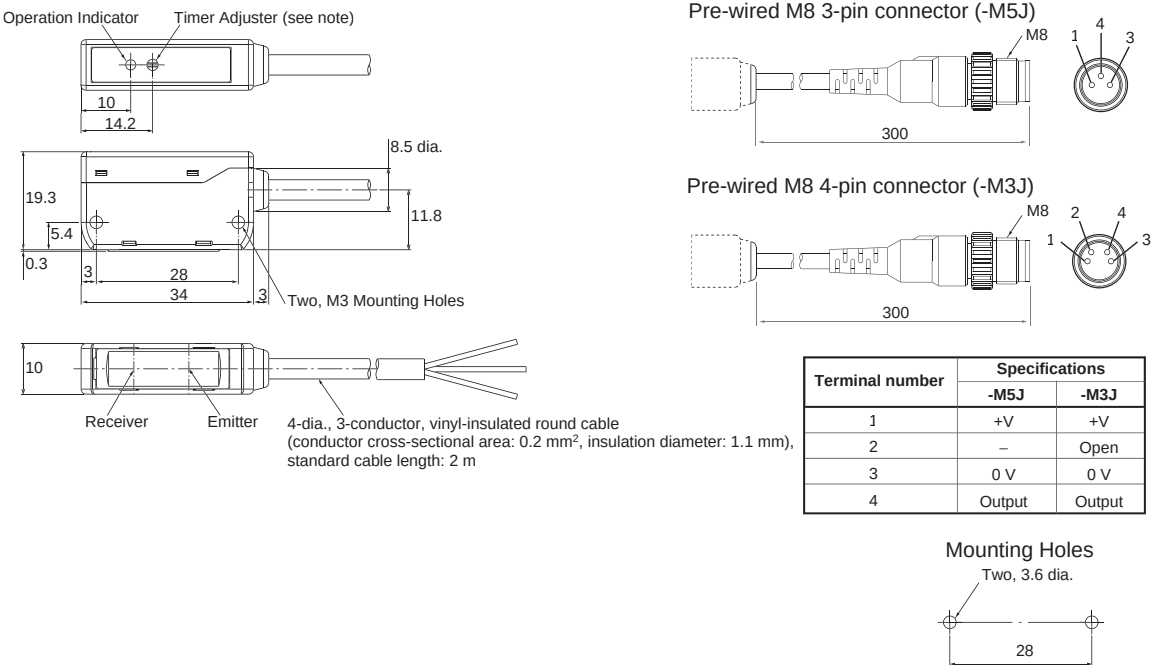
Note: All units are in millimeters unless otherwise indicated.

E3S-LS3N
E3S-LS3NW



CAD file E3S_51

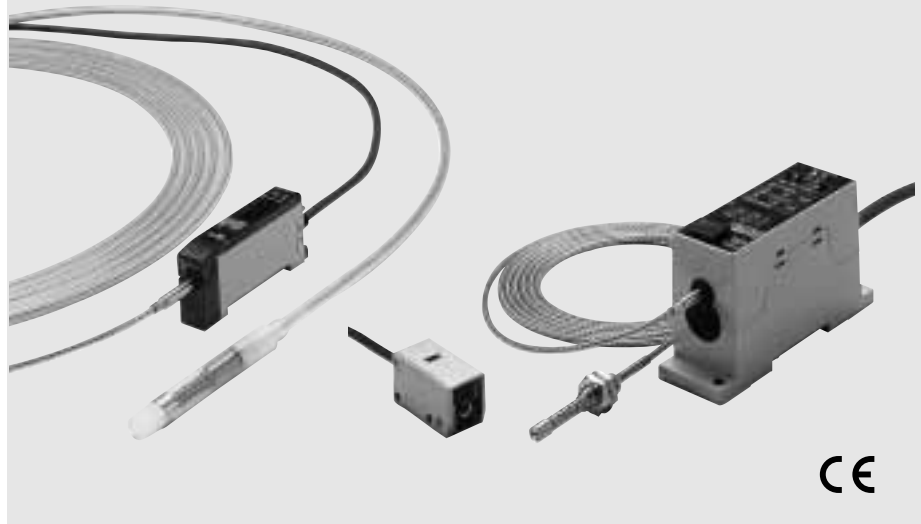
E3S-LS3□(T)(-M5J/-M3J)
E3S-LS3□W(T)(-M5J/-M3J)



Note: The Timer Adjuster is only for the E3S-LS3PT and E3S-LS3PWT.

Ultraviolet power monitor/illumination monitor

F3UV

Monitoring output state of UV (ultraviolet light)/illumination light source

Features

Optical Fiber Type

Can be used as ultraviolet power monitor/illumination monitor

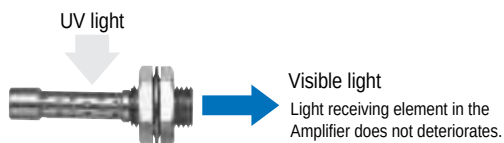
Fiber Units

● UV Power Monitor

Heat resistance applications

Head can resist heat up to 300°C (using F3UV-HM) Converts harmful ultraviolet light into visible light

Case is made of ozone-proof and heatproof stainless steel (SUS303).



F32-300, F32-70

F3UV-XW11/41, F3UV-XA

● During projection monitoring

Monitors projected light through fiber unit.

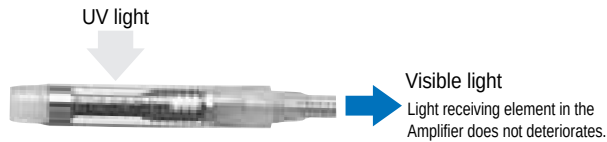


F32-300, F32-70

F3UV-XW11/41, F3UV-XA

Waterproof applications

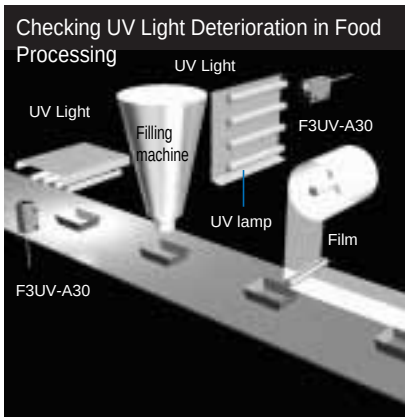
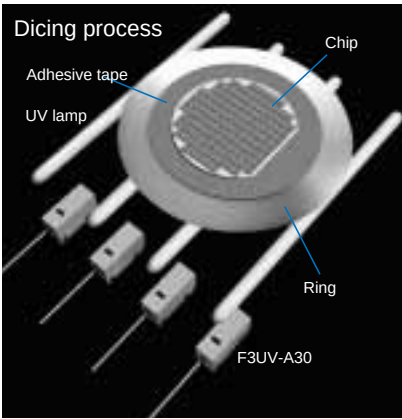
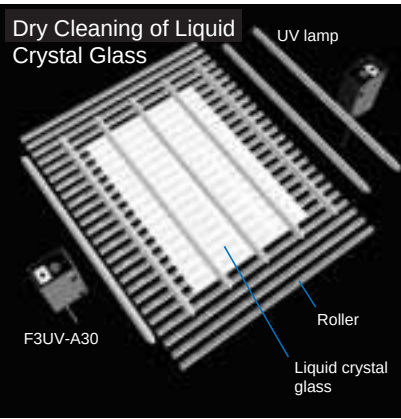
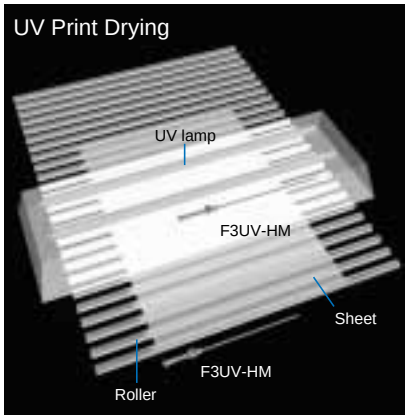
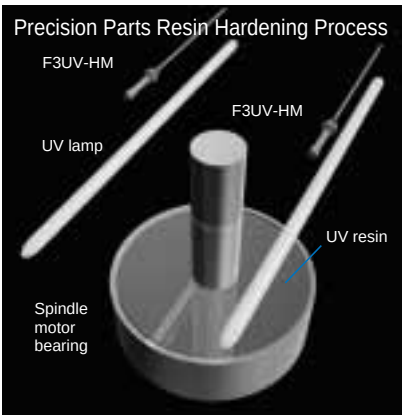
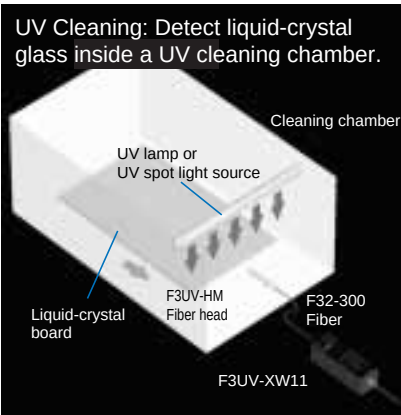
Head can resist heat up to 150°C
(using F3UV-HM) Converts harmful
ultraviolet light into visible light



(Fiber unit not required)

F3UV-XW11/41, F3UV-XA

Application



Features

Optical Fiber Type

Amplifier Units

● F3UV-XW Series

Digital % display for easy visualization of measured values

7-segment digital % display

Easy teaching scheme

Button teaching is possible for zero-point setting and sensitivity setting.

Output form can be selected.

Two outputs: current/voltage output + decision output

● F3UV-XA

Sensitivity control scheme

Fine adjustment possible with 8-revolution dial.

Verify output form with operation indicator lamp

Illuminates at approximate range of 4 to 5 V

Built-in Amplifier Type

(Cannot be used as illumination monitor)

About 1/10th the cost

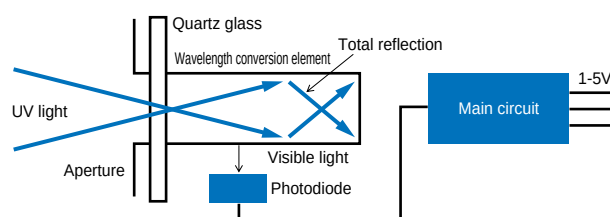
The price is about 1/10th the price of a dedicated measuring instrument

Protective Structure to Prevent UV Deterioration.

A zinc die-cast case and synthetic quartz glass for the light receiving window.

Protective tubes and covers available as options.

(Option)



Monitor UV Light Output Status with an Operation Indicator.

(Lit at approx. 4 to 5 V.)

With control for sensitivity adjustment

Filter Cover (reduced by 1/6.5) Available.

Ordering Information

Built-in Amplifier Type

Sensors

Shape	Intensity range of incident light	Output	Model
	1 to 30 mW/cm ²	Analog voltage output (1 to 5 V)	F3UV-A30
	0.2 to 3 mW/cm ²		F3UV-A03

Accessories (Sold Separately)

Shape	Name	Model
	Protective Tube (Protects the cord.)	F39-CU1M
	Protective Cover (Protects the display.)	F39-HU2
	1/6.5 Filtering Cover	F39-HU1
	Mounting Brackets	F39-L9

Optical Fiber Type

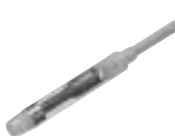
Sensors

Amplifier Unit

Shape	Connection method	Output	Output form	Model
	Pre-wired	- Evaluation output - Answer-back output - Current/voltage analog output	NPN output	F3UV-XW11 *
			PNP output	F3UV-XW41
		Analog voltage output	---	F3UV-XA

* A model with 5 times higher sensitivity is also available.

Head Unit (can only be used as UV power monitor)

Shape	Wavelength range of incident light	Max. temperature	Model	Remarks
 *1	200 to 370 nm	300°C*2	F3UV-HM	Includes two M8 nuts and one mounting plate.
 *3		150°C	F3UV-HT 5m	• Waterproof and chemical-resistant Teflon cover *4 • For the mounting procedure, see "Please use correctly". • For the incoming light power range, please inquire separately.
			F3UV-HT 10 m	

*1. The fiber unit is required for connection to the amplifier unit.

*2. Use within the operating temperature range of the fiber unit you are using.

*3. Can be directly connected to the amplifier unit.

*4. Teflon is a registered trademark of the Dupon Company and the Mitsui Dupon Chemical Company for their fluoride resin.

Fiber Units

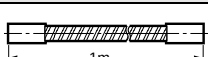
Compatible Amplifier Units	Compatible Head Units	Shape*1	Max. temperature	Intensity range of incident light*2	Model	Quantity
F3UV-XW11 F3UV-XW41	F3UV-HM*3	 M4 screw	300°C	10 to 300 mW/cm ²	F32-300	1 pc.
		 M4 screw	70°C		F32-70	
F3UV-XA		 M4 screw	300°C	30 to 300 mW/cm ²	F32-300	
		 M4 screw	70°C		F32-70	

*1. The values given are for a standard UV light source with a central wavelength of 360 nm, measured with a standard illumination meter (and for use in combination with the specified Amplifier and Head Unit). The power range is one for which teaching to 100% is possible.

*2. For the fiber length, please inquire separately.

*3. Not required when using as an illumination monitor.

Accessories (Order Separately)

Shape	Name	Model	Quantity	Applicable Fiber Units
	Protective Tube (Protects the fiber.)	F39-FU1M	1 pc.	F32-70

Rating/performance

Built-in Amplifier Type

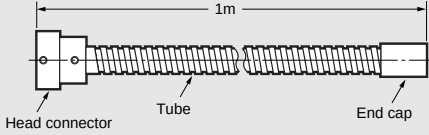
Main Unit

Item	Model	F3UV-A30	F3UV-A0
Intensity range of incident light*1		1 to 30 mW/cm ²	0.2 to 3 mW/cm ²
Wavelength range of incident light		200 to 370 nm	
P indicator		Green LED	
Operation indicator		Orange LED (illuminates at an output of approximately 4 to 5 V)	
Sensitivity adjuster		One-turn adjuster	
Supply voltage		12 to 24 VDC $\pm 10\%$	
Current consumption		15 mA max.	
Response time*2		300 ms max.	400 ms max.
Output*3		1 to 5 V (offset voltage of 0.2 V or higher)	
Connection impedance		100 k Ω min.	
Repetition precision		$\pm 2\%$ F.S. max.	
Temperature drift		0.2% of F.S./ $^{\circ}\text{C}$ max.	
Ambient illuminance*4		Fluorescent light 1,000 lx max.	Fluorescent light 500 lx max.
Ambient temperature		-10° to 70°C	
Ambient humidity		35% to 85%	
Ambient temperature		-25° to 80°C	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC for 1 min.	
Vibration resistance		10 to 150 Hz, half amplitude of 0.1 mm in 3 directions: X, Y, and Z, 8 min x 10 sweeps each	
Shock resistance		150 m/s ² , 3 times each in $\pm X$, $\pm Y$, and $\pm Z$ directions	
Protective structure		IEC Standard IP30	
Connection method		Pre-wired models (standard length: 2 m)	
Weight (Packed state)		78 g	
Material	Case	Zinc diecast	
	Window	Synthetic quartz glass	
Accessories		Instruction manual	

- *1. Using a standard UV light source and UV illumination meter in a power range for which analog output can be set to 5 V.
- *2. The response time is the rise time of the output signal to 10 to 90%.
- *3. An output voltage up to 6 V can be output. Adjust the sensitivity so that the output is less than 5 V. The output is 0.2 to 1 V when there is no incident UV light.
- *4. This value is the illumination at the receiver window maintaining an offset voltage of 1 V max. with the fluorescent light.

Accessories (Order Separately)

Protective Tube (Protects the cord.)

Item	Model	Shape
	F39-CU1M	
Ambient temperature	Operating/storage: -40 to $+100^{\circ}\text{C}$ (must use in operating temperature range of sensor)	
Ambient humidity	Operating: 35% to 85% Storage: 35% to 95%	
Bending radius	24 $\pm 5\text{mm}$	
Tensile strength	Gap between head connector/end cap and tube: 2 Nm or less, tube: 2 Nm or less	
Compression load	Tube: 9.8 Nm (lateral pressure load)	
Material	Head connector	Brass nickel plating
	End cap	Brass nickel plating
	Tube	Stainless steel (SUS304)
Accessories	M2 screws	

Optical Fiber Type

Sensors

Amplifier Units

Item	Model	F3UV-XW11*1	F3UV-XW41	F3UV-XA
Power supply voltage		12 to 24 VDC $\pm 10\%$		
Current consumption		75 mA max.		15 mA max.
Output	Analog output	Current (4 to 20 mA)/Voltage (1 to 5 V) (when using light intensity monitor and light intensity integration mode)		Voltage (1 to 5 V) (offset voltage of 0.2 V or less)
	Discrimination output	NPN open collector output, 100 mA or less, residual voltage 1 V or less (when using light intensity monitor and light intensity integration mode)	PNP open collector output, 100 mA or less, residual voltage 2 V or less (when using light intensity monitor and light intensity integration mode)	---
	Answer-back output	NPN open collector output, 100 mA or less, residual voltage 1 V or less (when using light intensity monitor and light intensity integration mode)	PNP open collector output, 100 mA or less, residual voltage 2 V or less (when using light intensity monitor and light intensity integration mode)	---
Inputs	Remote teaching input	When ON: 0 V short circuit (short circuit current of 1 mA or less) When OFF: Open circuit (open or 9 V or higher and 24 V or less)	When ON: Power supply voltage short circuit or 9 V or higher and 24 V or less (short circuit current of 3 mA or less) When OFF: Open circuit (open or 1.5 V or less)	---
	Reset input	When ON: 0 V short circuit (short circuit current of 1 mA or less) When OFF: Open circuit (open or 9 V or higher and 24 V or less)	When ON: Power supply voltage short circuit or 9 V or higher and 24 V or less (short circuit current of 3 mA or less) When OFF: Open circuit (open or 1.5 V or less)	---
Protective circuits		Protection from load short-circuit and reversed power supply connection		
Response time*2		500 ms max.		300 ms max.
Sensitivity setting		Teaching		8-revolution dial type
Indicator lamp		Measurement/teaching indicator lamp (green/red) Operation indicator lamp (orange) 7 segment digital percent display (red) 7 segment digital threshold value display (red)		Power display (green) Operation display (orange)
Repetition precision		$\pm 2\%$ F.S. max.		
Ambient illuminance		Fluorescent light 1,000 lx max.*3		Fluorescent light 1,000 lx max.*4
Temperature drift		$\pm 0.1\%$ of F.S./°C max		0.2% of F.S./°C max.
Ambient temperature		Operating: -25 to +55°C, Storage: -40 to +70°C (with no icing or condensation)		
Ambient humidity		Operating/storage: 35% to 85% RH		
Insulation resistance		20 M Ω min. at 500 VDC		
Dielectric strength		Lead wires to case: 1,000 V AC 50/60 Hz		
Vibration resistance		10 to 150 Hz, half amplitude of 0.1 mm, or 15 m/s ² , 2h each in X, Y, and Z directions		
Shock resistance		150 m/s ² , 3 times each in X, Y, and Z directions		
Protective structure		IEC Standard IP30		IEC 60529 IP50
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 270 g		Approx. 60 g
Material		ABS		
Accessories		Instruction manual		Operation manual, adjustment driver, clamps

*1. A model with 5 times the sensitivity is also available.

*2. Response time: 10% to 90% of rise and fall time of analog output signal.

*3. An analog output of up to 6 V (or 24 mA) can be output. The output is 1 V (or 4 mA) when there is no incident UV light.

*4. Shows value at which offset voltage can maintain 1 V or less using fluorescent lamp.

Note: 1. Analog output outputs up to approximately 6 V (24 mA). Outputs 1 V (4 mA) when there is no incoming light.

2. F.S. stands for full scale. For a current output, full scale is 16 mA (4 to 20 mA).

Voltage output: 4 V (1 to 5 V)

3. Definition of the luminous energy integral: The physical unit of the luminous energy integral is energy (J: joules) and this value is calculated by multiplying the UV intensity (mV) by the time of exposure (s), but it is dimensionless when this sensor's analog output value (V) is used for the UV intensity. The integral is measured with an 11 ms sampling time.

Head unit

Item		Model	F3UV-HM	F3UV-HT (both 5m and 10m)
Wavelength range of incident light			200 to 370 nm	
Temperature drift			-0.15%/°C max.	
Ambient temperature			Operating/Storage: -40° to 300°C (with no icing or condensation)	Operating/Storage: -40° to 150°C (with no icing or condensation)
Ambient humidity			Operating/Storage: 35% to 85% RH (with no icing or condensation)	
Vibration resistance			10 to 55 Hz, half amplitude of 0.75 mm or 100 m/s ²	
Shock resistance			500 m/s ²	
Weight (Packed state)			30 g	5 m cable: approximately 170 g, 10 m cable: approximately 380 g
Material	Protective casing		Stainless steel (SUS303)	Fluororesin
	Fluorescent fiber path		Functional fluoroglass	
Accessories			M8 nut and mounting bracket	---

Optical Fiber Type

Sensors

Fiber Units

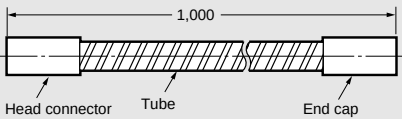
Item		Model	F32-300	F32-70
Ambient temperature	Operation		-40° to 300°C*1	-40° to 70°C
	Storage		-40° to 110°C	-40° to 70°C
			(with no icing or condensation)	
Ambient humidity			Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)	
Permissible bending radius			25 mm min.	
Fiber sheath material			SUS	Black polyethylene
Protective structure			IEC 60529 IP67	
Standard fiber length			2 m *2	

*1. Heat-resistance temperatures vary depending on the fiber part. See the dimensions for details.

*2. For the fiber length, please inquire separately.

Accessories (Order Separately)

Protective Tube (Protects the Fiber.)

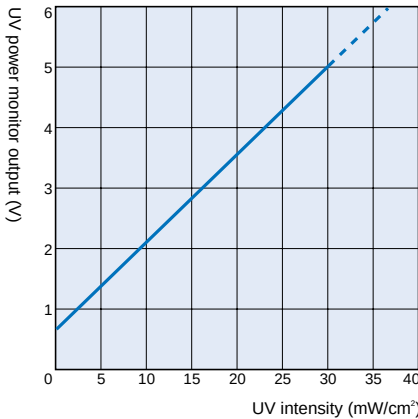
Item		Model	F39-FU1M
Shape			
Ambient temperature			-40° to 150°C for operating or storage Fiber inserted inside must be used within its operating temperature range.
Ambient humidity			Operating: 35% to 85% RH, storage: 35% to 95% RH
Bending radius			30 mm min.
Tensile strength			Between tube and head connector or end cap: 1.5 Nm or less Tube: 2 Nm or less
Compression load			Tube: 29.4 N max.
Material	Head connector		Brass nickel plating
	End cap		Brass nickel plating
	Tube		Stainless steel (SUS304)

Characteristic data (typical)

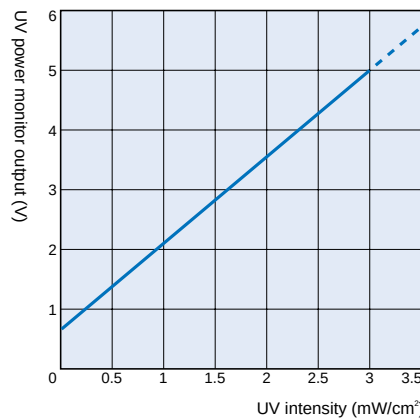
Built-in Amplifier Type

Output Characteristics

F3UV-A30 (output characteristics when output at 30 mW/cm² is set to 5 V)

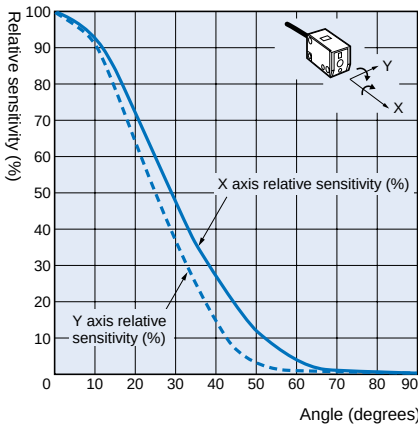


F3UV-A03 (output characteristics when output at 3 mW/cm² is set to 5 V)

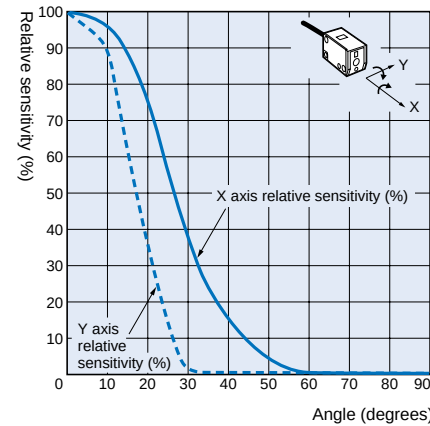


Angular Characteristics (Y-direction)

F3UV-A30/-A03



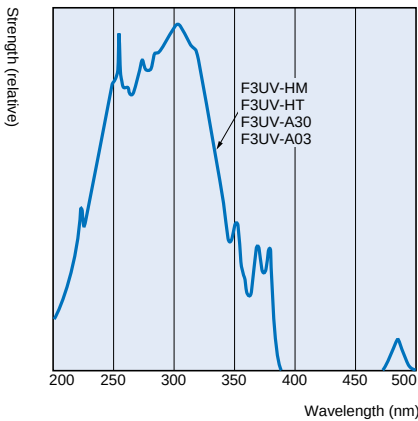
F3UV-A30/A03 + F39-HU1 (exposure cover option)



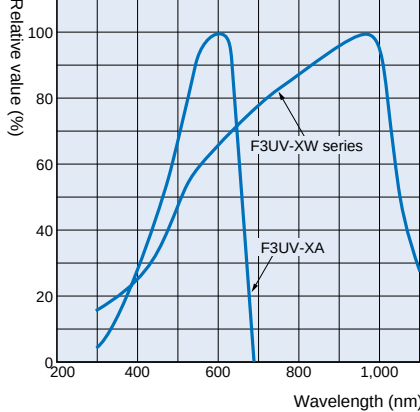
General

Sensitivity Characteristics

All F3UV Models



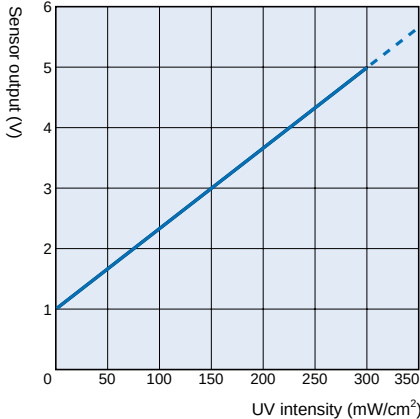
When used as illumination monitor



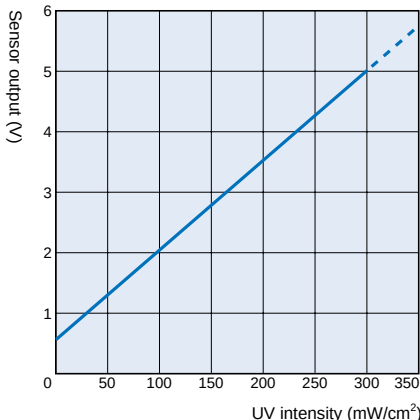
Optical Fiber Type

Output Characteristics

F3UV-XW□1 + F3UV-HM + F32-300 (output characteristics at 300 mW/cm² when sensitivity is set)

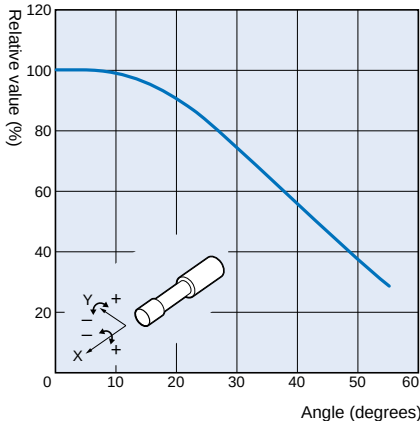


F3UV-XA + F3UV-HM + F32-300 (output characteristics at 300 mW/cm² when sensitivity is set)



Angle characteristics (Y direction)

F3UV-HM/-HT

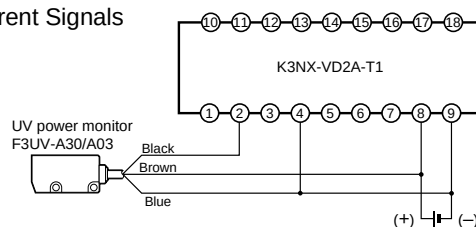


Note: X-direction output fluctuation is ±10% F.S. or less through 360° revolution

Connected with controller

Built-in Amplifier Type

Analog Indications such as Voltage or Current Signals



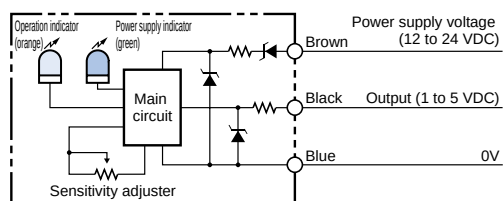
Input/output stage circuit schematic

Built-in Amplifier Type

Optical Fiber Type

F3UV-A30, F3UV-A03

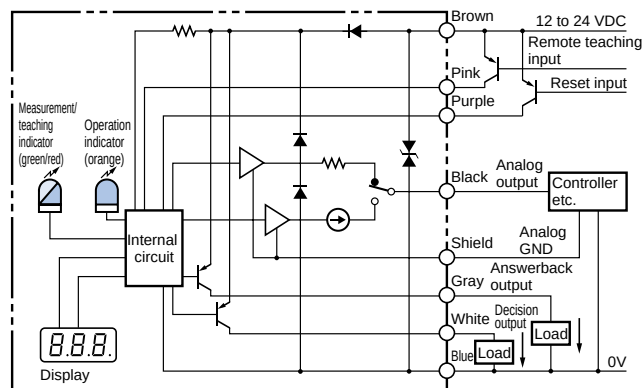
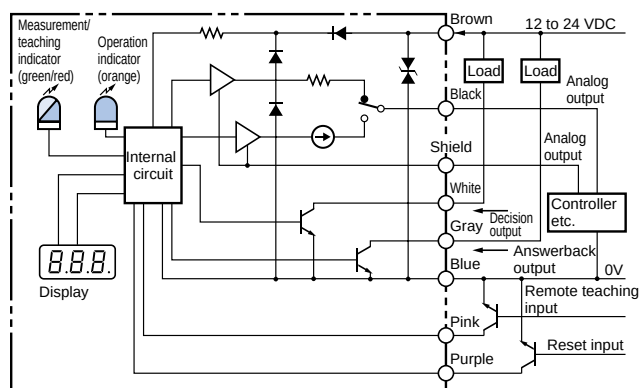
F3UV-XA



Optical Fiber Type

F3UV-XW11 (NPN output)

F3UV-XW41 (PNP output)



Part Names/Functions

Optical Fiber Type

- F3UV-XW11/XW41
- F3UV-XA

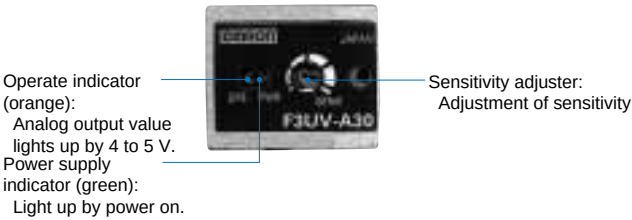


Functions

Name	Functions
Light monitor function (with current/voltage output switch function)	Displays the digital (%) value corresponding to the incident light intensity and outputs the analog and judgement outputs. Analog output Decision output
Light intensity integration function (with current/voltage output switch function)	Calculates the light intensity integral value (I) from the incident light intensity (P) and time (T) using the following equation: $I = P \times T$. Also outputs the integral's analog output simultaneously and displays the digital (%) value. (Output ON at 100%.)
Remote teaching function	In light monitor mode or light intensity integration mode, teaching is performed by pulse signal input.

Built-in Amplifier Type

- F3UV-A30/A03



Functions

Name	Functions
Display function	P indicator Lit green when power supply is ON. Operation indicator Lit orange when the analog output is between 4 and 5 V.
Output function	Analog output Outputs voltage proportional to incoming light intensity. (Offset voltage of 0.2 V or higher)
Sensitivity adjustment function	Sensitivity can be set to the desired level with this one-turn adjuster.

Operation

● F3UV-A30/A03

Sensitivity adjustment method

During initial setup or when UV light source is replaced, adjust the analog output to 4 to 5 V as follows.

(Sensitivity adjustment)

After installing the sensor, adjust the sensitivity with the sensitivity control.

When the analog output is within the range of 4 to 5 V, the orange operation indicator lamp illuminates. Once it illuminates, fine adjust the output to the required voltage.

(If the UV light intensity is too high)

If the analog output is 5.0 V or higher when the sensitivity control is set to MIN (all the way to the left), the UV light intensity exceeds the sensor specification. Either use the optional F39-HU1 Exposure Cover, or move the sensor away from the UV lamp.

(If the UV light intensity is too low)

If the analog output is 5.0 V or lower when the sensitivity control is set to MAX (all the way to the right), the UV light intensity is lower than the sensor specification. Move the sensor closer to the UV lamp.

● F3UV-XW11/XW41

Basic Operating Procedures

- (1) Install the Amplifier Unit.
- (2) Connect the Fiber Unit to the Amplifier Unit.
- (3) Turn ON the power supply.
- (4) Select an operating mode with the operation mode switch.
(Light intensity monitor mode or light intensity integral mode)
- (5) When using the analog output, select current or voltage output with the output selection switch.
- (6) Set the processing mode switch to TEACH and perform the teaching operation.
 - Light Intensity Monitor Mode
Perform the zero-point setting when the indicator is not lit and make the sensitivity setting when the indicator is lit. (Perform the sensitivity setting after the temperature has stabilized.)
 - Light Intensity Integral Mode
Use the start setting at the start of illumination and the stop setting when completed.
Teaching can be performed by pressing the buttons or with codes.
- (7) When changing the threshold value in light intensity monitor mode, set the processing mode switch to ADJ and adjust the threshold value. The judgement output will go ON if the light intensity is below the threshold value. The threshold value is set to 50 at the factory.

- (8) Set the processing mode switch to RUN to start measurement. In light intensity integral mode, start integration with the Reset input.

For detailed operation procedures, see the product manual.

● F3UV-XA

Sensitivity adjustment method

During initial setup or when UV light source is replaced, adjust the control output to any value between 4 and 5 V using the sensitivity control. After that, you can monitor weakening of the UV light source intensity by monitoring the control output value.

(Sensitivity adjustment)

After installing and securing the sensor, adjust the sensitivity with the sensitivity control. When the control output value is within the range of 4 to 5 V, the orange operation indicator lamp illuminates. (The sensor output goes up to approximately 6 V, and thus the operation indicator lamp does not illuminate if the sensitivity is too high.) Adjustment is easier if you verify that the operation indicator lamp is illuminated and then fine-adjust the sensitivity to the desired value while viewing the voltmeter display.

(If the UV light intensity is too high)

If the analog output is 5.0 V or higher when the sensitivity control is set to MIN (all the way to the left), or if the analog output does not decrease when the sensor is moved away from the UV lamp, the UV light intensity exceeds the sensor specification. Move the sensor further away from the UV lamp

(If the UV light intensity is too low)

If the analog output is 5.0 V or lower when the sensitivity control is set to MAX (all the way to the right), the UV light intensity is lower than the sensor specification. Move the sensor closer to the UV lamp.

Precautions

Important

Be sure to observe the precautions listed here. These precautions are essential for safe operation.

- (1) Do not disassemble, repair, or modify this product.
- (2) Do not short-circuit the two ends of the load.
- (3) Do not install the amplifier unit in a location where it will be exposed to ultraviolet light.

Correct Use

F3UV general

Wiring Considerations

Connection

- (1) Ensure that the power supply voltage is below the maximum voltage before turning the power ON.
- (2) Ensure that the terminal polarity and wiring are correct.
- (3) Use a cable with 0.3 mm² or greater wires and which is no more than 5 m in length, and test operation before using.

Power Supply

Do not use the system until 1 second has elapsed after turning on the power and it is in a detection-capable state. If the F3UV and the unit on which it is installed are connected to separate power sources, be sure to turn on the F3UV power first.

During use

Mounting the sensor

Ultraviolet light is harmful. Ensure the UV lamp is off when you install it.

Sensitivity setting

Temperature drift may cause the analog output value to change. If the temperature is rising, wait until it has stabilized sufficiently to set the sensitivity.

Output characteristics

If the analog output is not proportional to the ultraviolet illuminance of another manufacturer's illuminance meter, the following problems are possible.

- (1) If the distance between the lamp and the sensor was changed to adjust the ultraviolet illuminance, the values sometimes differ due to differing angles of view in the sensor receiver and in the other manufacturer's illuminance meter receiver.
- (2) If the illumination power of the UV lamp was changed to adjust the ultraviolet illuminance, accurate monitoring may not be possible due to insufficient stability of the UV lamp. Wait until the UV lamp has sufficiently stabilized and then perform the measurement.
- (3) If the temperature rises due to the UV lamp, wait until the sensor temperature stabilizes sufficiently and then perform the measurement.
- (4) If the sensor and the illuminance meter have different sized receiver areas, the values sometimes differ due to uneven illuminance on the receiver surface.

Miscellaneous

Cleaning

Do not use thinners. Use a soft cloth or blower brush to remove dust and dirt from the receiver window.

F3UV-A30/-A03

Mounting dimensions

(Installation strength)

Screws for mounting the sensor should be tightened to a torque of no more than 0.49 Nm.

(Protection against ultraviolet light)

The indicator lamps and cables on the sensor are not protected against ultraviolet light. If the indicator lamps and cables will be exposed to ultraviolet light, use the F39-HU2 and F39-CU1 to protect these parts.

Use protective gear if ultraviolet light will directly enter your field of vision or shine on your skin while mounting and adjusting the sensor.

F3UV-XW11/XW41/XA

Mounting

Mounting procedure

(1) Mounting strength * The torque for tightening screws when installing the sensor should be no more than 0.49 Nm.

(2) Using a DIN rail

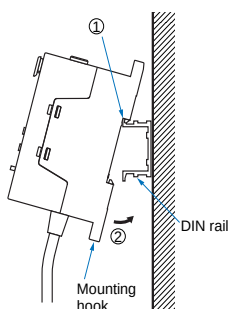
(Mounting)

1. Hook the top of the Unit onto the DIN Track.
2. Snap the bottom of the Unit onto the DIN Track.

Note: Do not reverse steps 1 and 2.

(Removal)

When removing the Unit from the DIN Track, pull the mounting hook forward to release it.



*F3UV-XW11/XW41 only

Protection against ultraviolet light

This amplifier is not protected against ultraviolet light.

Do not install the amplifier unit in a location where it will be exposed to ultraviolet light.

Fiber Unit/Base Unit

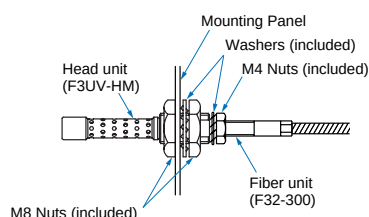
Mounting

Mounting the head unit when using as an ultraviolet power monitor

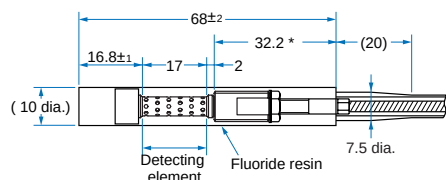
When installing the head unit, turn off the ultraviolet light and install in safe conditions.

The torque for tightening screws on the fiber unit should not exceed 0.78 Nm.

(F3UV-HM)



(F3UV-HT)



* When using mounting bracket, please use within this dimensions.

Mounting the fiber unit when using as an illumination monitor

As with a regular fiber unit, attach using a an M4 locking nut.

When connecting to an amplifier unit

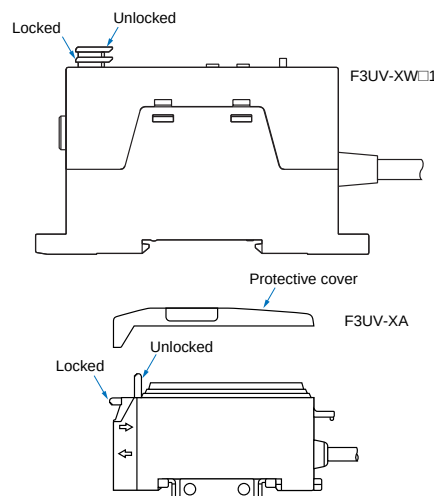
The quality of the connection between the Fiber Unit and Amplifier Unit has a major impact on the operating characteristics, so be sure to connect these Units securely.

(1) Cutting the Fiber (F32-70 only)

- Insert the fiber into the hole of the cutting tool and set the tool at the desired length.
- Press down the blade and cut the fiber. Do not stop when the fiber is only partially cut; make one clean cut
- Once a hole has been used to cut a fiber, do not use that hole again. The cut surface may not be clean enough and the detection characteristics may be degraded.

(2) Installing the Fiber

With the lock button in the release position, insert the fiber into the Unit and press the button until you hear a click. This click is the sound of the fiber being locked.



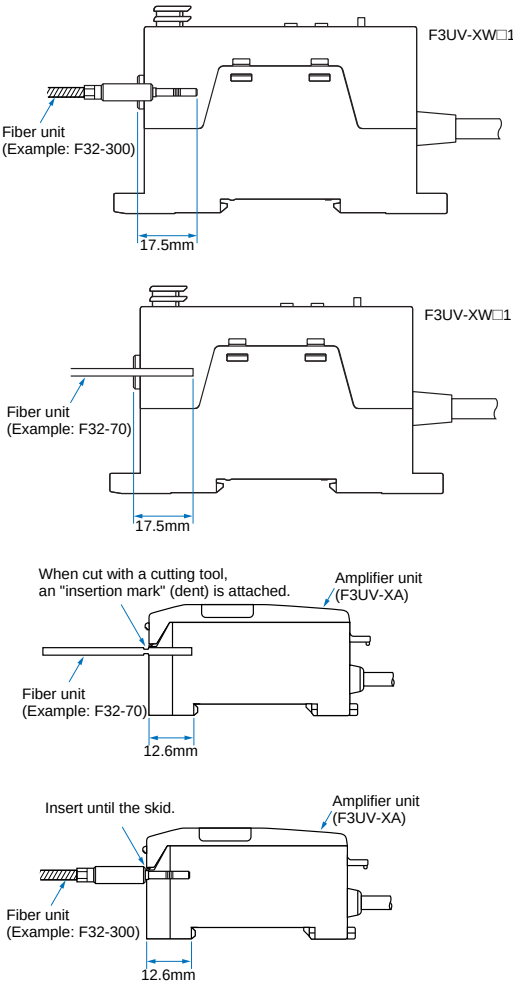
(3) Fiber removal

Press the lock button again. The lock will be released, the lock button will pop up, and it will be possible to remove the fiber.

Do not force the lock button up by pulling on it. (To maintain the fiber's characteristics, check whether the lock is out of place.)

(4) Fiber Insertion Location

When inserting the Fiber Unit into the Amplifier Unit, always insert the Fiber Unit completely as shown in the following diagram.



(5) Fiber Unit Installation/Removal Precautions

Install and remove the Fiber Unit only when the ambient temperature is between -40 and 40°C.

(6) Protecting the Fiber Unit

If the outer sheathing of a Fiber Unit other than the F32-300 is exposed to UV light, protect the fiber by covering it with the F39-FU1M Protective Tube.

Dimensions (Unit: mm)

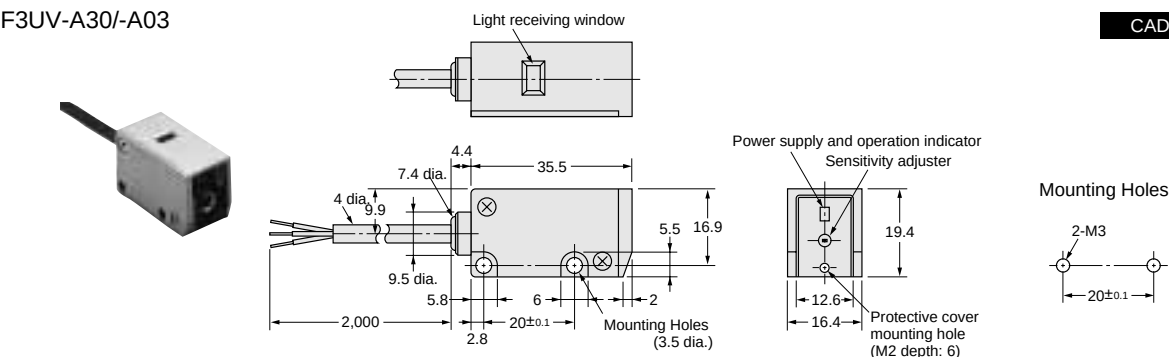
Built-in Amplifier Type

Sensors

F3UV-A30/-A03

CAD file

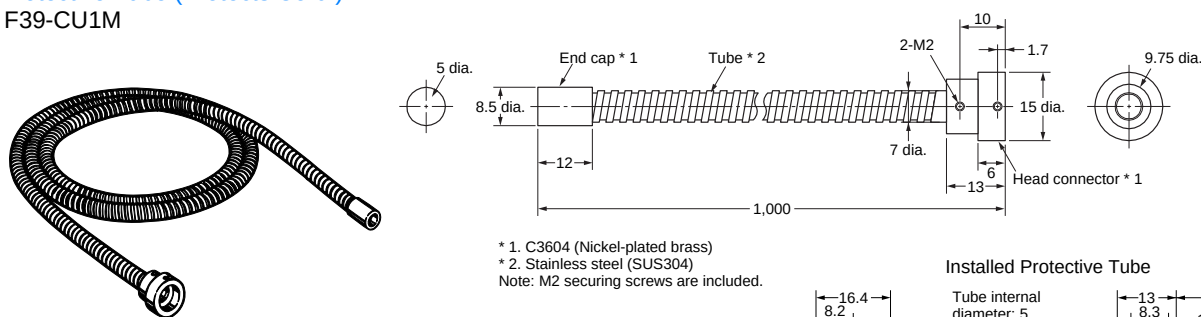
F3UV_01



Accessories (Order Separately)

Protective Tube (Protects Cord.)

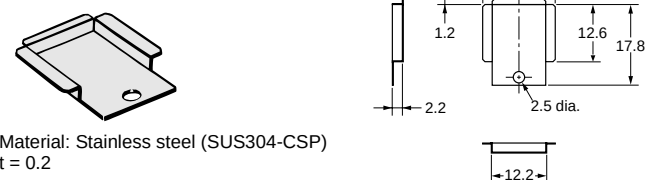
F39-CU1M



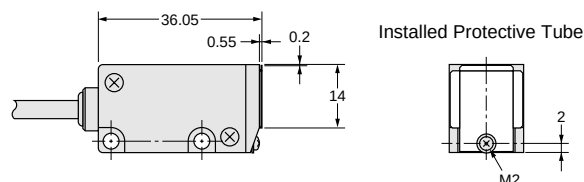
* 1. C3604 (Nickel-plated brass)
* 2. Stainless steel (SUS304)
Note: M2 securing screws are included.

Protective Cover (Protects the display.)

F39-HU2

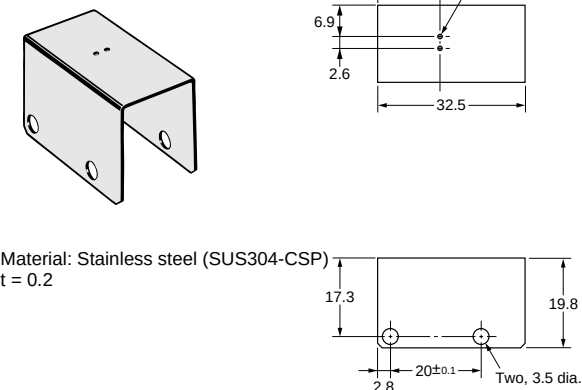


Material: Stainless steel (SUS304-CSP)
t = 0.2

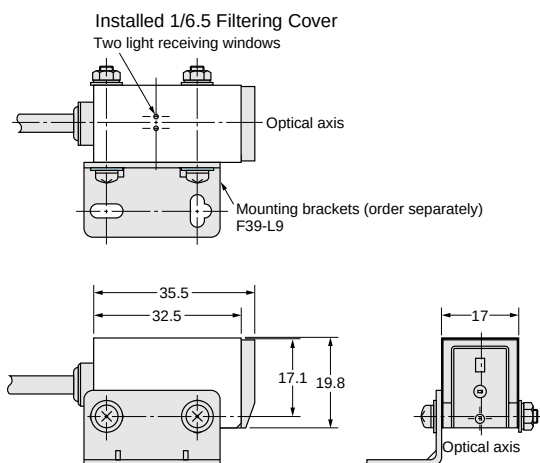


1/6.5 Filtering Cover

F39-HU1



Material: Stainless steel (SUS304-CSP)
t = 0.2



Mounting Brackets

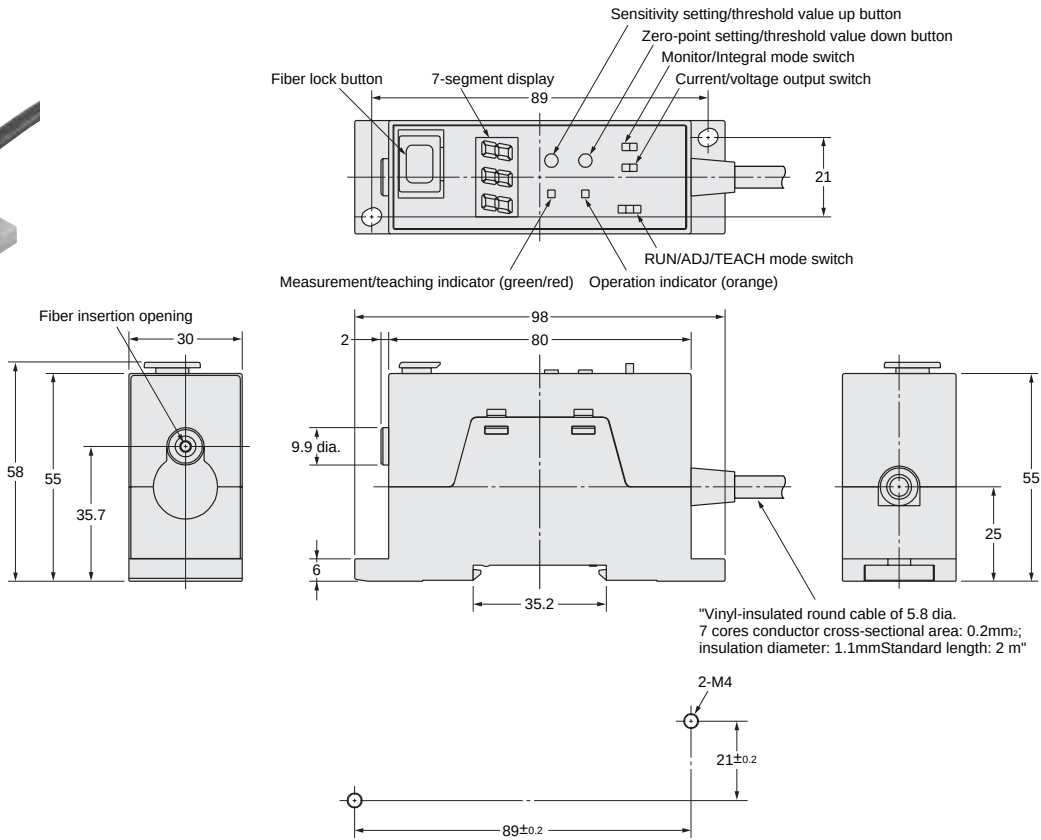
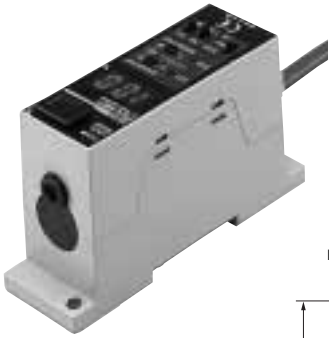
Optical Fiber Type

Sensors

Amplifier Units

F3UV-XW11/XW41

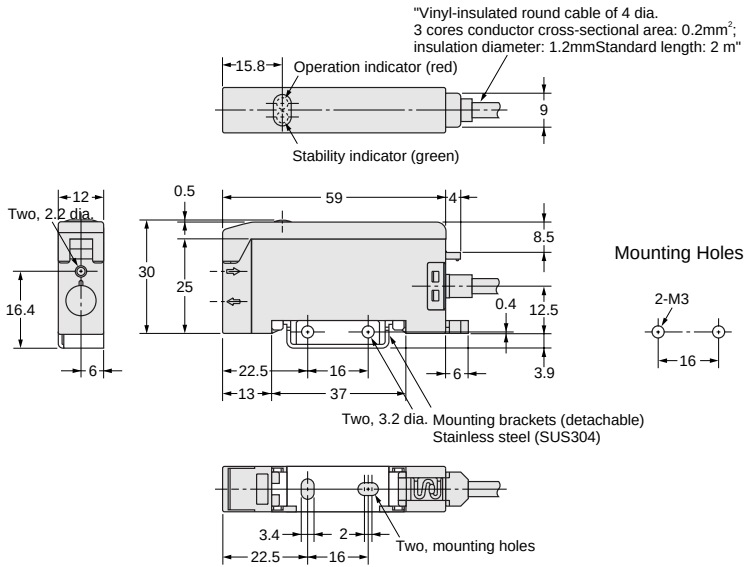
CAD file F3UV_02



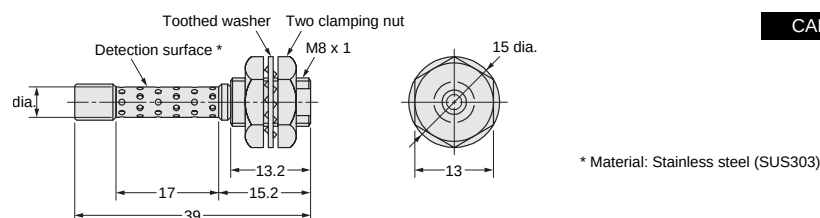
Amplifier Units

F3UV-XA

CAD file E3X_01



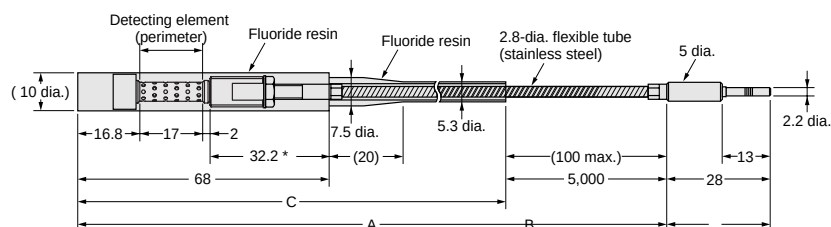
Head Unit F3UV-HM



CAD file F3UV_03

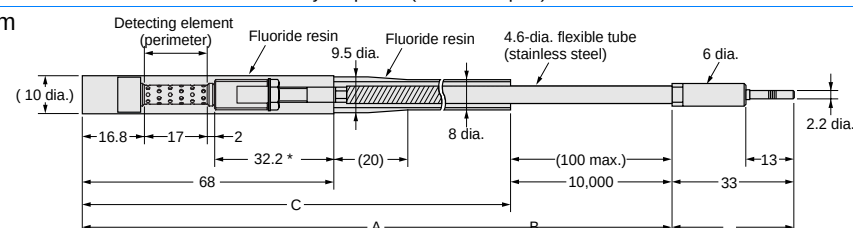
Head Unit

F3UV-HT 5m



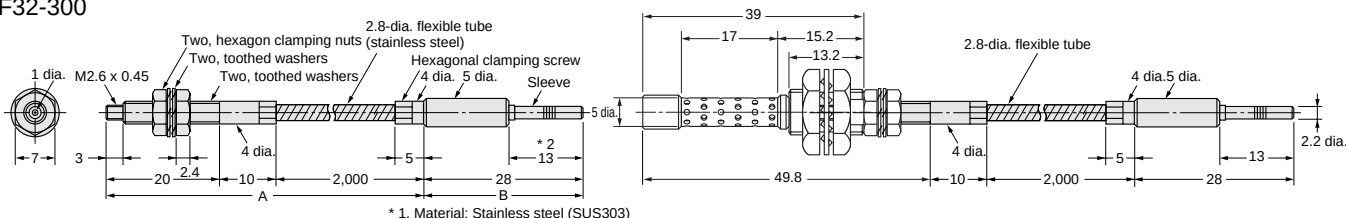
Note 1. Heat resistance temperature is 150°C for part A and 110°C for part B (part inserted in unit).
2. Protective structure is IP67 only for part C (fluororesin part)

F3UV-HT 10 m



Note 1. Heat resistance temperature is 150°C for part A and 110°C for part B (part inserted in unit).
2. Protective structure is IP67 only for part C (fluororesin part)

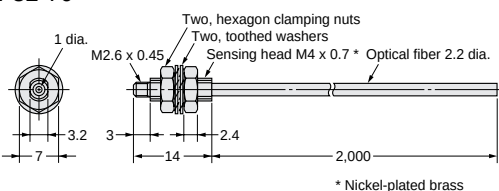
Fiber Units F32-300



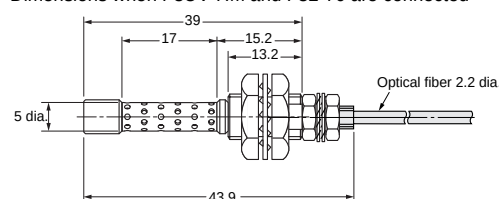
Note: Heat resistance temperature is 300°C for part A and 110°C for part B (part inserted in unit). However, take care that parts inserted in unit (parts marked are within operating temperature range of amplifier).

CAD file E32_47

Fiber Units F32-70



Dimensions when F3UV-HM and F32-70 are connected



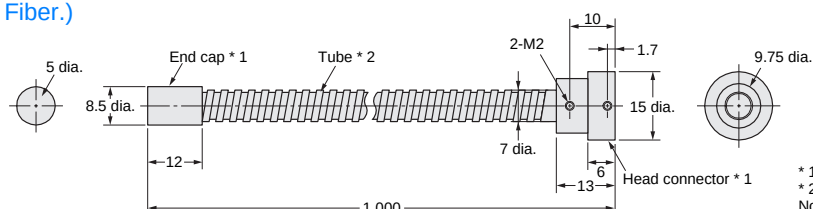
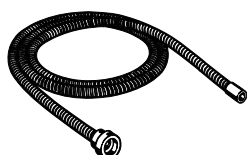
CAD file E32_50

Note: (Free-cut) indicates that free-cutting is possible. Free-cutting is not possible on units that are not marked with (Free-cut).

Accessories (Order Separately)

Protective Tube (Protects the Fiber.)

F39-FU1M



* 1. C3604 (Nickel-plated brass)
* 2. Stainless steel (SUS304)
Note: M2 set screw attached

MEMO

F3UV

Sensor adjuster

E39-L93□/-L150/-L151

Cover fittings

E39-L97/E39-L98

Easy to install and easy to adjust. Sturdy sensor attachments that give you peace of mind.

Applicable models: E3Z, E3S-R1□, E3S-R6□



Ordering Information

Shape	Name	Model	Price	Applicable type				
				E3Z	E3S-R1□	E3S-R6□	E39-R1	E39-R3
	flexible horizontal installation type	E39-L93FH	1,700	●	●	●	●*2	●
	flexible vertical installation type	E39-L93FV		●	●	●	●*2	●
	fixed horizontal installation type	E39-L93H	1,500	●	●	●	●*2	●
	fixed vertical installation type	E39-L93V		●	●	●	●*2	●
	XY shaft with joint	E39-L93XY	1,000	---	---	---	---	---
	Sensor adjuster*1	E39-L150	1,250	●	Vertical type only ●	Vertical type only ●	---	●
		E39-L151	1,350	●	Vertical type only ●	Vertical type only ●	---	●
	Attachments for the E39-L93 and E39-R1	E39-L96	600	---	---	---	●	---
	Cover fitting for horizontal type	E39-L97	700	---	●	---	---	---
	Cover fitting for vertical type	E39-L98		●	---	●	---	---

*1 Sensors not included

*2 Install with E39-L96

Easy installation and adjustment on aluminum frames and rails of conveyors.

● Sensor Adjuster E39-L150/151

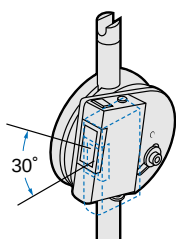
- ① Can be set to desired height.

Approximately 100-mm height (E39-L150)

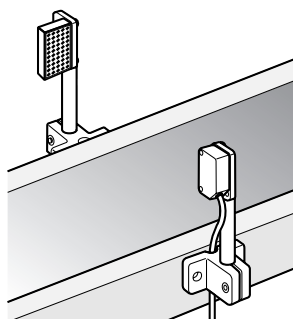
Approximately 200-mm height (E39-L151)

- ② Left/right adjustment as desired.

* If vertical adjustment is required, use the E39-L93.



- ③ Reflective plate type (E39-R3) can also be installed.



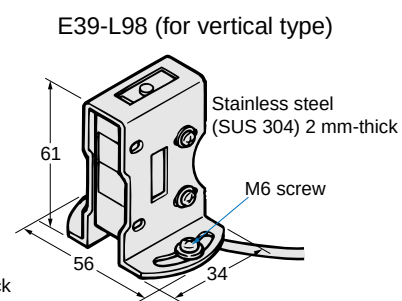
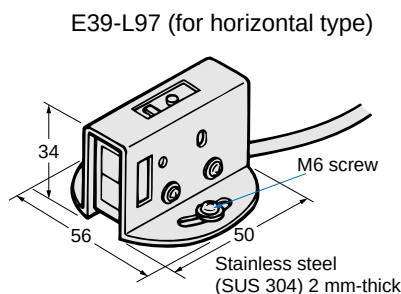
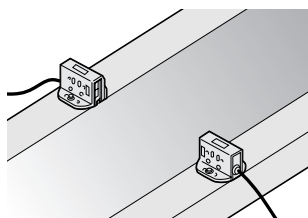
Sturdily protected sensor for long durability!

● Cover Fittings E39-L97/E39-L98

- ① M6 screws on both sides for strong installation.

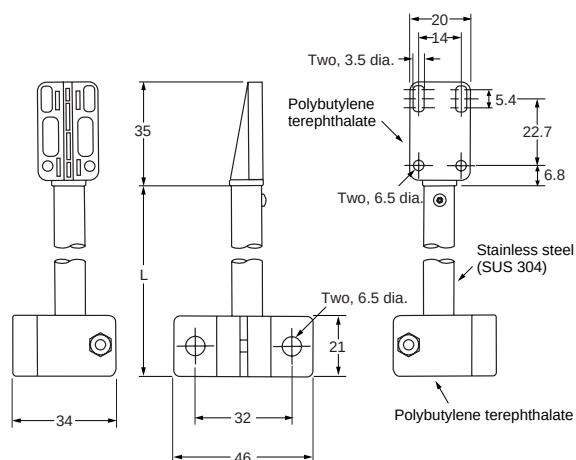
- ② Stainless steel for excellent environmental

- ③ Models available for horizontal type (E39-L97) and vertical type (E39-L98).



Dimensions (Unit: mm)

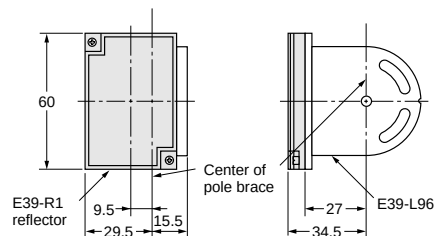
E39-L150
E39-L151



Model (typical example)	A	B	C	D	E	F
E3S-R vertical type	85.3	58	17.9	11.7	11.5	27.3
E3Z	84.5	47.5	16.3	10.9	10	37

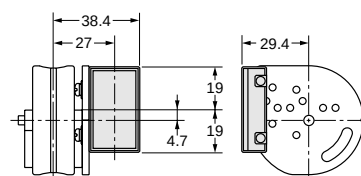
Model	L
E39-L150	100
E39-L151	200

E39-R1
(Reflectors)
+
E39-L93

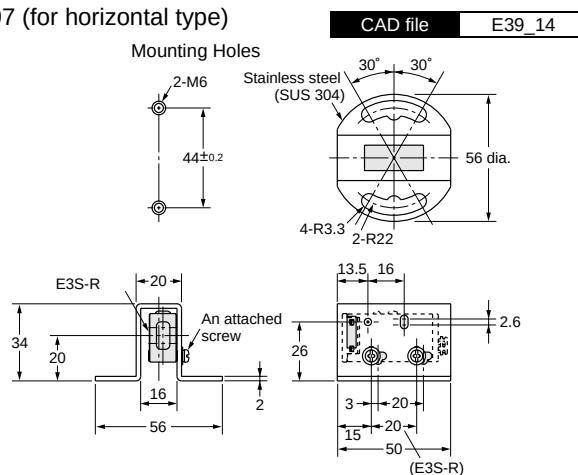


* E39-L96 is necessary.

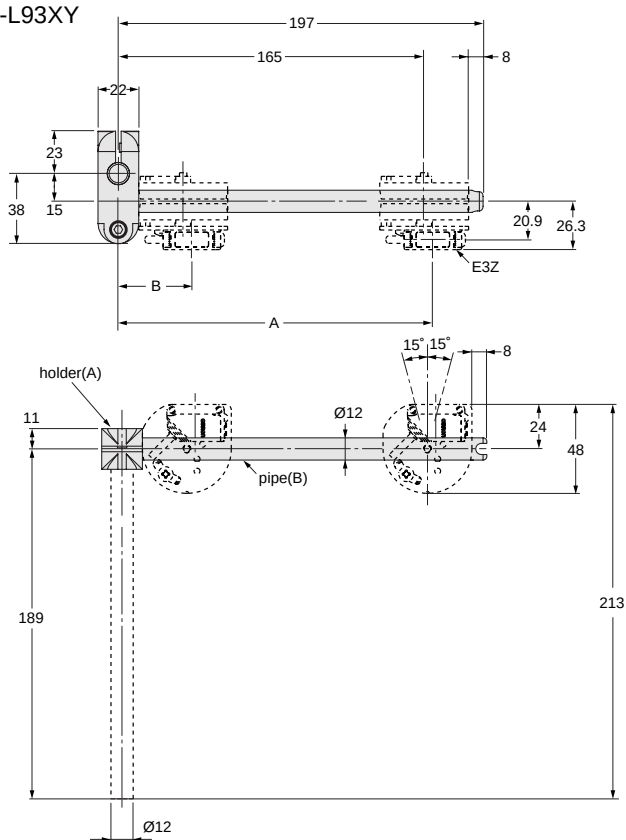
E39-R3
(Reflectors)
+
E39-L93



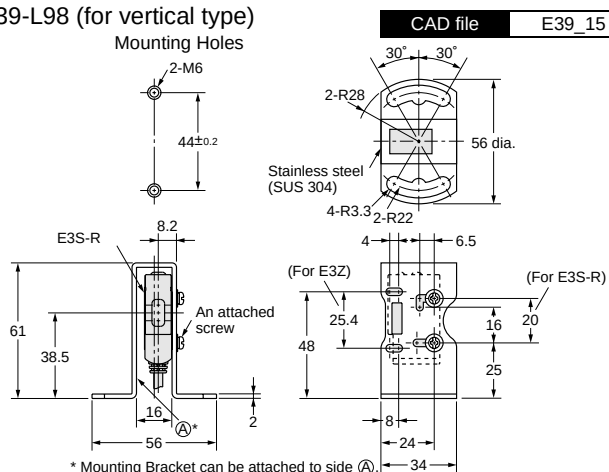
E39-L97 (for horizontal type)



E39-L93XY



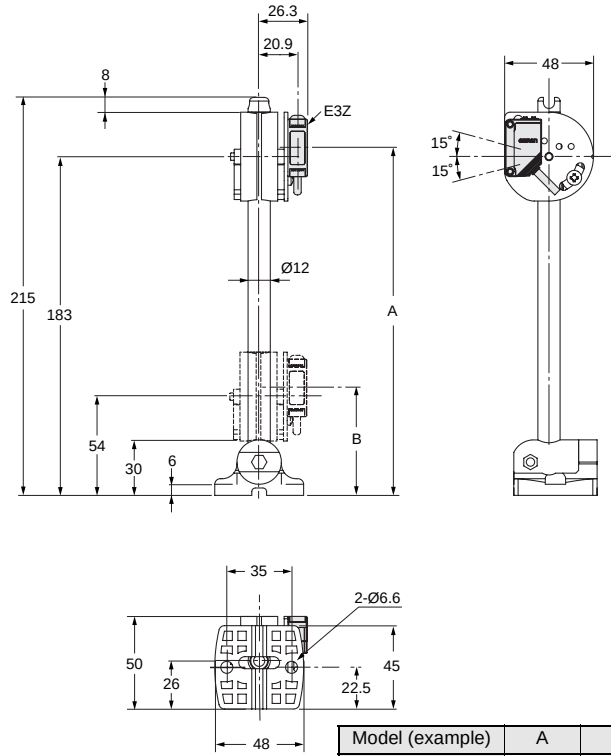
E39-L98 (for vertical type)



Model (example)	A	B
E3Z	170	40
E3S-A/R vertical type	172.3	42.3
E3S-A/R horizontal type	179.6	49.6

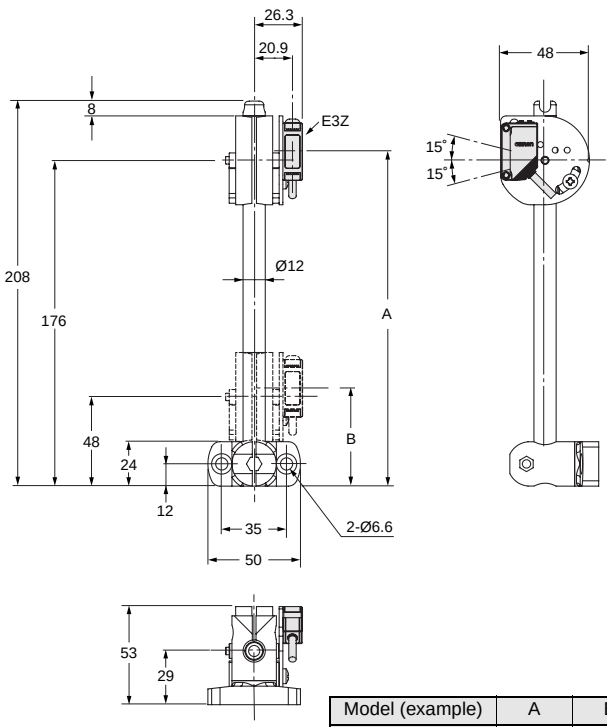
Note: E39-L93XY consists of a holder(A), a pipe(B), two hexagon hole bolts and two screw nuts.

E39-L93FH



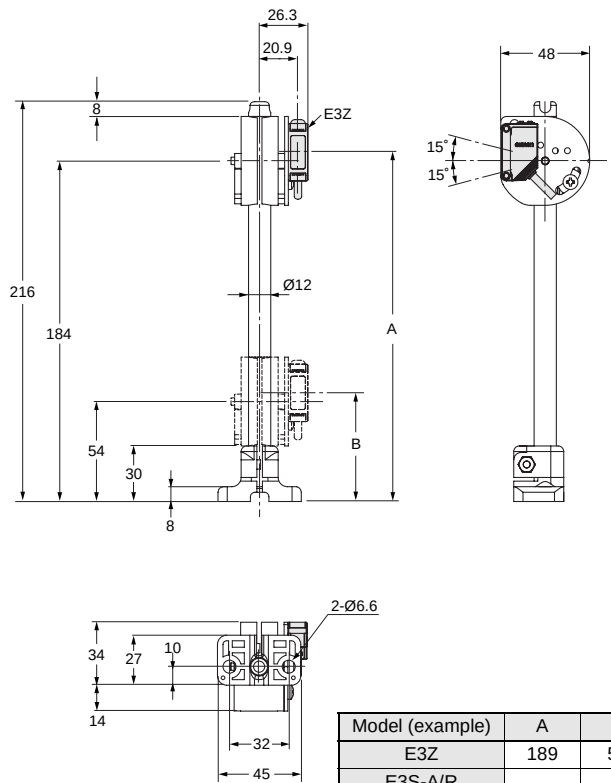
Model (example)	A	B
E3Z	188	59
E3S-A/R vertical type	190.3	61.3
E3S-A/R horizontal type	197.6	68.6

E39-L93FV



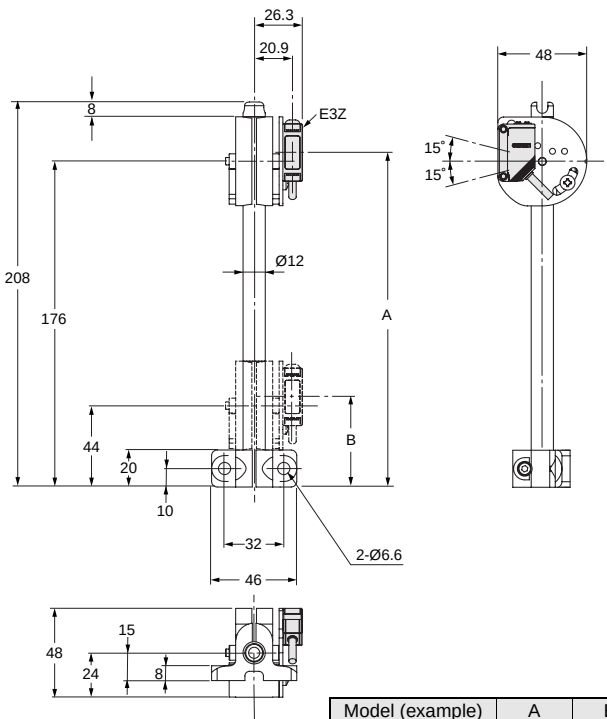
Model (example)	A	B
E3Z	181	53
E3S-A/R vertical type	183.3	55.3
E3S-A/R horizontal type	190.6	62.6

E39-L93H



Model (example)	A	B
E3Z	189	59
E3S-A/R vertical type	191.3	61.3
E3S-A/R horizontal type	198.6	68.6

E39-L93V



Model (example)	A	B
E3Z	181	49
E3S-A/R vertical type	183.3	51.3
E3S-A/R horizontal type	190.6	58.6

Mounting Brackets

E39-L/F39-L

Slit/reflective plate

E39-S/E39-R

Brackets list

*  Applicable models that appear shaded come with the clamps indicated at left as accessories.

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L4	Iron, zinc plating	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Iron, zinc plating	2	E32-T16(20)
E39-L40	Iron, zinc plating	1	Phillips screws M4 x 25 (with spring and plain washers) Nut M4	Iron, zinc plating Iron, zinc plating	2 2	E3JK F3C-AL
E39-L43	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L44	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L54V	Stainless steel (SUS304)	1	---	---	-	E32-T54V
E39-L69	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R1□(20)
E39-L70	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R6□(20)
E39-L85	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4)
E39-L86	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4)
E39-L87	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4) E3S-CR62/67(25.4)
E39-L93FH E39-L93FV E39-L93H E39-L93V E39-L93XY	Stainless steel (SUS304)	1	Holder (upper) Holder (lower) Pipe Bolts M4 x 12 with hexagonal holes Bolts M4 x 30 with hexagonal holes Phillips screws M3 x 12 (with spring and plain washers) Spring washer M4 Plain washer M4 Nut M4	Heat-resistant ABS resin PBT (polybutylene terephthalate) Stainless steel (SUS304) Iron, nickel plating Iron, nickel plating Stainless steel (SUS304) Iron, nickel plating Iron, nickel plating Iron, nickel plating	1 1 1 2 1 2 1 1 3	E3Z(25.4) E3S-R1□/R6□(20) E3S-A(20)
E39-L94	Iron, zinc plating	2	Phillips screws M3 x 10 Nut M3	Iron, zinc plating Iron, zinc plating	4 4	E32-T16P(19)
E39-L96 * For installation of Sensor Adjuster E39-L93	Stainless steel (SUS304)	1	Phillips screws M3 x 6 (with spring and plain washers)	Iron, nickel plating	2	E39-R1
E39-L97	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R1□(20)
E39-L98	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4) E3S-R6□(20)
E39-L102	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C (horizontal type) (25.4)

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L103	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C (vertical type) (25.4) E3S-CR62/67(25.4)
E39-L104	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4) E32-R21 (for installation of E39-R3) (25.4)
E39-L109	Stainless steel (SUS430)	1	---	---	-	E32-S15-□(13.2)
E39-L114	Stainless steel (SUS430)	2	Phillips screws M5 x 10	Iron, zinc plating	4	E3MC(28)
E39-L115	Stainless steel (SUS304)	1	Phillips screws M5 x 8 Slotted/Phillips screws M3 x 8	Iron, zinc plating Iron, nickel plating	4 2	E3MC
E39-L116	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L117	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L118	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L119	Stainless steel (SUS304)	1	---	---	-	E3T-F(8)
E39-L120	Stainless steel (SUS304)	1	---	---	-	E3T-F(8)
E39-L131	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 25	Stainless steel (SUS304)	2	E3G
			Spring washer M4	Stainless steel (SUS304)	2	
			Plain washer M4	Stainless steel (SUS304)	2	
E39-L132	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 25	Stainless steel (SUS304)	2	E3G
			Spring washer M4	Stainless steel (SUS304)	2	
			Plain washer M4	Stainless steel (SUS304)	2	
E39-L135	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 35	Stainless steel (SUS304)	2	E3G
			Spring washer M4	Stainless steel (SUS304)	2	
			Plain washer M4	Stainless steel (SUS304)	2	
E39-L136	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 35	Stainless steel (SUS304)	2	E3G
			Spring washer M4	Stainless steel (SUS304)	2	
			Plain washer M4	Stainless steel (SUS304)	2	
E39-L139	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12	Stainless steel (SUS304)	2	E3G-L1/L3
E39-L140	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12	Stainless steel (SUS304)	2	
E39-L142	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L143	Stainless steel (SUS304)	1	None	---	-	E3X-DA-N E3X-NA
E39-L144	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z
E39-L148	Stainless steel (SUS304)	1	None	---	-	E3X-DA-N E3X-NA

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L150	Stainless steel (SUS304)	1	Holder/bracket	PBT (polybutylene terephthalate)	1	E3Z, E3S-R, E39-R3
			Shaft (brace)	Stainless steel (SUS304)	1	
			Hexagon bolt	Stainless steel (SUSXM7)	1	
			Nut	Stainless steel (SUS304)	1	
			Phillips screw	Stainless steel (SUSXM7)	1	
			Slotted/Phillips screws	Stainless steel (SUS304)	2	
E39-L151	Stainless steel (SUS304)	1	Holder/bracket	PBT (polybutylene terephthalate)	1	E3Z, E3S-R, E39-R3
			Shaft (brace)	Stainless steel (SUS304)	1	
			Hexagon bolt	Stainless steel (SUSXM7)	1	
			Nut	Stainless steel (SUS304)	1	
			Phillips screw	Stainless steel (SUSXM7)	1	
			Slotted/Phillips screws	Stainless steel (SUS304)	2	
E39-L153	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUSXM7) Stainless steel (SUS304)	2	E3Z
F39-L9	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 25	Iron, zinc plating	2	F3UV-A
			Plain washer M3	Iron, zinc plating	2	

Contact mounting plate list

*  Applicable models that appear shaded come with the mounting plate at left as accessories

Model	Material	Count	Applicable type
E39-L60	PBT (polybutylene terephthalate)	1	E3S-R□6

Slit list

*  Applicable models that appear shaded come with the slits indicated at left as accessories

Model	Slit width	Installation procedure	Applicable type
E39-S39	Width 1 x 20 mm	Seal type	E3JK-5□□
E39-S60	Width 0.5, 1 x 20 mm	Seal type	E32-T16
E39-S61	Width 0.5, 1, 2, 4 x 20 mm	Insertion type	E3S-CT□1
E39-S63	0.5 mm dia., 1 mm		E3T-ST1□
E39-S64	0.5 mm dia., 1 mm		E3T-FT1□
E39-S65A	0.5 mm dia.		E3Z-T□□
E39-S65B	1 mm dia.		
E39-S65C	2 mm dia.		
E39-S65D	Width 0.5 x 10 mm		
E39-S65E	Width 1 x 10 mm		
E39-S65F	Width 2 x 10 mm		

Reflectors list

Name	Reflectors		Non-fogging reflector	Reflectors					
Item	Model	E39-R1	E39-R1S	E39-R1K	E39-R2	E39-R6	E39-R7	E39-R8	E39-R10
Directional angle	30° min.*1				30° min.*2	30° min.	40° min.		30° min.
Ambient operating temperature	-25° to 55°								
Ambient storage temperature	-40° to 70°C		-40° to 55°		-40° to 70°C		-25° to 60°C		-40° to 70°C
Ambient operating humidity	35% to 85%								35% to 95%
Ambient storage humidity	35% to 95%						35% to 85%		35% to 95%
Protective structure	IEC 60529 IP67								
Accessories	---								

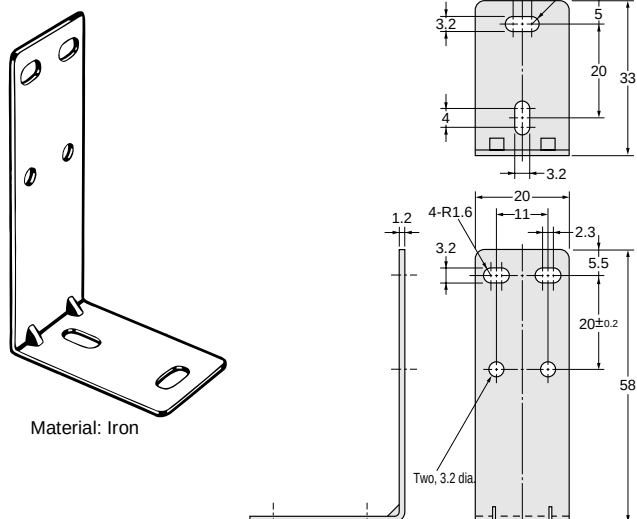
*1. 40° or higher for E3JK-R.

*2. 40° or higher for E3G-R.

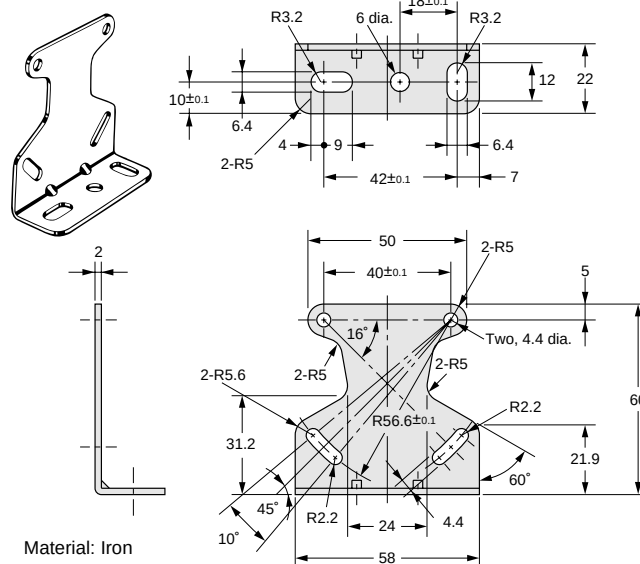
Item	Name Model	Small reflector				Tape Reflector		
	E39-R9	E39-R3	E39-R4	E39-R37	E39-RS1	E39-RS2	E39-RS3	
Directional angle	30° min.		2° to 20° min.		30° min.			
Ambient temperature	-25° to 55° C							
Ambient temperature	-40° to 70°C				0°C to 40°C			
Ambient operating humidity	35% to 95%	35% to 85%						
Ambient storage humidity	35% to 95%				35% to 85%			
Protective structure	IEC 60529 IP67							
Accessories	---	Clamps (with screws)	---	Phillips screws M3 x 3, spring washers M3, nut M3	---			

Mounting brackets dimensions (unit: mm)

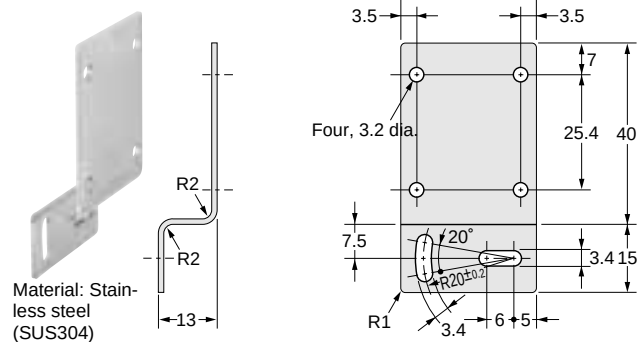
E39-L4



E39-L40

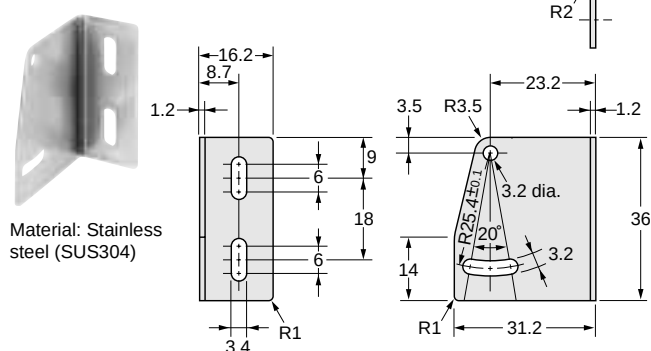


E39-L43



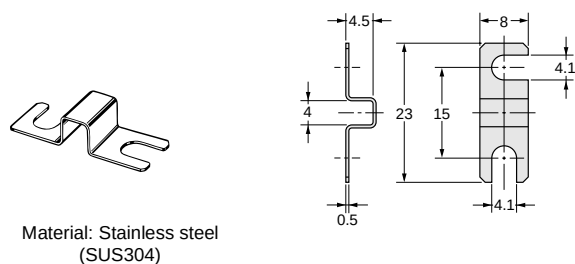
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E39-L44

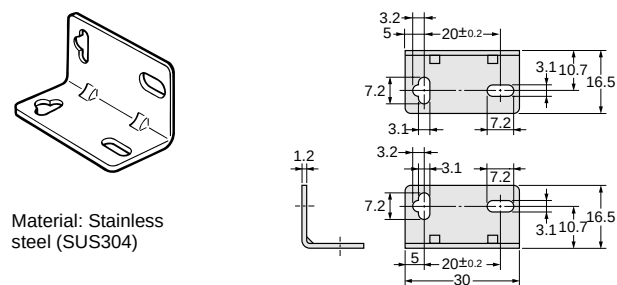


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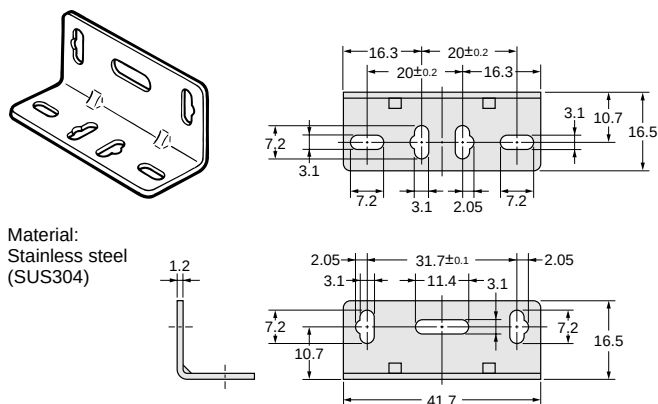
E39-L54V



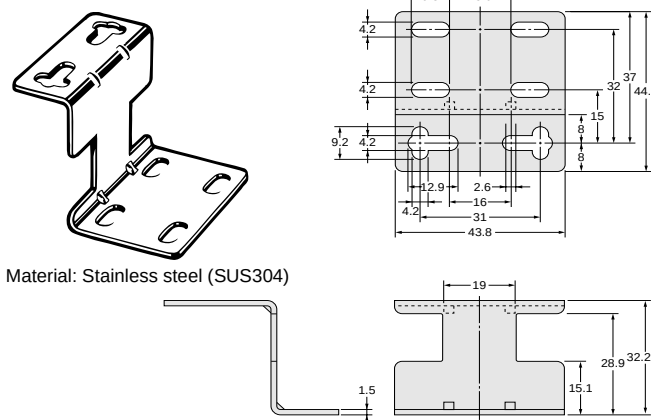
E39-L69 (for E3S-R1□)



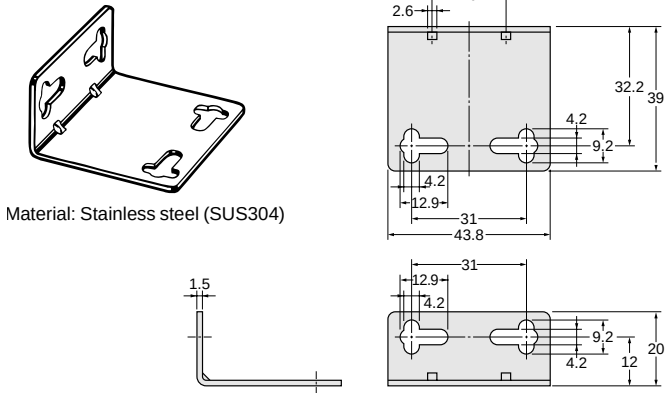
E39-L70 (for E3S-R6□)



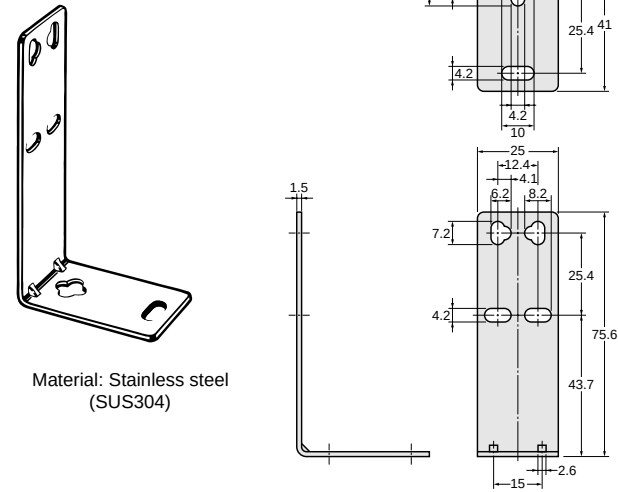
E39-L85



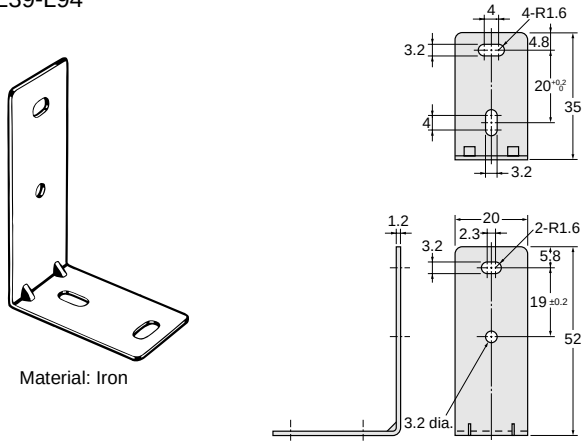
E39-L86



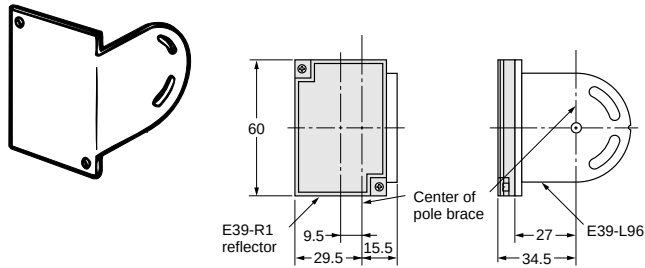
E39-L87



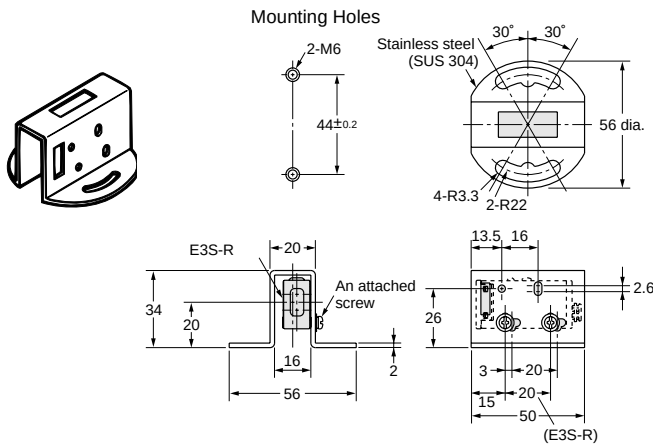
E39-L94



E39-L96

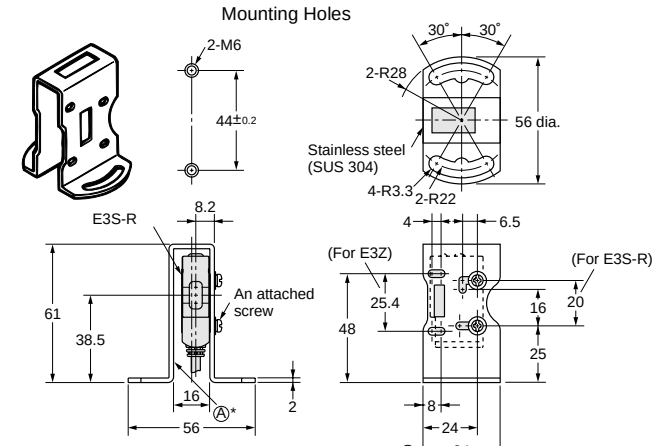


E39-L97



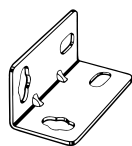
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E39-L98

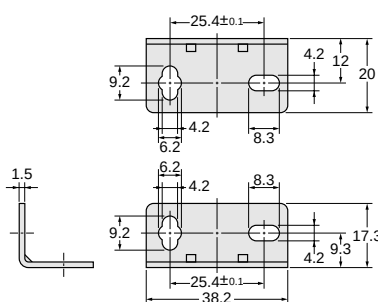


CAD file E39_15

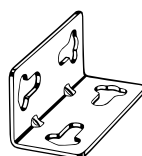
E39-L102



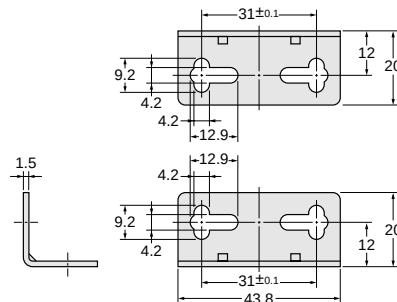
Material:
Stainless steel
(SUS304)



E39-L103



Material:
Stainless steel
(SUS304)

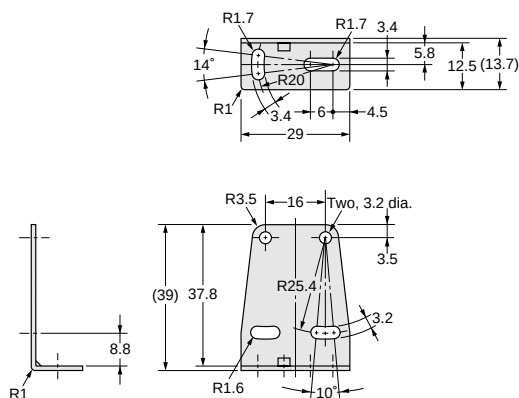


CAD file E39_37

E39-L104

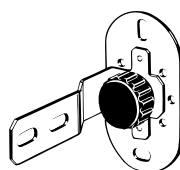


Material:
Stainless steel

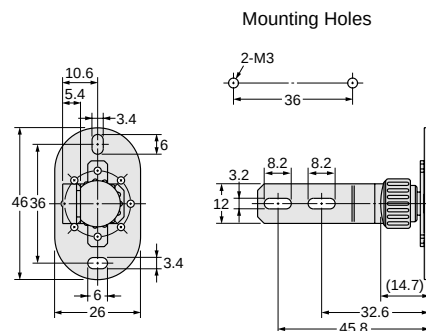


CAD file E39_31

E39-L109

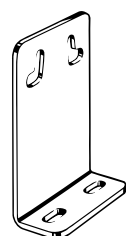


Material:
Stainless steel
(SUS430)

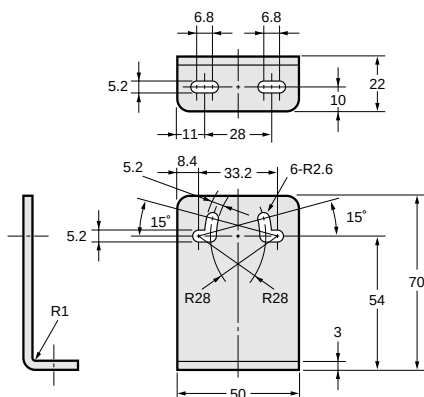


CAD file E39_10

E39-L114

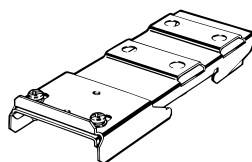


Material:
Stainless steel
(SUS304)

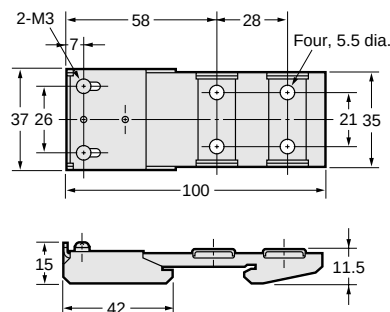


CAD file E39_24
(clamps only)

E39-L115

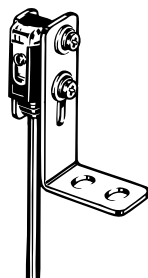


Material:
Stainless steel
(SUS304)

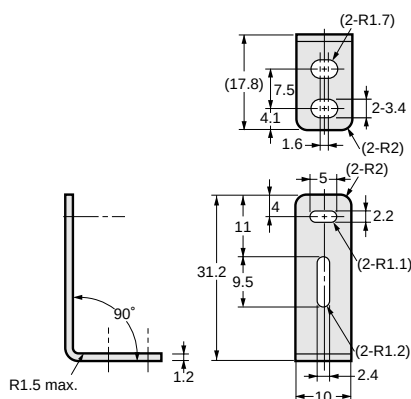


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(clamps only)

E39-L116

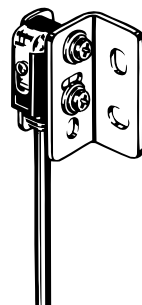


Material: Stainless steel
(SUS304)
1.2 mm thick

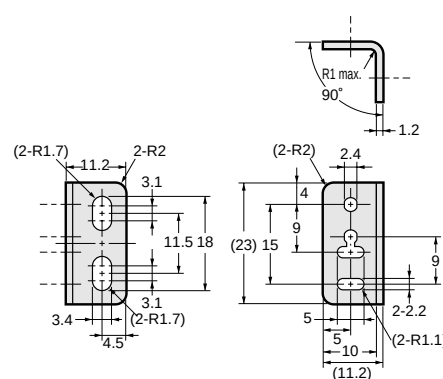


CAD file E39_26

E39-L117

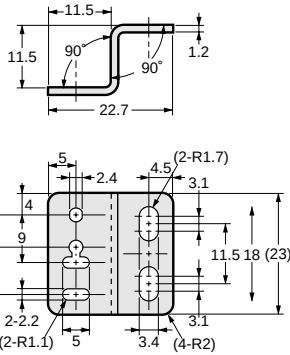
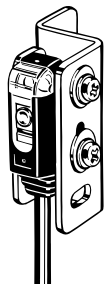


Material: Stainless steel
(SUS304)
1.2 mm thick



CAD file E39_27

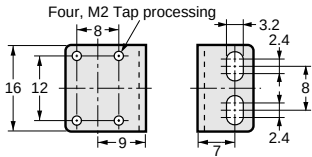
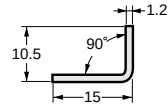
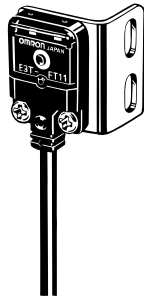
E39-L118



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_28

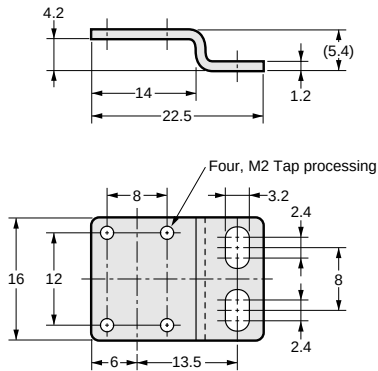
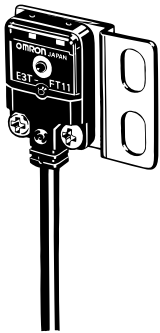
E39-L119



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_29

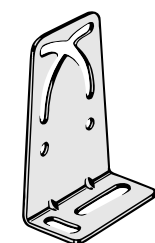
E39-L120



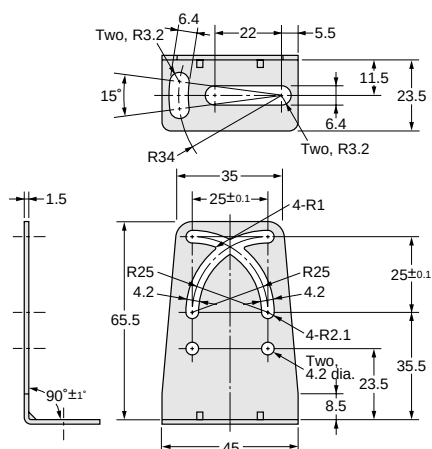
Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_30

E39-L131

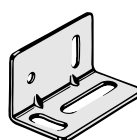


Material: Stainless steel (SUS304)

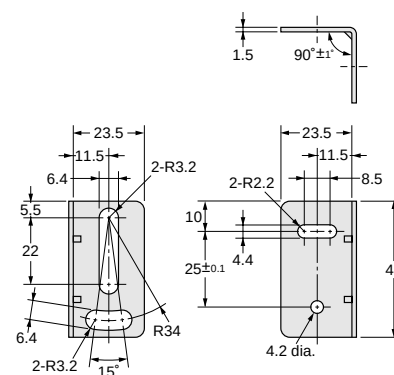


CAD file E39_39

E39-L132

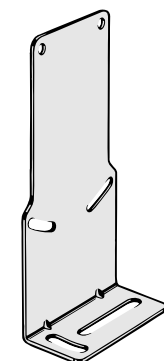


Material: Stainless steel (SUS304)

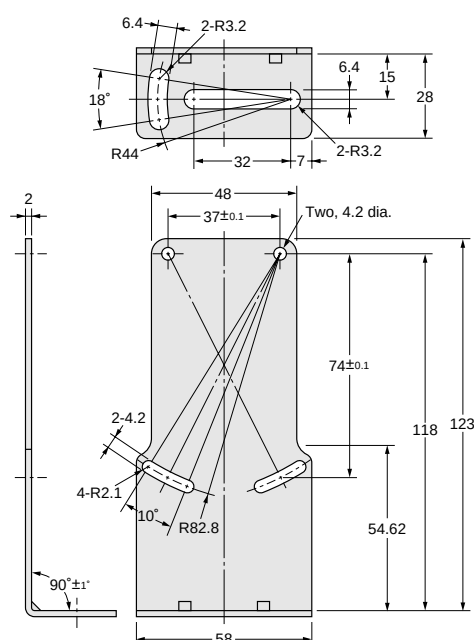


CAD file E39_40

E39-L135

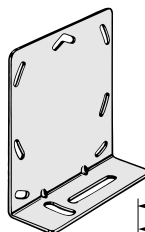


Material: Stainless steel (SUS304)

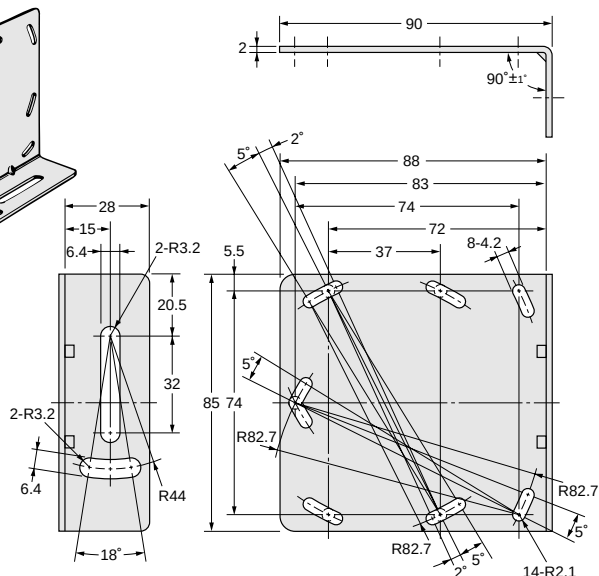


CAD file E39_42

E39-L136



Material: Stainless steel (SUS304)

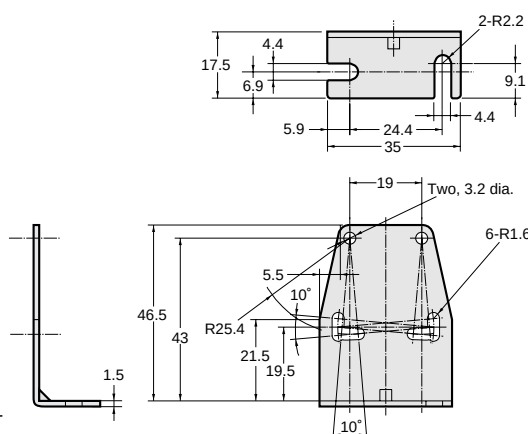


CAD file E39_43

E39-L139



Material: Stainless steel (SUS304)

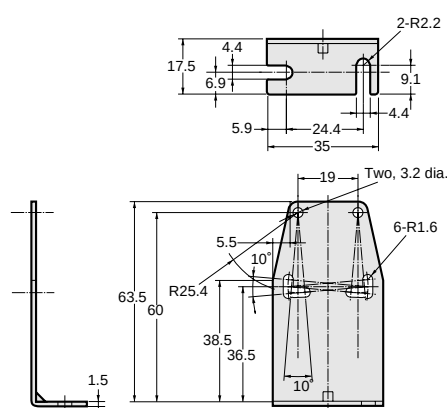


CAD file E3G_09 E3G_11

E39-L140



Material: Stainless steel (SUS304)

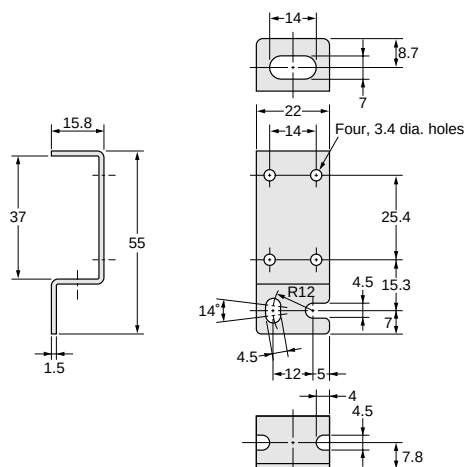


CAD file E3G_09 E3G_11

E39-L142

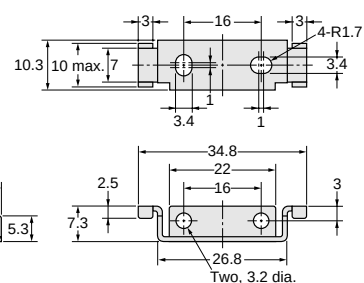
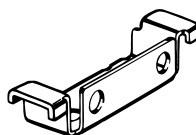


Material: Stainless steel (SUS304)



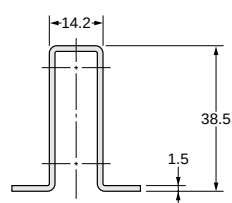
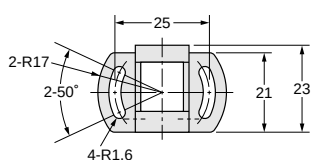
CAD file	E39_49

E39-L143

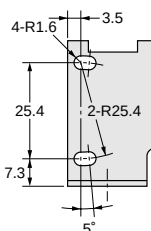


Material: Stainless steel (SUS304)

E39-L144

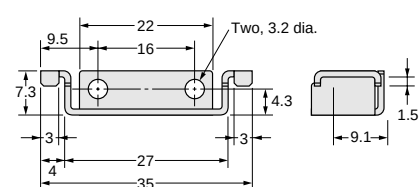
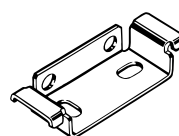
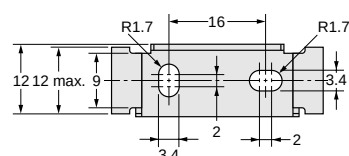


Material: Stainless steel (SUS304)



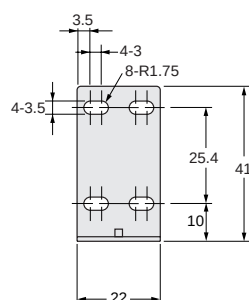
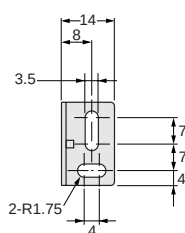
CAD file	E39_50

E39-L148

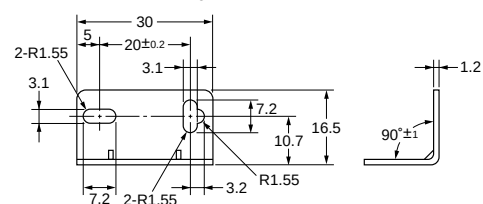
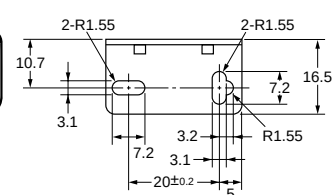
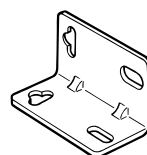


Material: Stainless steel (SUS304)

E39-L153



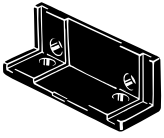
	F39-L9



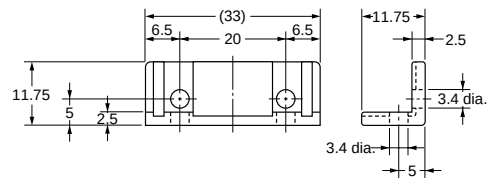
Material: Stainless steel (SUS304-CP)

Contact mounting plate (unit: mm)

E39-L60

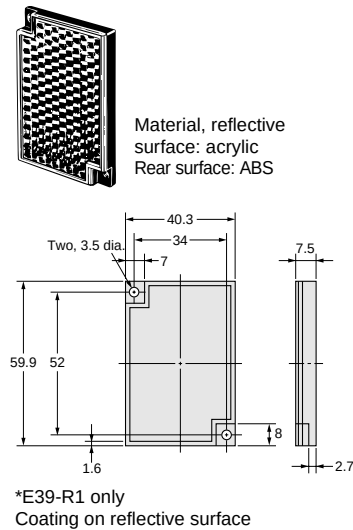


Material: PBT (polybutylene terephthalate)



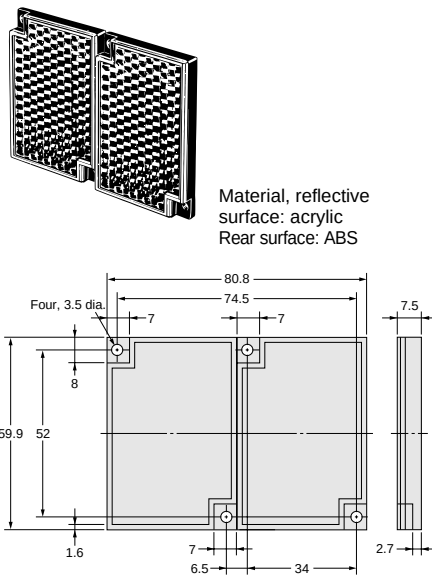
Reflectors dimensions (unit: mm)

E39-R1
E39-R1S
E39-R1K *



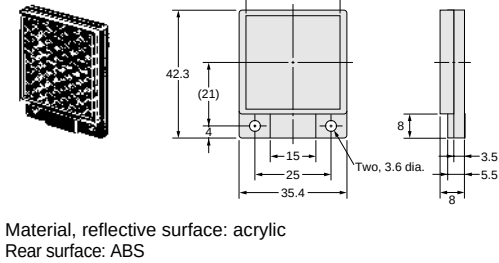
CAD file E39_16

E39-R2

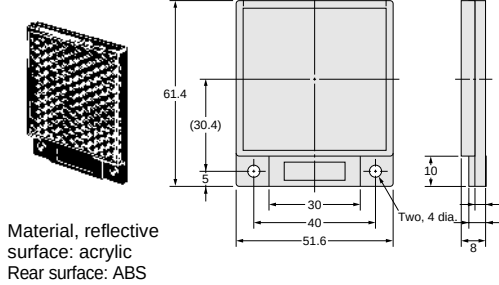


CAD file E39_17

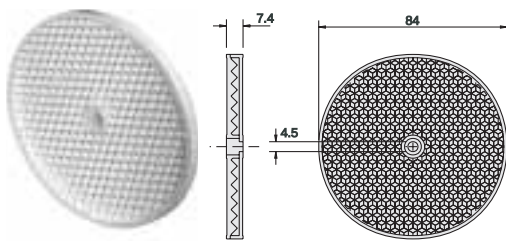
E39-R9



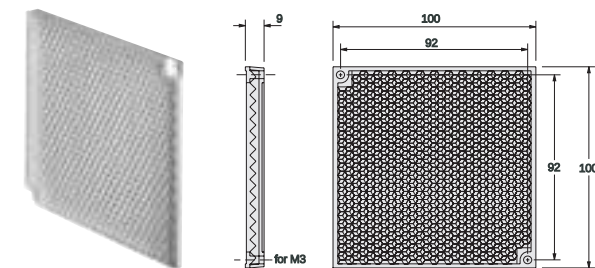
E39-R10



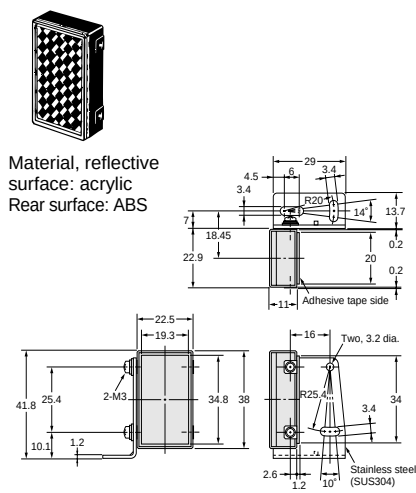
E39-R7



E39-R8

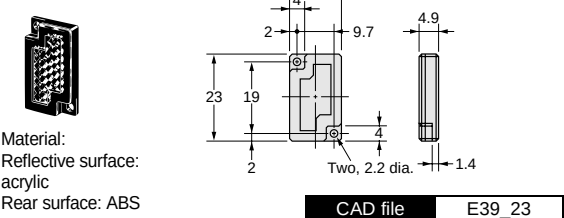


E39-R3



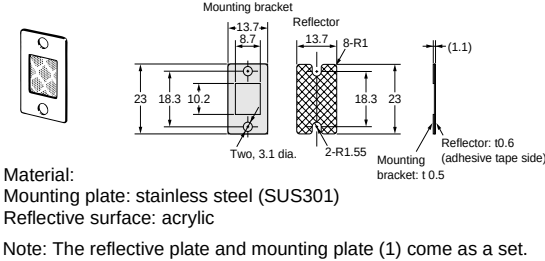
CAD file E39_18

E39-R4

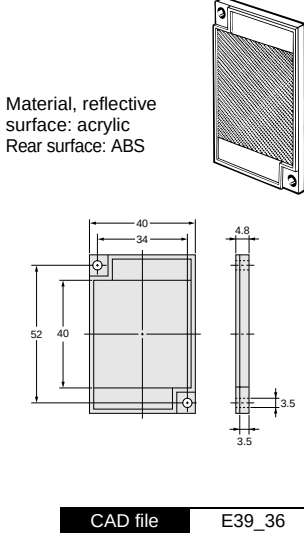


CAD file E39_23

E39-R37

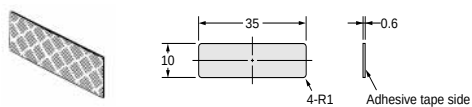


E39-R6



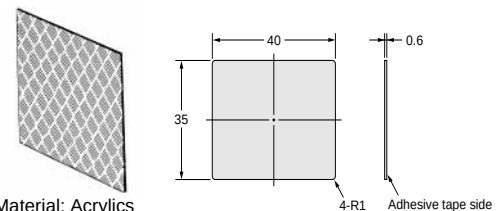
CAD file E39_36

E39-RS1



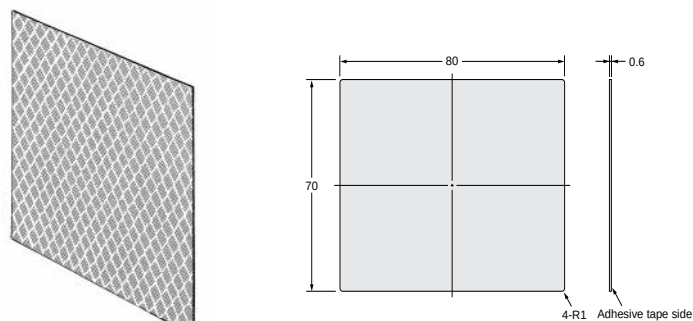
Material: Acrylics

E39-RS2



Material: Acrylics

E39-RS3



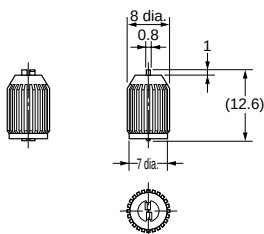
Material: Acrylics

Sensitivity adjustment driver (Unit: mm)

E39-G2

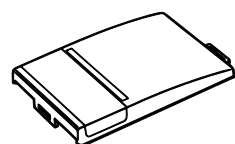


Material: Polycarbonate

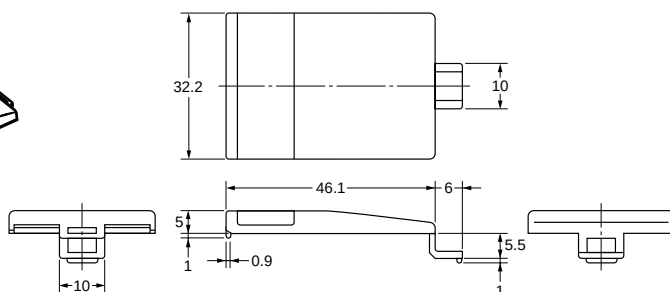


Protective Cover(Unit: mm)

E39-G9

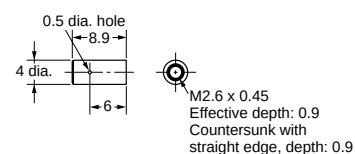


Material: Polycarbonate



Lens Unit(Unit: mm)

E39-F1V



Standard fiber unit

E32

The fiber optic - E32 series provides for each sensing problem the optimum solution



Omron offers with the E32-fiber optics series a huge range of fiber optic sensors for all automation tasks, whether it's for basic object detection, positioning, color analysis or high accuracy sensing.

Omron takes a leading part in fiber technology with a long time experience in producing fiber optic solutions for all kind of industry.

Everything from head size, sensing distance, mounting, beam size up to special heat - and chemical resistant materials can be chosen in order to best suit your application.

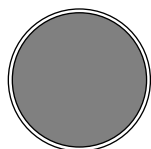
The E32 series provides for each sensing problem the optimum solution

On top of it, Omron provide customised fiber solutions based on your demand and specification, made in Germany.

Variation of fiber optics

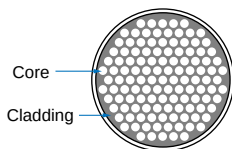
Flexible fiber models are indicated by an "R" at the end of the model number.

Flexible fiber contains multiple cores. These cores are all surrounded by cladding, giving a minimum bending radius of 1 mm. The fiber can be bent at right angles without affecting the light intensity. Handle it just like any other cable.



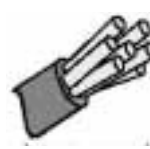
Conventional Fiber

Conventional fiber uses just one core and one cladding section. Bending the fiber may break it or reduce the light intensity.



Flexible Fiber

Flexible fiber contains multiple independent cores all surrounded by cladding. The fiber can be bent without breaking or reducing the light intensity.



Fiber for robot application

Individual cores in one bundle, Surrounded by cladding, Strong against repeatable bending. Bending radius 4 mm

Coaxial fibers

The accuracy of coaxial fibers is very high, due to the special orientation of transmitter- and receiver fibers.

With the special lens unit, the spot beam can be reduced to min. 0,1 mm.



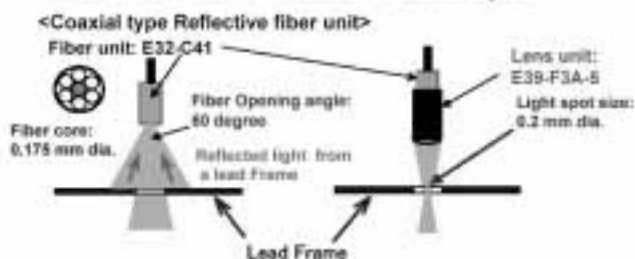
E32-EC31



E32-EC41

Coaxial fibers and lens unit (small spot)

"Use a lens unit to make a small spot."



Beam Spot variable type E39-F3A

Beam spot can be changed from 0.1 to 1 mm dia., applicable to various size of sensing objects.



Applicable fiber unit:



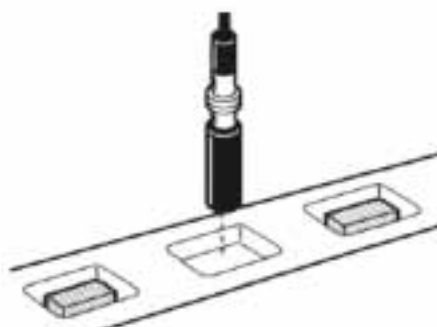
Beam spot 0.5 to 1 mm: E32-D32
Beam spot 0.1 to 0.6 mm: E32-C42

Long distance & Minute spot E39-F3B

Achieving 0.2 mm dia. spot & 15 mm sensing distance.



Detection of chips on embossed tape.



Applicable fiber unit:



E32-EC31
E32-EC41

Minute beam spot E39-F3A-5

Achieving 0.1 mm dia. spot & 7 mm sensing distance. Optimum solution for downsizing of electronic parts.



Detection of front or back of "0603" chips.
Applicable fiber unit:



E32-EC31
E32-EC41

Long distance type E39-F3C

Achieving 0.2 mm dia. spot & 20 mm sensing distance.



Detection of yarn for industrial sewing machine.



Applicable fiber unit:



E32-EC31

E32-EC41

Detection missing chips on embossed tape. Adding a lens unit to a fiber sensor permits the detection of very small workpieces at a detection distance of 17 mm with a 0.2 mm diameter spot.



E32-EC41 Fiber Unit

E39-F3B Lens Unit.

Fibers for Robot application (Strong against repeatable bending)

Omron offers special fibers with independent cores in one bundle.

This fibers are very strong against repeatable bending and suitable for moving- and robot applications.

Moving-piece-mounting Fiber Unit E32-D11/D21

Detecting workpiece by robot hand

An allowable bending radius of 4 mm enables the E32-D11/ D21 to withstand repeated bending, making it ideal applicable to moving parts subject to frequent bending



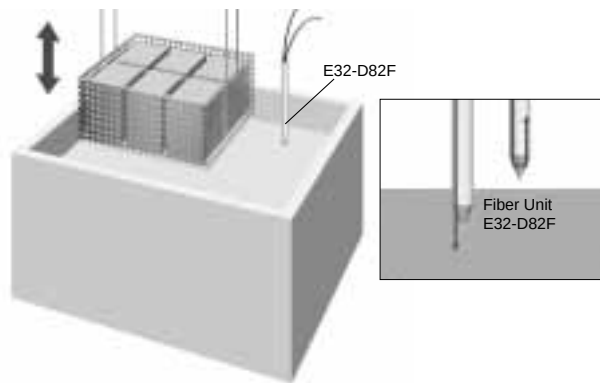
Liquid level detection

Direct contact type E32-D82F

The E32-D82F1 / E32-D82F2 are suitable for high accuracy detection of fluid level detection in tanks. The principle is based on the change of the refractive index when the sensor touches the medium. The fiber head is Teflon^{®1} covered and therefore chemical resist and can be used for high temperature up to 200°C.

Level detection in heated chemicals

The fiber unit uses Teflon^{®1} so that chemical levels can be precisely and directly detected in cleaning tanks or chemical processing tanks.



Tube mounting E32-L25T

Omron offers a variation of different level detection sensors. Depending on the mounting situation the applicable tube can be from 3,2 to 10mm dia. For special purpose the fiber material is Teflon^{®1} covered and therefore chemical resist.

Chemical level detection with pipe mounting

A minimum level difference of 4 mm can be detected in stages to control resist liquid levels.

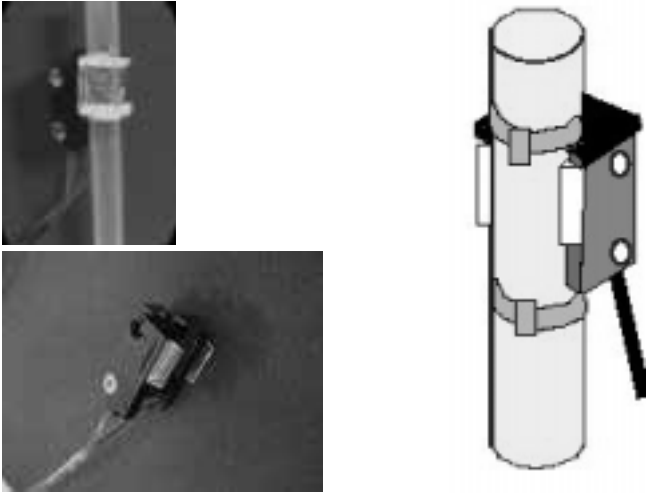


E32-D36F

The wide sensing area provide a stable liquid detection without influence of bubbles.

¹ Teflon is a registered trademark of DuPont Company and Mitsui DuPont Chemical Company for their fluoro resin

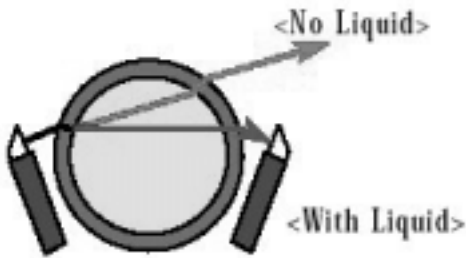
Due to the special sensing head there is no limitation to tube diameter, (thickness of tube max. 1,6 mm, bending radius 4 mm).



Product Features:

- Omron original optical design using prism to provides a great signal noise ratio. The wide area sensing method (11mm) is not influenced by bubbles or water drops in a tube.
- E32-A1 has a fail-safe function outputs an faulty signal, which is the same as " No Liquid" signal when the fiber unit is accidentally broken or released from the fiber amplifier unit.
- Dark red resist liquid can stably be detected by a high power amplifier unit of E3X-DA-N which has an LED auto power control circuit.
- Fluorine resin coated, bundle type fiber cable (bending radius: 4 mm) can be cut freely.

Sensing Principle:

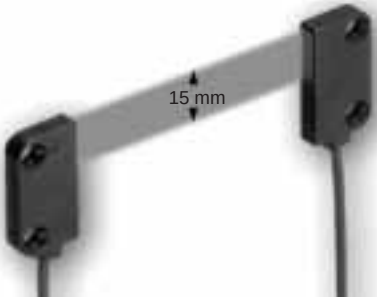


Area Type

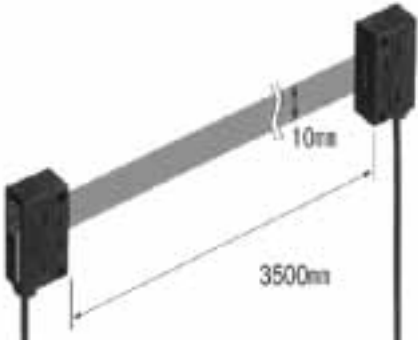
Omron offers a variation of area sensing fibers from 10 mm area up to 30 mm area. Due to the area the sensor can easily detect parts somewhere on a conveyer even when the parts are not very good guided.

Standard screen E32-T16P/-T16

E32-T16P standard screen fiber sensor, providing 11 mm width of area detection.



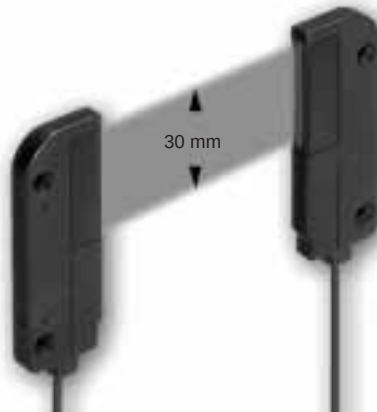
E32-T16 long distance screen sensor, providing 11 mm width & 3,500 mm max. distance of area detection.



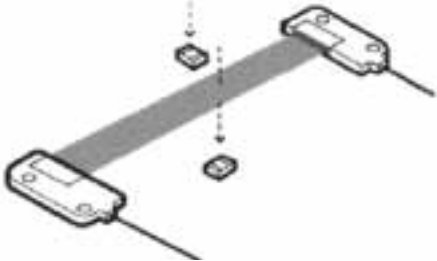
Wide Screen E32-T16WR

Widest screen in the industry

By the 30 mm wide optical screen, provide wide area detection.



Applicable to parts feeder for various size of parts.

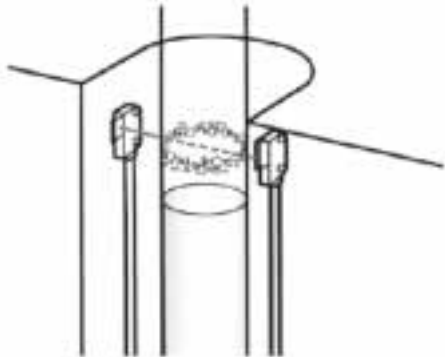


Side-view E32-T16J

First in the industry
By the adoption of prosm, achieved side-view screen reflective sensor. Optimum for mounting to limited space.



Detection of liquid level through transparent tube.

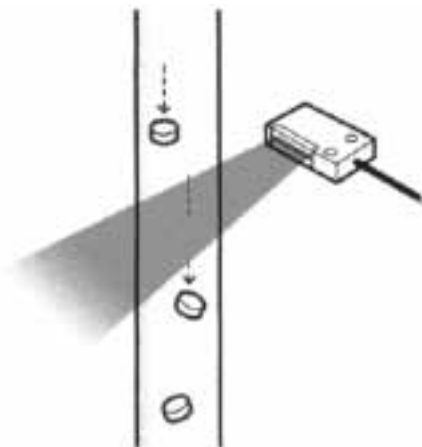


Screen reflective E32-D36P1

Screen reflective sensor provide wide area detection and space saving mounting.

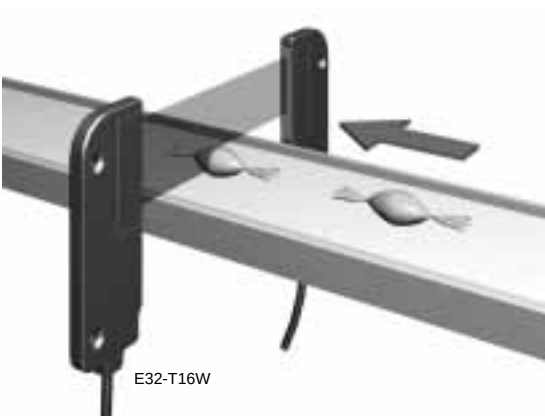


Detection of pills through transparent tube.



Area detecting fiber unit E32-T16W

Detecting the front edge location of candies
Area detection using a screen fiber enables positioning of even irregularly shaped objects.



Area detecting fiber unit E32-T16P

Inspection of tape remaining in tape take-up application



Chemical resist

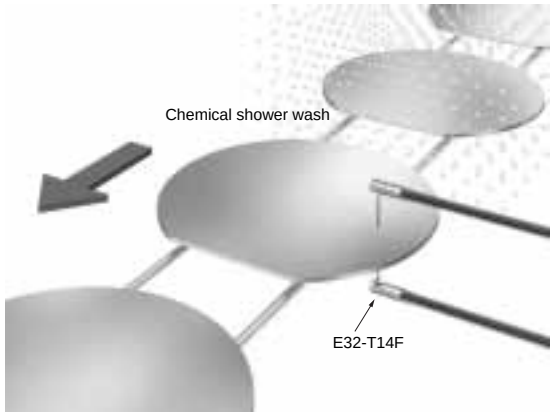
Due to the Teflon^{®1} covered sensor head and fiber, the sensor is resist against oil and chemicals. Also the combination of chemical- and temperature resistant for 200 °C is available. Overview of chemical and temperature resist fibers:

Temperature	Through Beam Type	Reflection Type
-40 °C to 200 °C	E32-T81F-S	
-30 °C to 70 °C	E32-T11F E32-T12F E32-T14F	E32-D12F

¹ Teflon is a registered trademark of DuPont Company and Mitsui DuPont Chemical Company for their fluride resin

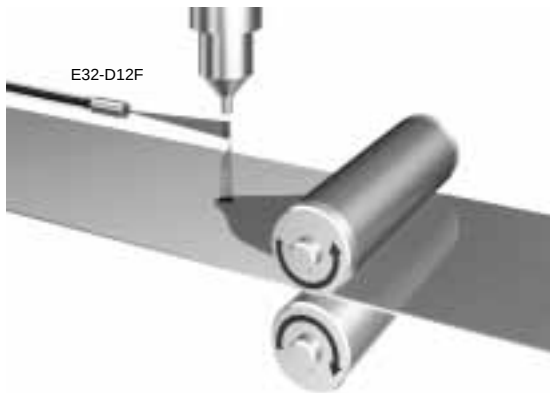
Teflon^{®1} side-view fiber unit E32-T14F

Detection on narrow lines for chemical washing
Teflon^{®1} side view fiber units are ideal for applications requiring resistance to chemicals when the sensor can be installed on a narrow line.



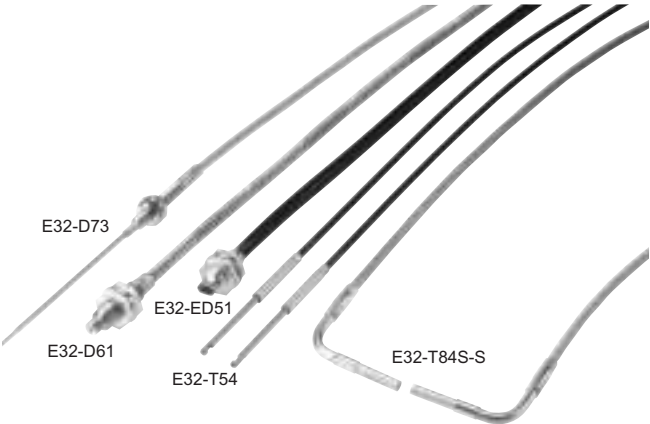
Chemical-resistant fiber unit E32-D12F

The E32-D12F can detect light reflected from oil drops. The Teflon^{®1} fiber can also be safely used in an environment where oil is likely to be spattered.



Heat resistant fibers

Omron offers a huge variation of heat resistant fibers, beginning from 150 °C, Teflon^{®1} covered and for extreme temperature resist up to 400 °C. For strong mechanical strength there are special fibers with stainless steel spiral tubes available.

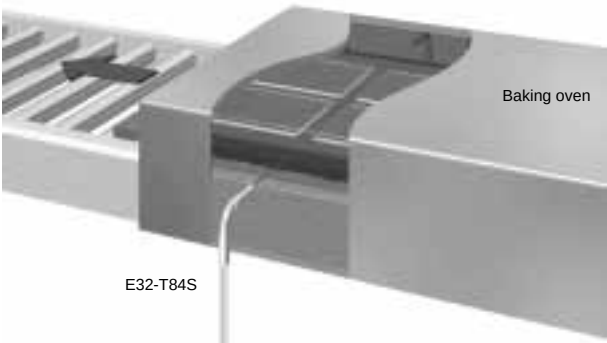


Overview of heat resistant fibers:

Temperature	Trough Beam Type	Reflection Type
150 °C	E32-T54	E32-ED51
	E32-ET51	
200 °C	E32-T84S-S	E32-D81R-S
	E32-T81R-S	E32-D81R
300 °C		E32-D61
350 °C	E32-T61-S	E32-D61-S
400 °C		E32-D73
		E32-D73-S

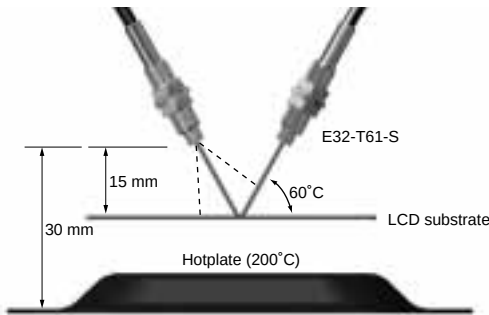
Heat-resistant, narrow beam fiber unit E32-T84S

Detecting glass substrates in baking ovens
An L-shaped side-view sensor requiring little space and providing 200 °C heat resistance is used. The detection distance of 1,300 mm (for E3X-DA-N standard mode) is more than sufficient to detect even large glass substrates.



Heat-resistant fiber unit E32-T61-S

Detecting liquid crystal substrates in ovens
Regular reflective light from the LCD substrates is received with a fiber to detect the presence or absence of the substrates. The large spot ensures stable detection of substrates even if positioning is not completely consistent.



¹ Teflon is a registered trademark of DuPont Company and Mitsui DuPont Chemical Company for their fluoro resin

Limited reflective

Minute difference of displacement E32-L25L

Sensing distance: 7.2 ± 1.8 mm



Minute difference of displacement E32-L25/-L25A

Sensing distance: 3.3 mm



Minute difference & Side-view E32-L24L

With special optical lens



Sensing distance: 4 ± 2 mm

Detection of wafer



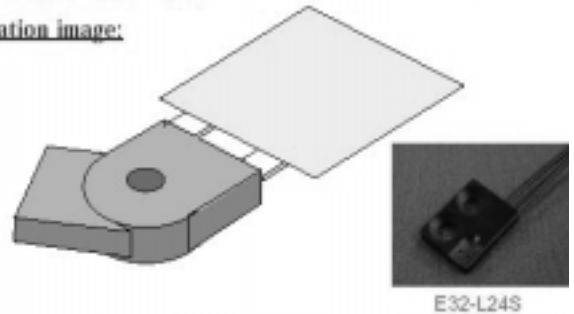
E32-L24S

Special optical design provides stable sensing

Sensing distance 0-4 mm

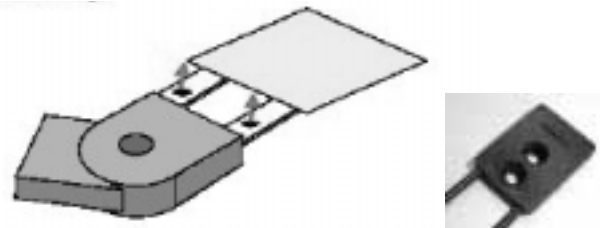
Convergent reflective fiber with a thin and compact housing. Stable sensing even inclined glass

Application image:



LCD edge positioning sensor E32-L16

- E32-L16 can make super accurate positioning for an LCD glass sheet on a robot hand
- E32-L16 can stably detect the inclined surface of LCD
- Ultra thin and small body can fit into robot hand.

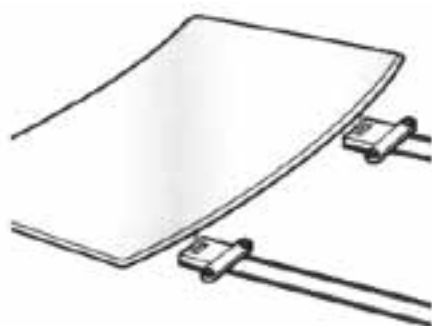


Heat-resistive & precise positioning

For precise positioning at the sensing range of 4 mm to 12 mm under high temperature environment.



Positioning of LCD (E32-L56E1/-L56E2)



Mapping sensors

With the narrow beam fibers of E32-A03 and E32-A04 Omron offers very successful fiber mapping sensors, with an opening angle of 1,5° for E32-A03 to 3° for E32-A04.



Depending on the amplifier mode the sensing distance can be set up from 500 to 1.100 mm.

Mapping fiber units E32-A03/-A04

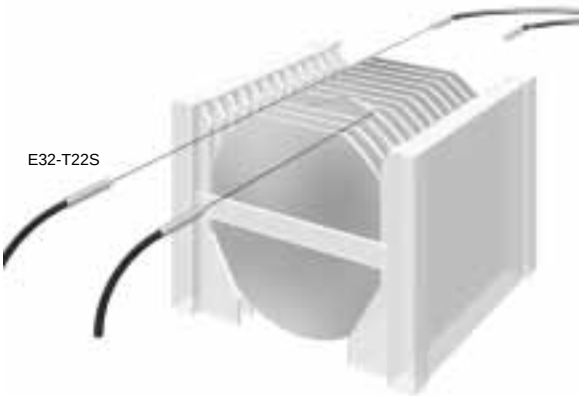
Mapping wafers with a through-beam side-view sensor
The narrow beam permits the detection of single wafers, even of wafers with mirror surfaces.



High precision

Narrow-view fiber unit E32-T22S

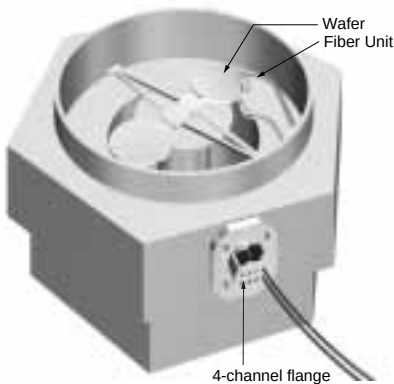
Checking orientation flat directions with a fiber unit
High-precision detection is possible using a narrow-view beam.



Vacuum resist sensors

Vacuum sensors E32-V

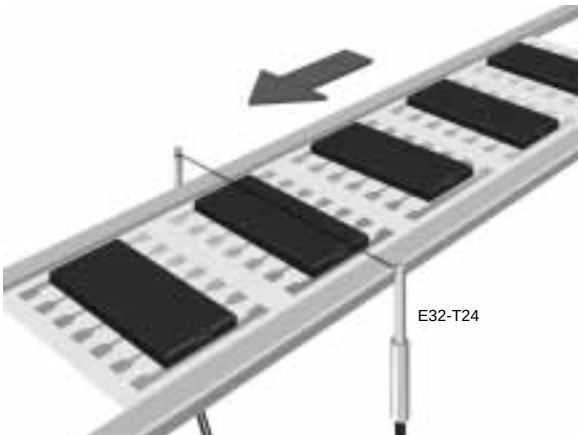
Detecting wafers in a vacuum conveyance system
The E32-V provides an easy-connecting fiber and easy-to-use 4-channel flange system, making it ideally applicable to vacuum systems.



Side-view sensors

Thin side-view fiber unit E32-T24

Detecting rises in lead frames
Easy detection even in tight spaces, is possible with no sleeve bending.

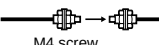


Sensing Distance

General purpose

Throughbeam fiber units

High resolution mode
 Super long-distance mode
 Green light Red light Infrared ray
 Standard mode
 Super high-speed mode

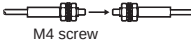
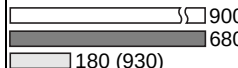
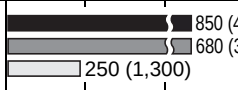
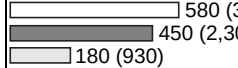
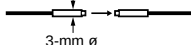
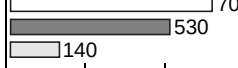
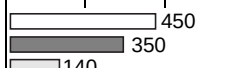
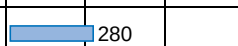
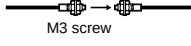
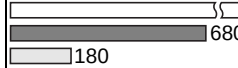
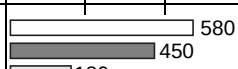
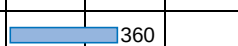
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius
M4 Free-cut	 M4 screw	E3X-DA□-S	 1,000 (4,000)*³ 760 (4,000)*³ 200 (1,500)	1.0 mm ø (0.005 mm ø)	E32-TC200	25 mm
		E3X-DAG□-S E3X-DAB□-S	 100 (700) 75 (550) 45 (350)			
		E3X-DA□-N	 950 (4,000)*³ 760 (4,000)*³ 280 (2,100)	1 mm ø (0.01 mm ø)		
		E3X-DAB #-N	 100 (700) 75 (550) 45 (350)			
		E3X-DAH□-N	 250 200 70			
		E3X-MDA	 650 (4,000)*³ 500 (3,700) 200 (1,500)	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 400 (3,000)	1.0 mm ø (0.03 mm ø)		
		E3X-NAG□	 75 (550)			
		E3X-NA□F	 120 (900)	1.0 mm ø (0.2 mm ø)		
		E3X-DA□-S	 700 (4,000)*³ 530 (3,700) 140 (970)	1.0 mm ø (0.005 mm ø)	E32-ET11R	1 mm
M4 Free-cut		E3X-DA□-N	 670 (4,000) 530 (3,700)*³ 200 (1,400)	1.0 mm ø (0.03 mm ø)		
		E3X-MDA	 450 (3,100) 350 (2,400) 140 (970)	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 280 (2,100)	1.0 mm ø (0.03 mm ø)		
		E3X-NAG□	 50 (375)			
		E3X-NA□F	 80	1.0 mm ø (0.2 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. Longer sensing distance by using the lens unit E39-F1.

 High resolution mode  Standard mode
 Super long-distance mode  Super high-speed mode
 Green light  Red light  Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius
M4 Fiber sheat material: fluorine resin Free-cut		E3X-DA□-S	 900 (4,000) ^{*2} 680 (3,600) 180 (930)	1.0 mm ø (0.005 mm ø)	E32-T11U NEW	4 mm
		E3X-DA#-N	 850 (4,000) ^{*3} 680 (3,800) ^{*3} 250 (1,300)	1.0 mm ø (0.01 mm ø)		
		E3X-MDA	 580 (3,000) ^{*3} 450 (2,300) 180 (930)	1.0 mm ø (0.005 mm ø)		
		E3X--NA#(V)	 360	1.0 mm ø (0.003 mm ø)		
		E3X--NA#F	 100	1.0 mm ø (0.02 mm ø)		
3 mm ø Free-cut		E3X-DA□-S	 700 530 140	1.0 mm ø (0.005 mm ø)	E32-T12R	1 mm
		E3X-DA□-N	 670 ^{*3} 530 200	1 mm ø (0.01 mm ø)		
		E3X-MDA	 450 350 140	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 280	1.0 mm ø (0.03 mm ø)		
		E3X-NAG□	 50			
		E3X-NA□F	 80	1.0 mm ø (0.2 mm ø)		
M3 Possible to mount the E39-F5 reflective side-view conversion attachment Free-cut		E3X-DA□-S	 900 680 180	1.0 mm ø (0.005 mm ø)	E32-TC200A	25 mm
		E3X-DA□-N	 850 680 250	1 mm ø (0.01 mm ø)		
		E3X-MDA	 580 450 180	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 360	1.0 mm ø (0.03 mm ø)		
		E3X-NAG□	 65			
		E3X-NA□F	 100	1.0 mm ø (0.2 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. Longer sensing distance by using the lens unit E39-F1.

High resolution mode Standard mode
 Super long-distance mode Super high-speed mode
 Green light Red light Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)				Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius					
M3 For detecting minute sensing objects Free-cut	 M3 screw	E3X-DA□-S	 270				0.5 mm ø (0.005 mm ø)	E32-TC200E	10 mm					
			 220											
			 50											
		E3X-DAG□-S E3X-DAB□-S	 25				0.5 mm ø (0.01 mm ø)							
			 20											
			 12											
		E3X-DA□-N	 250							0.5 mm ø (0.01 mm ø)				
			 220											
	 90													
E3X-DAB#-N	 25				0.5 mm ø (0.005 mm ø)									
	 20													
	 12													
E3X-MDA	 170							0.5 mm ø (0.005 mm ø)						
	 130													
	 50													
E3X-NA□(V)	 100				0.5 mm ø (0.03 mm ø)									
E3X-NAG□	 20													
E3X-NA□F	 30				0.5 mm ø (0.1 mm ø)									
M3 Free-cut	 M3 screw	E3X-DA□-S	 160				0.5 mm ø (0.005 mm ø)	E32-ET21R	1 mm					
			 130											
			 30				0.5 mm ø (0.005 mm ø)							
		E3X-DA□-N	 150											
			 130											
			 50											
E3X-MDA	 100				0.5 mm ø (0.01 mm ø)									
	 75													
	 45				0.5 mm ø (0.03 mm ø)									
E3X-NA□(V)	 60													
E3X-NAG□	 12													
E3X-NA□F	 18				0.5 mm ø (0.1 mm ø)									

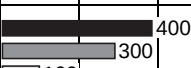
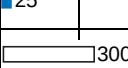
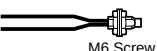
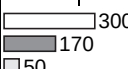
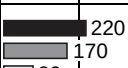
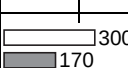
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. Longer sensing distance by using the lens unit E39-F1.

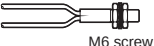
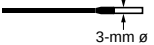
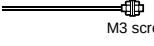
Diffuse reflective fibre units

 High resolution mode  Standard mode
 Super long-distance mode  Super high-speed mode
 Green light  Red light  Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm)*1	Standard object (min. sensing object *2) (Parentheses: Opaque object)	Model	Permissible bending radius
M6 Free-cut		E3X-DA□-S	 500 300 90	400x400 (0.005 mm ø)	E32-DC200	25 mm
		E3X-DAG□-S E3X-DAB□-S	 32 25 16	100x100 (0.1 mm ø)		
		E3X-DA□-N	 400 300 100	400x400 (0.01 mm ø)		
		E3X-DAB#-N	 32 25 16	100x100 (0.1 mm ø)		
		E3X-DAH□-N	 100 75 25	100x100 (0.01 mm ø)		
		E3X-MDA	 300 210 90	400x400 (0.005 mm ø)		
		E3X-NA□(V)	 150	200x200 (0.01 mm ø)		
		E3X-NAG□	 25	50x50 (0.1 mm ø)		
		E3X-NA□F	 50	75x75 (0.015 mm ø)		
M6 Free-cut		E3X-DA□-S	 300 170 50	300x300 (0.005 mm ø)	E32-D11R	1 mm
		E3X-DA□-N	 220 170 80	300x300 (0.01 mm ø)		
		E3X-MDA	 300 170 50	300x300 (0.005 mm ø)		
		E3X-NA□(V)	 90	150x150 (0.01 mm ø)		
		E3X-NAG□	 15	25x25 (0.1 mm ø)		
		E3X-NA□F	 30	50x50 (0.02 mm ø)		

*1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.

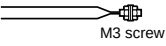
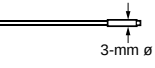
 High resolution mode  Standard mode
 Super long-distance mode  Super high-speed mode
 Green light  Red light  Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm)*1			Standard object (min. sensing object *2) (Parentheses: Opaque object)	Model	Permissible bending radius
M6 Fiber sheat material: fluorine resin Free-cut		E3X-DA□-S	 300  170  50			300x300 (0.005 mm ø)	E32-D11U NEW	4 mm
		E3X-DA#-N	 220  170  80			300x300 (0.01 mm ø)		
		E3X-MDA	 170  120  50			300x300 (0.005 mm ø)		
		E3X--NA#(V)	 90			150x150 (0.01 mm ø)		
		E3X--NA#F	 30			50x50 (0.0015 mm ø)		
3 mm ø Free-cut		E3X-DA□-S	 300  170  50			300x300 (0.005 mm ø)	E32-D12R	1 mm
		E3X-DA□-N	 220  170  80			300x300 (0.01 mm ø)		
		E3X-MDA	 170  120  50			300x300 (0.005 mm ø)		
		E3X-NA□(V)	 90			150x150 (0.01 mm ø)		
		E3X-NAG□	 15			25x25 (0.1 mm ø)		
		E3X-NA□F	 30			50x50 (0.02 mm ø)		
M3 Free-cut		E3X-DA□-S	 130  80  22			100x100 (0.005 mm ø)	E32-DC200E	10 mm
		E3X-DAG□-S E3X-DAB□-S	 32  25  16			25x25 (0.2 mm ø)		
		E3X-DA□-N	 100  80  30			100x100 (0.01 mm ø)		
		E3X-DAB#-N	 8  6  4			25x25 (0.2 mm ø)		
		E3X-MDA	 80  55  22			100x100 (0.005 mm ø)		
		E3X-NA□(V)	 36			50x50 (0.01 mm ø)		
		E3X-NAG□	 6			25x25 (0.1 mm ø)		
		E3X-NA□F	 12			25x25 (0.02 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

High resolution mode Standard mode
Super long-distance mode Super high-speed mode
Green light Red light Infrared ray

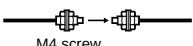
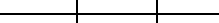
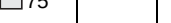
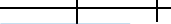
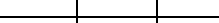
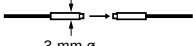
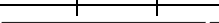
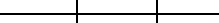
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm)*1				Standard object (min. sensing object *2) (Parentheses: Opaque object)	Model	Permissible bending radius
M3 (small ø) Free-cut	 M3 screw	E3X-DA□-S	□ 50 ■ 30 ■ 8				50x50 (0.005 mm ø)	E32-ED21R	1 mm
		E3X-DA□-N	■ 40 ■ 30 ■ 10				50x50 (0.01 mm ø)		
		E3X-MDA	□ 30 ■ 22 ■ 8				50x50 (0.005 mm ø)		
		E3X-DA□-N	■ 40 ■ 30 ■ 10				50x50 (0.01 mm ø)		
		E3X-NA□(V)	■ 15				25x25 (0.01 mm ø)		
		E3X-NA□F	■ 5				25x25 (0.03 mm ø)		
3 mm ø (small ø) Free-cut	 3-mm ø	E3X-DA□-S	□ 50 ■ 30 ■ 8				50x50 (0.005 mm ø)	E32-D22R	1 mm
		E3X-DA□-N	■ 40 ■ 30 ■ 10				50x50 (0.01 mm ø)		
		E3X-MDA	□ 30 ■ 22 ■ 8				50x50 (0.005 mm ø)		
		E3X-NA□(V)	■ 15				25x25 (0.01 mm ø)		
		E3X-NA□F	■ 5				25x25 (0.03 mm ø)		

*1. Sensing distance based on white paper.
*2. Indicates values for standard mode.

Long-distance

Throughbeam fiber units

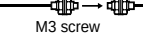
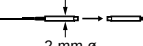
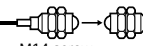
High resolution mode
 Super long-distance mode
 Green light
 Red light
 Standard mode
 Super high-speed mode
 Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) * ¹ (Parentheses: With E39-F1 Lens Unit)	Standard object (min. sensing object * ²) (Parentheses:)	Model	Permissible bending radius	
M4 Free-cut	 M4 screw	E3X-DA□-S	 1,700 (4,000)* ³  1,330 (3,200)  350 (840)	1.4 mm ø (0.01 mm ø)	E32-T11L	25 mm	
		E3X-DAG□-S E3X-DAB□-S	 150  120  75				
		E3X-DA□-N	 1,660 (4,000)  1,330 (3,200)  490 (1,200)				
		E3X-DAB#-N	 150  120  75	1.4 mm ø (0.02 mm ø)			
		E3X-DAH□-N	 430  350  120				
		E3X-MDA	 1,100 (2,600)* ³  870 (2,000)  350 (840)				1.4 mm ø (0.01 mm ø)
		E3X-NA□(V)	 700 (2,000)	1.4 mm ø (0.03 mm ø)			
		E3X-NAG□	 130 (370)				
		E3X-NA□F	 210 (600)				1.4 mm ø (0.5 mm ø)
3-mm ø Free-cut	 3-mm ø	E3X-DA□-S	 1,700  1,330  350	1.4-mm ø (0.01-mm ø)	E32-T12L		
		E3X-DA□-N	 1,660  1,330  490				
		E3X-MDA	 1,100  870  350				
		E3X-NA□(V)	 700	1.4 mm ø (0.03 mm ø)			
		E3X-NAG□	 130				
		E3X-NA□F	 210				1.4 mm ø (0.5 mm ø)

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. Longer sensing distance by using the lens unit E39-F

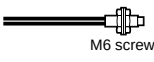
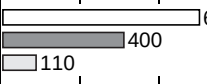
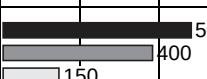
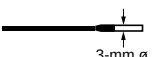
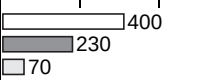
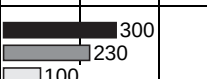
				High resolution mode Standard mode Super long-distance mode Super high-speed mode Green light Red light Infrared ray			
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) *1 (Parentheses: With E39-F1 Lens Unit)		Standard object (min. sensing object *2) (Parentheses:)	Model	Permissible bending radius
M3 Free-cut	 M3 screw	E3X-DA□-S	540 440 100		0.9 mm ø (0.005 mm ø)	E32-T21L	10 mm
		E3X-DA□-N	500 440 180		0.9 mm ø (0.01 mm ø)		
		E3X-MDA	340 260 100		0.9-mm ø (0.005-mm ø)		
		E3X-NA□(V)	200		0.9 mm ø (0.03 mm ø)		
		E3X-NAG□	40				
		E3X-NA□F	60		0.9 mm ø (0.2 mm ø)		
2-mm ø; small ø Free-cut	 2-mm ø	E3X-DA□-S	540 440 100		0.9-mm ø (0.005-mm ø)	E32-T22L	10 mm
		E3X-DA□-N	500 440 180		0.9 mm ø (0.01 mm ø)		
		E3X-MDA	340 260 100		0.9 mm ø (0.005 mm ø)		
		E3X-NA□(V)	200		0.9 mm ø (0.03 mm ø)		
		E3X-NAG□	40				
		E3X-NA□F	60		0.9 mm ø (0.2 mm ø)		
M14; with lens; ideal for explo- sion-proof appli- cations Free-cut	 M14 screw	E3X-DA□-S	20,000*5 20,000*5 4,000*5		10 mm ø	E32-T17L	25 mm
		E3X-DA□-N	20,000*3 20,000 9,800		10 mm ø (0.01 mm ø)		
		E3X-MDA	13,000 10,000 4,000		10-mm ø		
		E3X-NA□(V)	14,000		10 mm ø (0.1 mm ø)		
		E3X-NA□F	4,200		10 mm ø (1.5 mm ø)		

*1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.
 *3. Longer sensing distance by using the lens unit E39-F

Long distance

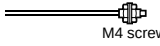
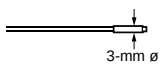
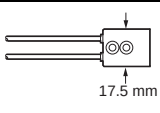
Diffuse reflective fiber units

High resolution mode
 Super long-distance mode
 Green light
 Red light
 Standard mode
 Super high-speed mode
 Infrared ray

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object (min. sensing object: Gold wire) ^{*2}	Model	Permissible bending radius
M6 Free-cut	 M6 screw	E3X-DA□-S	 650 400 110	500x500 (0.005 mm ø)	E32-D11L	25 mm
		E3X-DAG□-S E3X-DAB□-S	 44 35 22	100x100 (0.1 mm ø)		
		E3X-DA□-N	 500 400 150	500x500 (0.01 mm ø)		
		E3X-DAB#-N	 44 35 22	100x100 (0.1 mm ø)		
		E3X-DAH□-N	 130 100 30	200x200 (0.01 mm ø)		
		E3X-MDA	 400 270 110	500x500 (0.005 mm ø)		
		E3X-NA□(V)	 200	250x250 (0.01 mm ø)		
		E3X-NAG□	 35	50x50 (0.1 mm ø)		
		E3X-NA□F	 65	100x100 (0.015 mm ø)		
		E3X-DA□-S	 400 230 70	300x300 (0.005 mm ø)		
3 mm ø; small ø Free-cut	 3-mm ø	E3X-DA□-N	 300 230 100	300x300 (0.01 mm ø)	E32-D12	
		E3X-MDA	 230 160 70	300x300 (0.005 mm ø)		
		E3X-NA□(V)	 120	150x150 (0.01 mm ø)		
		E3X-NAG□	 20	25x25 (0.1 mm ø)		
		E3X-NA□F	 40	50x50 (0.015 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

				High resolution mode Super long-distance mode Green light Standard mode Super high-speed mode Red light Infrared ray					
Features	Shape	Applicable Am- plifier Unit	Sensing distance (mm) ^{*1}			Standard object ^{*2} (min. sensing ob- ject: Gold wire)	Model	Permissible bending radius	
M4 Free-cut		E3X-DA□-S	210 130 35				200x200 (0.005 mm ø)	E32-D21L	10 mm
		E3X-DA□-N	160 130 45				200x200 (0.01 mm ø)		
		E3X-MDA	130 85 35				200x200 (0.005 mm ø)		
		E3X-NA□(V)	50				100x100 (0.01 mm ø)		
		E3X-NAG□	10				25x25 (0.1 mm ø)		
		E3X-NA□F	17				25x25 (0.015 mm ø)		
3 mm ø; small ø Free-cut		E3X-DA□-S	210 130 35				200x200 (0.005 mm ø)	E32-D22L	10 mm
		E3X-DA□-N	160 130 45						
		E3X-MDA	130 85 35						
		E3X-NA□(V)	50				100x100 (0.01 mm ø)		
		E3X-NAG□	10				25x25 (0.1 mm ø)		
		E3X-NA□F	17				25x25 (0.015 mm ø)		
Square head, su- per-long distance Free-cut		E3X-DA□-S	40 to 1,000 40 to 700 40 to 240				300x300	E32-D16 NEW	4 mm
		E3X-MDA	40 to 600 40 to 490 40 to 240						
		E3X-DA#-N	40~1,000 40~700 40~400						
		E3X--NA#(V)	40~400						
		E3X--NA#F	55~70						

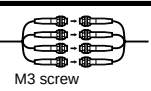
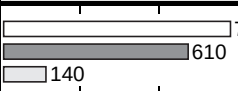
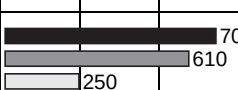
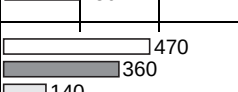
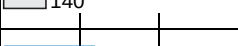
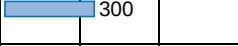
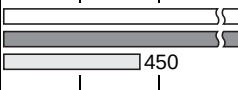
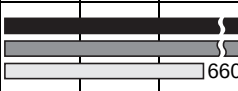
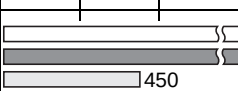
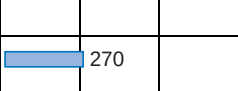
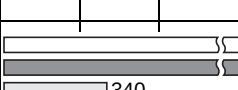
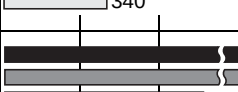
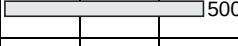
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

Area sensing

Throughbeam fiber units

High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Multi-point detection (4-head)	 M3 screw	E3X-DA□-S		2 mm ø (0.1 mm ø)	E32-M21	25 mm
		E3X-DA□-N		2.0 mm ø (0.01 mm ø)		
		E3X-MDA		2 mm ø (0.1 mm ø)		
		E3X-NA□(V)		2.0 mm ø (0.03 mm ø)		
		E3X-NA□F		2.0 mm ø (0.3 mm ø)		
Detects in a 30 mm area Free-cut	 30 mm	E3X-DA□-S		(0.3 mm ø) ^{*4}	E32-T16W	10 mm
		E3X-DA□-N				
		E3X-MDA				
		E3X-NA□(V)		(0.5 mm ø) ^{*3}		
		E3X-NAG□				
		E3X-NA□F		(4.0 mm ø) ^{*3}		
		E3X-DA□-S		(0.3 mm ø) ^{*4}	E32-T16WR	1 mm
		E3X-DA□-N				
		E3X-MDA				
		E3X-NA□(V)		(0.5 mm ø) ^{*3}		
		E3X-NA□F		(4.0 mm ø) ^{*3}		

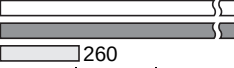
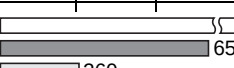
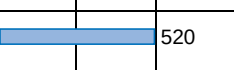
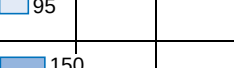
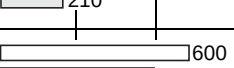
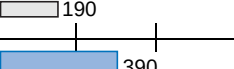
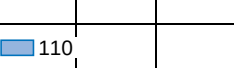
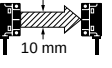
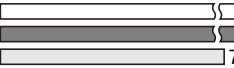
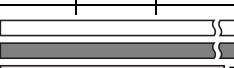
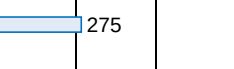
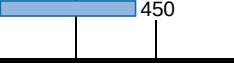
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. The sensing distance is 100 mm, possible detection within specified area under static condition

*4. The sensing distance is 300 mm, possible detection within specified area under static condition.

	High resolution mode		Standard mode
	Super long-distance mode		Super high-speed mode
	Green light		Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Side-view suitable for applications with limited spatial depth Free-cut 		E3X-DA□-S	 1,300 1,000 260	(0.2 mm ø) ^{*4}	E32-T16J	10 mm
		E3X-DA□-N	 1,300 1,000 280			
		E3X-MDA	 800 650 260			
		E3X-NA□(V)	 520	(0.3 mm ø) ^{*3}		
		E3X-NAG□	 95			
		E3X-NA□F	 150	(2.0 mm ø) ^{*3}		
		E3X-DA□-S	 980 750 190	(0.2 mm ø) ^{*4}	E32-T16JR	1 mm
		E3X-DA□-N	 980 750 210			
		E3X-MDA	 600 480 190			
		E3X-NA□(V)	 390	(0.3 mm ø) ^{*3}		
		E3X-NA□F	 110	(2.0 mm ø) ^{*3}		
Suitable for detecting over a 10 mm area; long distance Free-cut 		E3X-DA□-S	 3,700 2,800 740	(0.6 mm ø) ^{*5}	E32-T16	25 mm
		E3X-DA□-N	 3,500 2,800 1,000			
		E3X-MDA	 2,400 1,800 740			
		E3X-NA□(V)	 1,500	(0.9 mm ø) ^{*3}		
		E3X-NAG□	 275			
		E3X-NA□F	 450	(1.5 mm ø) ^{*3}		

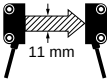
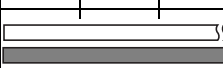
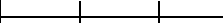
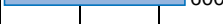
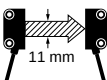
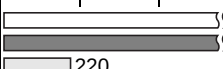
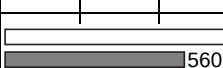
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. The sensing distance is 100 mm, possible detection within specified area under static condition

*4. The sensing distance is 300 mm, possible detection within specified area under static condition.

	High resolution mode		Standard mode
	Super long-distance mode		Super high-speed mode
	Green light		Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Stable for detecting minute sensing objects in a wide area Free-cut		E3X-DA□-S		(0.2 mm ø) ^{*4}	E32-T16P	10 mm
		E3X-DA□-N				
		E3X-MDA				
		E3X-NA□(V)		(0.3 mm ø) ^{*3}		
		E3X-NAG□				
		E3X-NA□F		(2.0 mm ø) ^{*3}		
Stable detection of minute sensing objects, wide sensing area Free-cut		E3X-DA□-S		(0.2 mm ø) ^{*4}	E32-T16PR	1 mm
		E3X-DA□-N				
		E3X-MDA				
		E3X-NA□(V)		(0.3 mm ø) ^{*3}		
		E3X-NA□F		(2.0 mm ø) ^{*3}		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. The sensing distance is 100 mm, possible detection within specified area under static condition

*4. The sensing distance is 300 mm, possible detection within specified area under static condition.

Diffuse reflective fiber units

 High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Side-view detection over wide areas Free-cut		E3X-DA□-S	 250  150  45	300x300 (0.005 mm ø)	E32-D36P1	25 mm
		E3X-DA□-N	 200  150  50	300x300 (0.01 mm ø)		
		E3X-MDA	 150  100  45	300x300 (0.005 mm ø)		
		E3X-NA□(V)	 75	100x100 (0.03 mm ø)		
		E3X-NA□F	 25	50x50 (0.03 mm ø)		

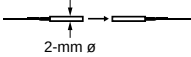
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

Small fiber head

Throughbeam fiber unit

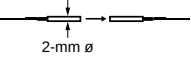
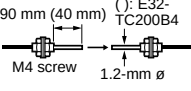
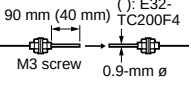
 High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
2 mm ø For detecting minute sensing objects Free-cut		E3X-DA□-S	 270  220  50	0.5 mm ø (0.005 mm ø)	E32-T22	10 mm
		E3X-DA□-N	 250  220  90	0.5 mm ø (0.01 mm ø)		
		E3X-MDA	 170  130  50	0.5 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 100	0.5 mm ø (0.03 mm ø)		
		E3X-NAG□	 20			
		E3X-NA□F	 30	0.5 mm ø (0.1 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

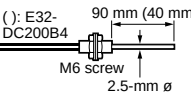
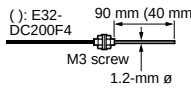
High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
2 mm $\varnothing$ For detecting minute sensing objects Free-cut		E3X-DA□-S	160 130 30	0.5 mm $\varnothing$ (0.005 mm $\varnothing$)	E32-T22R	1 mm
		E3X-DA□-N	150 130 50	0.5 mm $\varnothing$ (0.01 mm $\varnothing$)		
		E3X-MDA	100 75 30	0.5 mm $\varnothing$ (0.005 mm $\varnothing$)		
		E3X-NA□(V)	60	0.5 mm $\varnothing$ (0.03 mm $\varnothing$)		
		E3X-NA□F	18	0.5 mm $\varnothing$ (0.1 mm $\varnothing$)		
1.2 mm $\varnothing$ with sleeve Free-cut		E3X-DA□-S	1,000 760 200	1.0 mm $\varnothing$ (0.005 mm $\varnothing$)	E32-TC200B E32-TC200B4	25 mm
		E3X-DAG□-S E3X-DAB□-S	100 75 45			
		E3X-DA□-N	950 760 280	1 mm $\varnothing$ (0.01 mm $\varnothing$)		
		E3X-DAB#-N	100 75 45			
		E3X-MDA	650 500 200	1.0 mm $\varnothing$ (0.005 mm $\varnothing$)		
		E3X-NA□(V)	400	1.0 mm $\varnothing$ (0.03 mm $\varnothing$)		
		E3X-NAG□	75			
		E3X-NA□F	120	1.0 mm $\varnothing$ (0.2 mm $\varnothing$)		
0.9 mm $\varnothing$ with sleeve Free-cut		E3X-DA□-S	270 220 50	0.5 mm $\varnothing$ (0.005 mm $\varnothing$)	E32-TC200F E32-TC200F4	10 mm
		E3X-DA□-N	250 220 90	0.5 mm $\varnothing$ (0.01 mm $\varnothing$)		
		E3X-MDA	170 130 50	0.5 mm $\varnothing$ (0.005 mm $\varnothing$)		
		E3X-NA□(V)	100	0.5 mm $\varnothing$ (0.03 mm $\varnothing$)		
		E3X-NAG□	20			
		E3X-NA□F	30	0.5 mm $\varnothing$ (0.1 mm $\varnothing$)		

^{*1}. Sensing distance based on white paper.
^{*2}. Indicates values for standard mode.

Diffuse reflective fiber units

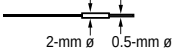
 High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
2.5 mm $\varnothing$ with sleeve Free-cut		E3X-DA□-S	 500  300  90	400x400 (0.005 mm $\varnothing$)	E32-DC200B E32-DC200B4	25 mm
		E3X-DAG□-S E3X-DAB□-S	 32  25  16	100x100 (0.1 mm $\varnothing$)		
		E3X-DA□-N	 400  300  100	400x400 (0.01 mm $\varnothing$)		
		E3X-DAB#-N	 32  25  16	100x100 (0.1 mm $\varnothing$)		
		E3X-MDA	 300  210  90	400x400 (0.005 mm $\varnothing$)		
		E3X-NA□(V)	 150	200x200 (0.01 mm $\varnothing$)		
		E3X-NAG□	 25	50x50 (0.1 mm $\varnothing$)		
		E3X-NA□F	 50	75x75 (0.015 mm $\varnothing$)		
1.2 mm $\varnothing$ with sleeve Free-cut		E3X-DA□-S	 130  80  22	100x100 (0.005 mm $\varnothing$)	E32-DC200F E32-DC200F4	10 mm
		E3X-DA□-N	 100  80  30	100x100 (0.01 mm $\varnothing$)		
		E3X-MDA	 80  55  22	100x100 (0.005 mm $\varnothing$)		
		E3X-NA□(V)	 36	50x50 (0.01 mm $\varnothing$)		
		E3X-NAG□	 6	25x25 (0.1 mm $\varnothing$)		
		E3X-NA□F	 12	25x25 (0.02 mm $\varnothing$)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

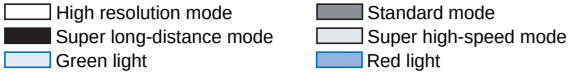
	High resolution mode		Standard mode
	Super long-distance mode		Super high-speed mode
	Green light		Red light

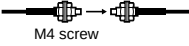
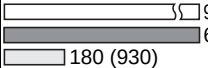
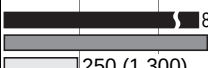
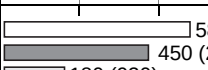
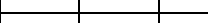
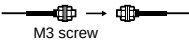
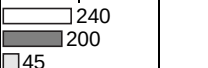
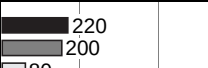
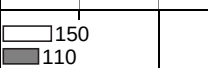
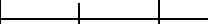
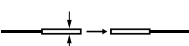
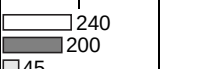
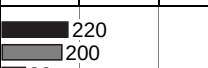
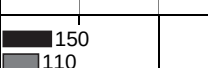
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)				Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
0.8 mm ϕ For detecting minute sensing objects Free-cut		E3X-DA□-S	□25				25x25 (0.005 mm ϕ)	E32-D33	4 mm
		E3X-DA□-N	■21 □16 □6				25x25 (0.01 mm ϕ)		
		E3X-MDA	□16 □10 □4				25x25 (0.005 mm ϕ)		
		E3X-NA□(V)	□10				25x25 (0.01 mm ϕ)		
		E3X-NA□F	□3.3				25x25 (0.03 mm ϕ)		
0.5 mm ϕ For detecting very minute sensing objects		E3X-DA□-S	□5 □3 □0.8				25x25 (0.005 mm ϕ)	E32-D331	
		E3X-DA□-N	□4 □3 □1				25x25 (0.01 mm ϕ)		
		E3X-MDA	□3 □2 □0.8				25x25 (0.005 mm ϕ)		
		E3X-NA□(V)	□1.5				25x25 (0.01 mm ϕ)		
		E3X-NA□F	□0.5				25x25 (0.05 mm ϕ)		

*1. Sensing distance based on white paper.
*2. Indicates values for standard mode.

Fiber for Robot Application R4 (Strong against repeatable bending)

Throughbeam fiber unit

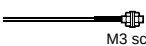


Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Ideal for mounting on moving sections (R4) Free-cut	 M4 screw	E3X-DA□-S	 900 (4,000) ^{*3} 680 (3,600) 180 (930)	1.0 mm ø (0.005 mm ø)	E32-T11	4 mm
		E3X-DA□-N	 850 (4,000) ^{*3} 680 (3,600) 250 (1,300)	1.0 mm ø (0.01 mm ø)		
		E3X-MDA	 580 (3,000) 450 (2,300) 180 (930)	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 360	1.0 mm ø (0.03 mm ø)		
		E3X-NAG□	 65			
		E3X-NA□F	 100	1.0 mm ø (0.2 mm ø)		
	 M3 screw	E3X-DA□-S	 240 200 45	0.5 mm ø (0.005 mm ø)	E32-T21	
		E3X-DA□-N	 220 200 80	0.5 mm ø (0.01 mm ø)		
		E3X-MDA	 150 110 45	0.5 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 100	0.5 mm ø (0.03 mm ø)		
		E3X-NAG□	 18			
		E3X-NA□F	 30	0.5 mm ø (0.1 mm ø)		
	 1.5-mm ø	E3X-DA□-S	 240 200 45	0.5 mm ø (0.005 mm ø)	E32-T22B	
		E3X-DA□-N	 220 200 80	0.5 mm ø (0.01 mm ø)		
		E3X-MDA	 150 110 45	0.5 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 100	0.5 mm ø (0.03 mm ø)		
		E3X-NAG□	 18			
		E3X-NA□F	 30	0.5 mm ø (0.1 mm ø)		

*1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.
 *3. Sensing distance by using the lens unit E39-F1.

Diffuse reflection fiber units

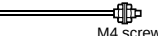
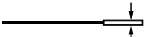
	High resolution mode		Standard mode
	Super long-distance mode		Super high-speed mode
	Green light		Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}			Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Ideal for mounting on moving sections (R4)	 M6 screw	E3X-DA□-S	 300  170  50			300x300 (0.005 mm ø)	E32-D11	4 mm
		E3X-DA□-N	 220  170  80			300x300 (0.01 mm ø)		
		E3X-MDA	 170  125  50			300x300 (0.005 mm ø)		
		E3X-NA□(V)	 90			150x150 (0.01 mm ø)		
		E3X-NAG□	 15			25x25 (0.1 mm ø)		
		E3X-NA□F	 30			50x50 (0.015 mm ø)		
	 M3 screw	E3X-DA□-S	 50  30  8			50x50 (0.005 mm ø)	E32-D21	
		E3X-DA□-N	 40  30  10			50x50 (0.01 mm ø)		
		E3X-MDA	 30  22  8			50x50 (0.005 mm ø)		
		E3X-NA□(V)	 15			25x25 (0.01 mm ø)		
		E3X-NA□F	 5			25x25 (0.02 mm ø)		

*1. Sensing distance based on a white paper.

*2. Indicates values for standard mode.

High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

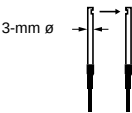
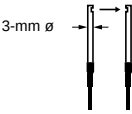
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}				Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Ideal for mounting on moving sections (R4)	 M4 screw	E3X-DA□-S	 110  70  20				100x100 (0.005 mm ø)	E32-D21B	4 mm
		E3X-DA□-N	 90  70  25				100x100 (0.01 mm ø)		
		E3X-MDA	 70  50  20				100x100 (0.005 mm ø)		
		E3X-NA□(V)	 15				25x25 (0.01 mm ø)		
		E3X-NAG□	 2.4				25x25 (0.1 mm ø)		
		E3X-NA□F	 5				25x25 (0.02 mm ø)		
	 1.5-mm ø	E3X-DA□-S	 50  30  8				50x50 (0.005 mm ø)	E32-D22B	
		E3X-DA□-N	 40  30  10				50x50 (0.01 mm ø)		
		E3X-MDA	 30  22  8				50x50 (0.005 mm ø)		
		E3X-NA□(V)	 7				25x25 (0.01 mm ø)		
		E3X-NA□F	 2.3				25x25 (0.02 mm ø)		

*1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.

Side view

Throughbeam fiber units

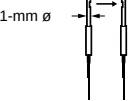
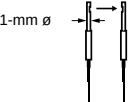
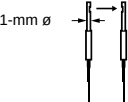
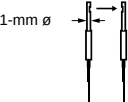
High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius
Long distance; space-saving Free-cut		E3x-DA□-S	600 460 120	1.0 mm ø (0.005 mm ø)	E32-T14L	25 mm
		E3x-DAG□-S E3x-DAB□-S	50 40 25			
		E3x-DA□-N	570 460 170	1 mm ø (0.01 mm ø)		
		E3x-DAB11-N	50 40 25			
		E3x-DAH□-N	150 120 40			
		E3x-MDA	390 300 120	1.0 mm ø (0.005 mm ø)		
		E3x-NA□(V)	240	1.0 mm ø (0.03 mm ø)		
		E3x-NAG□	45			
		E3x-NA□F	70	1.0 mm ø (0.2 mm ø)		
Space-saving Free-cut		E3x-DA□-S	270 210 50	1.0 mm ø (0.005 mm ø)	E32-T14LR	1 mm
		E3x-DA□-N	270 210 90	1 mm ø (0.01 mm ø)		
		E3x-MDA	170 130 50	1.0 mm ø (0.005 mm ø)		
		E3x-NA□(V)	110	1.0 mm ø (0.03 mm ø)		
		E3x-NA□F	33	1.0 mm ø (0.2 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

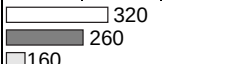
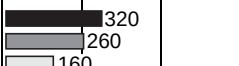
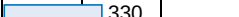
 High resolution mode	 Standard mode
 Super long-distance mode	 Super high-speed mode
 Green light	 Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)			Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius
Suitable for detecting minute sensing objects; small ϕ Free-cut		E3x-DA□-S	 160			0.5 mm ϕ (0.005 mm ϕ)	E32-T24	10 mm
			 130					
			 30					
		E3x-DA□-N	 150			0.5 mm ϕ (0.01 mm ϕ)		
			 130					
			 55					
Suitable for detecting minute sensing objects; small ϕ Free-cut		E3x-MDA	 100			0.5 mm ϕ (0.005 mm ϕ)	E32-T24R	1 mm
			 70					
			 30					
		E3x-NA□(V)	 90			0.5 mm ϕ (0.03 mm ϕ)		
		E3x-NAG□	 12					
		E3x-NA□F	 27			0.5 mm ϕ (0.3 mm ϕ)		
Suitable for detecting minute sensing objects; small ϕ Free-cut		E3x-DA□-S	 60			0.5 mm ϕ (0.005 mm ϕ)	E32-T24R	1 mm
			 50					
			 10					
		E3x-DA□-N	 60			0.5 mm ϕ (0.01 mm ϕ)		
			 50					
			 25					
Suitable for detecting minute sensing objects; small ϕ Free-cut		E3x-MDA	 35			0.5 mm ϕ (0.005 mm ϕ)	E32-T24R	1 mm
			 27					
			 10					
		E3x-NA□(V)	 30			0.5 mm ϕ (0.03 mm ϕ)		
		E3x-NA□F	 9			0.5 mm ϕ (0.3 mm ϕ)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

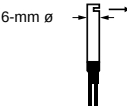
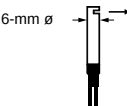
Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object (min. sensing object ^{*2}) (Parentheses: Opaque object)	Model	Permissible bending radius
Screw-mounting type Free-cut		E3x-DA□-S		4 mm ø (0.1 mm ø)	E32-T14	25 mm
		E3x-DAG□-S E3x-DAB□-S				
		E3x-DA□-N		4 mm ø (0.01 mm ø)		
		E3x-DAB11-N				
		E3x-DAH□-N				
		E3x-MDA		4 mm ø (0.1 mm ø)		
		E3x-NA□(V)		4.0 mm ø (0.03 mm ø)		
		E3x-NAG□				
		E3x-NA□F		4.0 mm ø (0.2 mm ø)		

*1. Sensing distance beased on white paper.

*2. Indicates values for standard mode.

Diffuse reflective fiber units

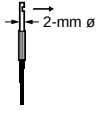
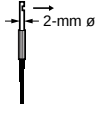
High resolution mode
 Super long-distance mode
 Green light Red light Infrared ray
 Standard mode
 Super high-speed mode

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}			Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
6 mm ø Long distance Free-cut		E3x-DA□-S	 200			200x200 (0.005 mm ø)	E32-D14L	25 mm
			 110					
			 36					
		E3x-DA□-N	 150			200x200 (0.01 mm ø)		
			 110					
			 50					
		E3x-DAH□-N	 35			50x50 (0.01 mm ø)		
6 mm ø Free-cut			 25					
			 10					
		E3x-MDA	 110			200x200 (0.005 mm ø)		
			 80					
			 36					
		E3x-NA□(V)	 40			50x50 (0.03 mm ø)		
		E3x-NAG□	 10			25x25 (0.3 mm ø)		
		E3x-NA□F	 13			25x25 (0.03 mm ø)		
		E3x-DA□-S	 80			100x100 (0.005 mm ø)	E32-D14LR	1 mm
			 45					
			 14					
		E3x-DA□-N	 60			100x100 (0.01 mm ø)		
			 45					
			 25					
		E3x-MDA	 45			100x100 (0.005 mm ø)		
			 33					
			 14					
		E3x-NA□(V)	 16			25x25 (0.03 mm ø)		
		E3x-NA□F	 5					

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

High resolution mode Standard mode
 Super long-distance mode Super high-speed mode
 Green light Red light Infrared ray

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}				Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
2 mm $\varnothing$ small $\varnothing$; space-saving Free.cut		E3x-DA□-S	 50 30 18				50x50 (0.005 mm $\varnothing$)	E32-D24	10 mm
		E3x-DA□-N	 40 30 10				50x50 (0.01 mm $\varnothing$)		
		E3x-MDA	 30 22 8				50x50 (0.005 mm $\varnothing$)		
		E3x-NA□(V)	 15				25x25 (0.03 mm $\varnothing$)		
		E3x-NAG□	 2.4				25x25 (0.3 mm $\varnothing$)		
		E3x-NA□F	 5				25x25 (0.03 mm $\varnothing$)		
		E3x-DA□-S	 26 15 4				50x50 (0.005 mm $\varnothing$)	E32-D24R	1 mm
		E3x-DA□-N	 25 15 6				50x50 (0.01 mm $\varnothing$)		
		E3x-MDA	 15 10 4				50x50 (0.005 mm $\varnothing$)		
		E3x-NA□(V)	 7				25x25 (0.03 mm $\varnothing$)		
		E3x-NA□F	 2.3						

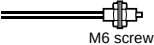
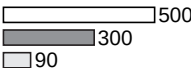
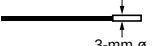
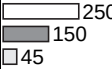
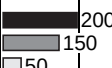
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

Coaxial fiber

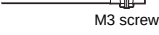
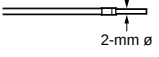
Diffuse reflective fiber units

 High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Infrared ray
 Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
M6 coaxial; high-precision positioning Free-cut		E3X-DA□-S	 500 300 90	500x500 (0.005 mm ø)	E32-CC200	25 mm
		E3X-DAG□-S E3X-DAB□-S	 32 25 16	100x100 (0.1 mm ø)		
		E3X-DA□-N	 400 300 100	500x500 (0.01 mm ø)		
		E3X-DAB#-N	 32 25 16	100x00 (0.1 mm ø)		
		E3X-DAH□-N	 100 75 25	100x100 (0.01 mm ø)		
		E3X-MDA	 300 210 90	500x500 (0.005 mm ø)		
		E3X-NA□(V)	 150	200x200 (0.01 mm ø)		
		E3X-NAG□	 25	50x50 (0.1 mm ø)		
		E3X-NA□F	 50	75x75 (0.015 mm ø)		
3 mm ø; small ø; coaxial; high-precision positioning Free-cut		E3X-DA□-S	 250 150 45	300x300 (0.005 mm ø)	E32-D32L	25 mm
		E3X-DA□-N	 200 150 50	300x300 (0.01 mm ø)		
		E3X-MDA	 150 100 45	300x300 (0.005 mm ø)		
		E3X-NA□(V)	 80	100x100 (0.01 mm ø)		
		E3X-NAG□	 12	25x25 (0.1 mm ø)		
		E3X-NA□F	 25	50x50 (0.02 mm ø)		

^{*1}. Sensing distance based on white paper.
^{*2}. Indicates values for standard mode.
^{*3}. Refer to page "AB-" when using the optional lens unit

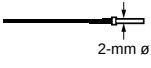
High resolution mode Standard mode
 Super long-distance mode Super high-speed mode
 Green light Red light Infrared ray

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}			Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
M3 coaxial high precision positioning Free-cut Small spot lens mountable (E39-F3A, F3A-5, F3B, F3C)		E3X-DA□-S	 120 75 22	Spot ø ^{*3} • Adjustable in the range 0.1 to 0.6-mm ø		100x100 (0.005 mm ø)	E32-EC31	25 mm
		E3X-DA□-N	 100 75 25	Spot ø Adjustable in the range 0.5 to 1.0 mm ø.		100x100 (0.01 mm ø)		
		E3X-MDA	 75 50 22			100x100 (0.005 mm ø)		
		E3X-NA□(V)	 40			50x50 (0.01 mm ø)		
		E3X-NAG□	 6			25x25 (0.1 mm ø)		
		E3X-NA□F	 13			25x25 (0.02 mm ø)		
M3 coaxial high precision positioning Free-cut Small spot lens mountable (E39-F3A, F3A-5, F3B, F3C)		E3X-DA□-S	 50 35 8	Spot ø • 0.1-mm ø • 0.2-mm ø • 4.0-mm ø max		50x50 (0.005 mm ø)	E32-EC41	
		E3X-DA□-N	 45 35 10	Spot ø • 0.1 mm ø • 0.2 mm ø • 4.0 mm ø max.		50x50 (0.01 mm ø)		
		E3X-MDA	 35 22 8			50x50 (0.005 mm ø)		
		E3X-NA□(V)	 15			25x25 (0.01 mm ø)		
		E3X-NA□F	 5			25x25 (0.02 mm ø)		
2 mm ø coaxial; high-precision positioning Small spot lens mountable (E39-F3A,)		E3X-DA□-S	 50 35 8	Spot ø • Adjustable in the range 0.1 to 0.6-mm ø.		50x50 (0.005 mm ø)	E32-C42	
		E3X-DA□-N	 45 35 10	Spot ø • Adjustable in the range 0.1 to 0.6 mm ø		50x50 (0.01 mm ø)		
		E3X-MDA	 35 22 8			50x50 (0.005 mm ø)		
		E3X-NA□(V)	 15			25x25 (0.01 mm ø)		
		E3X-NA□F	 5			25x25 (0.02 mm ø)		

*1. Sensing distance based on a white paper.

*2. Indicates values for standard mode.

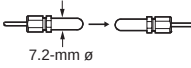
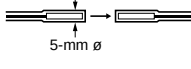
*3. Refer to page "AB-" when using the optional lens unit

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}				Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
			High resolution mode	Standard mode	Super long-distance mode	Super high-speed mode			
2 mm ø coaxial; high-precision positioning Free-cut Small spot lens mountable (E39-F3A,)		E3X-DA□-S	120 75 22	Spot ø ^{*3} • Adjustable in the range 0.1 to 0.6-mm ø			100x100 (0.005 mm ø)	E32-D32	25 mm
		E3X-DA□-N	100 75 25				100x100 (0.01 mm ø)		
		E3X-MDA	75 52 22				100x100 (0.005 mm ø)		
		E3X-NA□(V)	40				50x50 (0.01 mm ø)		
		E3X-NAG□	6				25x25 (0.1 mm ø)		
		E3X-NA□F	13				25x25 (0.02 mm ø)		

- *1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.
 *3. Refer to page "AB-" when using the optional lens unit

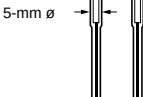
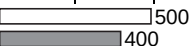
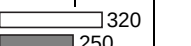
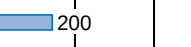
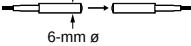
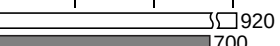
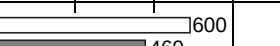
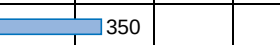
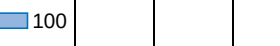
Chemical resistant

Throughbeam fiber unit

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)				Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
			High resolution mode	Standard mode	Super long-distance mode	Super high-speed mode			
Teflon-covered ^{*3} ; round head that resists water drops Free-cut		E3X-DA□-S	2,500 2,000 520				4 mm ø (0.1 mm ø)	E32-T11F	4 mm
		E3X-MDA	1,600 1,300 520				4 mm ø (0.1 mm ø)		
Teflon-covered ^{*3} ; withstands chemicals and harsh environments (operating ambient temperature: -30°C to 70°C) Free-cut		E3X-DA□-S	4,000 3,000 800				4 mm ø (0.1 mm ø)	E32-T12F	40 mm
		E3X-DA□-N	3,800 3,000 1,100				4 mm ø (0.01 mm ø)		
		E3X-MDA	2,600 2,000 800				4 mm ø (0.1 mm ø)		
		E3X-NA□(V)	1,600				4.0 mm ø (0.2 mm ø)		
		E3X-NAG□	300						
		E3X-NA□F	480				4.0 mm ø (0.7 mm ø)		

- *1. Sensing distance based on white paper.
 *2. Indicates values for standard mode.
 *3. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Company for their fluoride resin.

	High resolution mode		Standard mode
	Super long-distance mode		Super high-speed mode
	Green light		Red light

Features	Appearance	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)		Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Teflon-covered ^{*3} ; withstands chemicals and harsh environments; side-view (operating ambient temperature: -30°C to 70°C) Free-cut		E3X-DA□-S		500 400 100	3 mm ø (0.1 mm ø)	E32-T14F	
		E3X-DA□-N		500 400 150	3 mm ø (0.01 mm ø)		
		E3X-MDA		320 250 100	3 mm ø (0.1 mm ø)		
		E3X-NA□(V)		200	3.0 mm ø (0.2 mm ø)		
		E3X-NAG□		37			
		E3X-NA□F		60	3.0 mm ø (0.7 mm ø)		
Teflon ^{*3} ; withstands chemicals and harsh environments (operating ambient temperature: -40°C to 200°C)		E3X-DA□-S		920 700 190	1.0 mm ø (0.005 mm ø)	E32-T81F-S	10 mm
		E3X-DA□-N		880 700 260	1 mm ø (0.01 mm ø)		
		E3X-MDA		600 460 190	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)		350	1.0 mm ø (0.2 mm ø)		
		E3X-NA□F		100	1.0 mm ø (0.5 mm ø)		

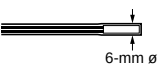
*1. Sensing distance based on a white paper.

*2. Indicates values for standard mode.

*3. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Company for their fluoride resin.

Diffuse reflective fiber units

 High resolution mode
 Super long-distance mode
 Green light
 Standard mode
 Super high-speed mode
 Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Teflon-covered ^{*3} ; withstands chemicals and harsh environments (operating ambient temperature: -30°C to 70°C Free-cut		E3X-DA□-S	 160  95  30	200x200 (0.005 mm ø)	E32-D12F	40 mm
		E3X-DA□-N	 120  95  45	200x200 (0.01 mm ø)		
		E3X-MDA	 95  70  30	200x200 (0.005 mm ø)		
		E3X-NA□(V)	 50	100x100 (0.03 mm ø)		
		E3X-NAG□	 8	25x25 (0.3 mm ø)		
		E3X-NA□F	 16	25x25 (0.03 mm ø)		

*1. Sensing distance based on white paper.

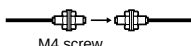
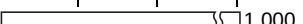
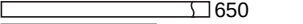
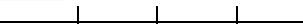
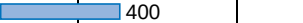
*2. Indicates values for standard mode.

*3. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Company for their fluoride resin.

Heat resistant

Throughbeam fiber unit

 High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Resists 150°C ^{*3} ; fiber sheath fiber sheath material: fluorine resin (operating ambient temperature: -40°C to 150°C) Free-cut		E3X-DA□-S	 1,000  760  200	1.5 mm ø (0.1 mm ø)	E32-ET51	35 mm
		E3X-DA□-N	 950  760  280	1.5 mm ø (0.01 mm ø)		
		E3X-MDA	 650  500  200	1.5 mm ø (0.1 mm ø)		
		E3X-NA□(V)	 400	1.5 mm ø (0.03 mm ø)		
		E3X-NA□F	 120	1.5 mm ø (1 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

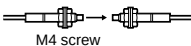
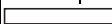
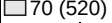
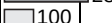
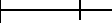
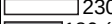
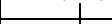
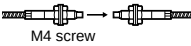
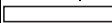
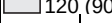
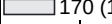
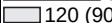
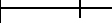
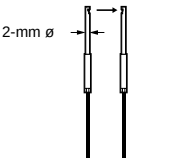
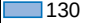
*3. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

*4. Indicates the heat resistant temperature at the fiber tip.

*5. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

*6. Longer sensing distance by using the lens unit E39-F1.

 High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Resists 200°C; flexible (R10); fiber sheath material: Teflon ^{*5} (operating ambient temperature: -40°C to 200°C)		E3X-DA□-S	 360 (2,650)  280 (2,100)  70 (520)	1.0 mm ø (0.005 mm ø)	E32-T81R-S NEW	10 mm
		E3X-DA□-N	 350  280  100	1.5 mm ø (0.01 mm ø)		
		E3X-MDA	 230 (1,700)  180 (1,300)  70 (520)	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 180	1.0 mm ø (0.2 mm ø)		
		E3X-NA□F	 50	1.0 mm ø (0.5 mm ø)		
Resists 350°C ^{*4} , with spiral tube; high mechanical strength; fiber sheath material: stainless steel (operating ambient temperature: -60°C to 350°C)		E3X-DA□-S	 600 (4,000) ^{*6}  450 (3,400)  120 (900)	1.0 mm ø (0.005 mm ø)	E32-T61-S NEW	25 mm
		E3X-DA□-N	 570 (4,000) ^{*6}  450 (3,400)  170 (1,300)	1 mm ø (0.01 mm ø)		
		E3X-MDA	 390 (3,000)  300 (2,200)  120 (900)	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 300 (3,000)	1.0 mm ø (0.03 mm ø)		
		E3X-NA□F	 90	1.0 mm ø (0.5 mm ø)		
Side-view; resists 150°C ^{*3} ; suitable for detecting minute sensing objects; fiber sheath material: fluorine resin (operating ambient temperature: -40°C to 150°C) Free-cut		E3X-DA□-S	 300  230  60	1.0 mm ø (0.005 mm ø)	E32-T54	35 mm
		E3X-DA□-N	 290  230  80	1 mm ø (0.01 mm ø)		
		E3X-MDA	 190  150  60	1.0 mm ø (0.005 mm ø)		
		E3X-NA□(V)	 130	1.0 mm ø (0.03 mm ø)		
		E3X-NA□F	 35	1.0 mm ø (0.3 mm ø)		

*1. Sensing distance based on a white paper.

*2. Indicates values for standard mode.

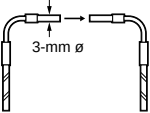
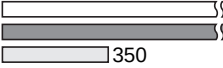
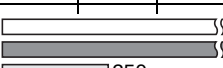
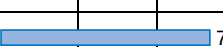
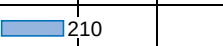
*3. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

*4. Indicates the heat resistant temperature at the fiber tip.

*5. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

*6. Longer sensing distance by using the lens unit E39-F1.

High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Resists 200°C ^{*4} ; L-shaped; fiber sheath material: stainless steel SUS		E3X-DA□-S		1.7 mm ø (0.1 mm ø)	E32-T84S-S NEW	25 mm
		E3X-DA□-N		1.7 mm ø (0.01 mm ø)		
		E3X-MDA		1.7 mm ø (0.1 mm ø)		
		E3X-NA□(V)		1.7 mm ø (0.03 mm ø)		
		E3X-NA□F		1.7 mm ø (0.4 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

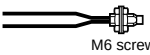
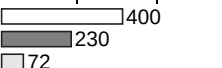
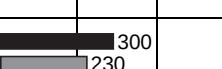
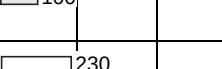
*4. Indicates the heat resistant temperature at the fiber tip.

*5. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

*6. Longer sensing distance by using the lens unit E39-F1.

Diffuse reflective fiber unit

High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Resists 150°C ^{*3} ; fiber sheath material: fluorine resin (operating ambient temperature: -40°C to 150°C) Free-cut		E3X-DA□-S		200x200 (0.005 mm ø)	E32-ED51	35 mm
		E3X-DA□-N		200x200 (0.01 mm ø)		
		E3X-MDA		100x100 (0.005 mm ø)		
		E3X-NA□(V)		150x150 (0.03 mm ø)		
		E3X-NA□F		50x50 (0.03 mm ø)		

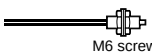
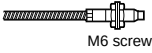
*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. For continuous operation use the product within a temperature range of -40° to 130°C.

*4. Indicates the heat-resistant temperature at the fiber tip.

 High resolution mode  Standard mode
 Super long-distance mode  Super high-speed mode
 Red light

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}			Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Resists 200°C ^{*4} ; fiber sheath material: fluorine resin (operating ambient temperature: -40°C to 200°C)		E3X-DA□-S	 150  90  27			200x200 (0.005 mm ø)	E32-D81R-S E32-D81R	10 mm
		E3X-DA□-N	 120  90  30			200x200 (0.01 mm ø)		
		E3X-MDA	 90  63  27			100x100 (0.005 mm ø)		
Resists 350°C ^{*4} ; fiber sheath material: stainless steel (operating ambient temperature: -60°C to 350°C)		E3X-DA□-S	 150  90  27			200x200 (0.005 mm ø)	E32-D61-S NEW	25 mm
		E3X-MDA	 90  60  27					
300°C Operating ambient temperature: -40 to +300°C Fiber sheath material: SUS		E3X-DA□-N	 120  90  30			200x200 (0.01 mm ø)	E32-D61 NEW	25 mm
		E3X-NA□(V)	 45			100x100 (0.03 mm ø)		
		E3X-NA□F	 15			25x25 (0.03 mm ø)		
400°C Operating ambient temperature: -40 to +400°C Fiber sheath material: SUS		E3X-DA□-N	 80  60  20			100x100 (0.01 mm ø)	E32-D73	25 mm
		E3X-NA□(V)	 30			50x50 (0.03 mm ø)		
		E3X-NA□F	 10			25x25 (0.03 mm ø)		
Resists 400°C ^{*4} ; fiber sheath material: stainless steel (operating ambient temperature: -40°C to 400°C)		E3X-DA□-S	 100  60  18			200x200 (0.005 mm ø)	E32-D73-S NEW	
		E3X-MDA	 60  40  18					

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

*3. For continuous operation use the product within a temperature range of -40° to 130°C.

*4. Indicates the heat-resistant temperature at the fiber tip.

Grooved

Throughbeam fiber unit

High resolution mode

Super long-distance mode

Green light

Standard mode

Super high-speed mode

Red light

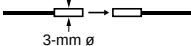
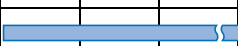
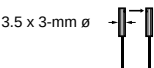
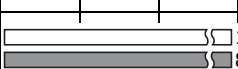
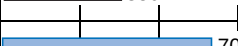
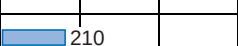
Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)				Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Suitable for film sheet detection; no optical axis adjustment required; easy to mount Free-cut		E3X-DA□-S	10 10 10				4.0 mm ø (0.1 mm ø)	E32-G14	25 mm
		E3X-DAG□-S E3X-DAB□-S	10 10 10						
		E3X-DA□-N	10 10 10				4.0 mm ø (2.0 mm ø)		
		E3X-DAB#-N	10 10 10						
		E3X-DAH□-N	10 10 10						
		E3X-MDA	10 10 10				4.0 mm ø (0.1 mm ø)		
		E3X-NA□(V)	10						
		E3X-NAG□	10						
		E3X-NA□F	10				4.0.0 mm ø (1.0 mm ø)		

*1. Sensing distance based an white paper.
*2. Indicates values for standard mode.

Narrow Vision Field

Throughbeam fiber unit

High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1} (Parentheses: With E39-F1 Lens Unit)	Standard object ^{*2} (min. sensing object) (Parentheses: Opaque object)	Model	Permissible bending radius
Suitable for detecting wafers Free-cut	 3-mm ø	E3X-DA□-S	 2,500 1,900 500	1.7 mm ø (0.1 mm ø)	E32-T22S	25 mm
		E3X-DA□-N	 2,300 1,900 700	1.7 mm ø (0.01 mm ø)		
		E3X-MDA	 1,600 1,250 500	1.7 mm ø (0.1 mm ø)		
		E3X-NA□(V)	 1,000	1.7 mm ø (0.5 mm ø)		
		E3X-NA□F	 300			
Side-view; suitable for detecting wafers Free-cut	 3.5 x 3-mm ø	E3X-DA□-S	 1,750 1,300 350	2 mm ø (0.1 mm ø)	E32-T24S	10 mm
		E3X-DA□-N	 1,700 1,300 500	2 mm ø (0.01 mm ø)		
		E3X-MDA	 1,100 870 350	2 mm ø (0.1 mm ø)		
		E3X-NA□(V)	 700	2.0 mm ø (0.03 mm ø)		
		E3X-NA□F	 210	2.0 mm ø (0.5 mm ø)		

*1. Sensing distance based on a white paper.

*2. Indicates values for standard mode.

Limited-reflective

Diffuse reflective fiber units

 High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm)*1			Standard object*2 (min. sensing object: Gold wire)	Model	Permissible bending radius
Suitable for positioning of crystal glass Free-cut		E3X-DA□-S	0 to 15			100x100 Soda glass with reflection factor of 7%	E32-L16 NEW	25 mm
		E3X-DA#-N	0 to 15					
		E3X-MDA	0 to 15					
		E3X-NA#(V)	0 to 15					
		E3X-NA#F	0 to 13					
Suitable for positioning of crystal glass Free-cut		E3X-DA□-S	4 to 12			100x100 Soda glass with reflection factor of 7%	E32-L56E1 E32-L56E2	35 mm
		E3X-DA□-N	4 to 12					
		E3X-MDA	4 to 12					
		E3X-NA□(V)	4 to 12					
		E3X-NA□F	4 to 12					
Suitable for positioning of crystal glass Heat resists up to 300°C Free-cut		E3X-DA□-S	5 to 18			100x100 Soda glass with reflection factor of 7%	E32-L66 NEW	25 mm
		E3X-DA#-N	5 to 18					
		E3X-MDA	5 to 18					
		E3X-NA#(V)	5 to 18					
		E3X-NA#F	7 to 14					

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

High resolution mode
 Super long-distance mode
 Red light
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}				Standard ob- ject ^{*2} (min. sens- ing object: Gold wire)	Model	Permissible bending radius
Siutable for crystal glass detection Thin and compact type Free-cut		E3X-DA□-S	0 to 4				25x25 (0.005 mm ø)	E32-L24S <i>NEW</i>	10 mm
		E3X-DA#-N							
		E3X-MDA	0 to 4						
		E3X-NA#(V)	0 to 4				25x25		
		E3X-NA#F	0 to 4						
Detects wafers and small differences in height; (operating ambient tempera- ture: -40°C to 105°C); degree of protection: IEC60529 IP50 Free-cut		E3X-DA□-S	4±2				25x25 (0.005 mm ø)	E32-L24L	10 mm
		E3X-DA□-N	4 ± 2				25x25 (0.01 mm ø)		
		E3X-MDA	4±2				25x25 (0.005 mm ø)		
		E3X-NA□(V)	4 ± 2				25x25 (0.015 mm ø)		
		E3X-NA□F	4 ± 2				25x25 (0.03 mm ø)		
		E3X-DA□-S	7.2±1.8				25x25 (0.005 mm ø)	E32-L25L	10 mm
		E3X-DA□-N	7.2 ± 1.8				25x25 (0.01 mm ø)		
		E3X-MDA	7.2±1.8				25x25 (0.005 mm ø)		
		E3X-NA□(V)	7.2±1.8				25x25 (0.015 mm ø)		
		E3X-NA□F	7.2±1.8				25x25 (0.03 mm ø)		

*1. Sensing distance based on white paper.

*2. Indicates values for standard mode.

High resolution mode

Super long-distance mode

Red light

Standard mode

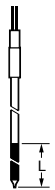
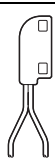
Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}				Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Detects wafers and small differences in height; degree of protection: IEC60529 IP50 Free-cut		E3X-DA□-S	3.3				25x25 (0.005 mm ø)	E32-L25	25 mm
		E3X-DA□-N	3.3				25x25 (0.01 mm ø)		
		E3X-MDA	3.3				25x25 (0.005 mm ø)		
		E3X-NA□(V)	3.3				25x25 (0.015 mm ø)		
		E3X-NA□F	3.3				25 x 25 (0.03 mm ø)		
		E3X-DA□-S	3.3				25x25 (0.005 mm ø)	E32-L25A	25 mm
		E3X-DA□-N	3.3				25x25 (0.01 mm ø)		
		E3X-MDA	3.3				25x25 (0.005 mm ø)		
		E3X-NA□(V)	3.3				25x25 (0.015 mm ø)		
		E3X-NA□F	3.3				25x25 (0.03 mm ø)		

*1. Sensing distance based an white paper.
*2. Indicates values for standard mode.

Fluid-level Detection Fiber Units

Diffuse reflective fiber units

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Fluid contact type: unbendable section L 150 mm, 350 mm (two types); (operating ambient temperature: -40°C to 200°C)		E3X-DA□-S DA□-N E3X-MDA NA□(V) NA□F	---	Pure water at 25°C	E32-D82F1 E32-D82F2	40 mm
Tube-mounting type; Light ON when fluid is present; minimal influence from bubbles and water drops Free-cut		E3X-DA□-S DA□-N E3X-MDA	Applicable tube: FEP, transparent tube, 3.2, 6.4, 9.5 mm ø, wall thickness 1mm		E32-A01	4 mm
Tube-mounting type; light ON when fluid is present; minimal influence from bubbles and water drops Free-cut		E3X-DA□-S DA□-N E3X-MDA	Applicable tube: FEP, transparent tube, 6- to 13 mm ø, wall thickness 1mm		E32-A02	
Tube-mounting type; dense mounting to detect level differences of 4 mm Free-cut		E3X-DA□-S DA□-N E3X-MDA NA□(V) NA□F	Applicable tube: FEP, transparent tube, 8- to 10 mm ø, wall thickness 1mm		E32-L25T	10 mm
Teflon ^{*3} -covered Tube-mounting type; unlimited tube diameter; minimal influence from bubbles and water drops Free-cut		E3X-DA□-S E3X-MDA	Applicable tube: Transparent tube Tube diameter: No restriction (Tube must be FEP or material with equivalent transparency)		E32-D36F	4 mm

*1. Sensing distance based on white paper.

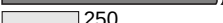
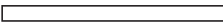
*2. Indicates values for standard mode.

*3. Teflon is a registered trademark of Dupont Company and Mitsui Chemical Company for fluorine resin.

Mapping sensors

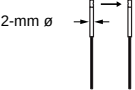
Diffuse reflective fiber units

 High resolution mode
 Super long-distance mode
 Standard mode
 Super high-speed mode

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}	Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
Super-narrow vision field; side-view; opening angle: 1.5°; simple adjustment Free-cut	3-mm ø 	E3X-DA□-S	 1,150  890  250	2 mm ø (0.1 mm ø)	E32-A03	1 mm
		DA□-N	 1,100  890  500	2 mm ø (0.01 mm ø)		
		E3X-MDA	 750  580  250	2 mm ø (0.1 mm ø)		
		NA□(V)	---	---		
		NA□F	---	---		

*1. Sensing distance based on white paper.

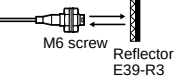
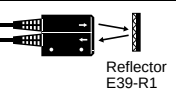
*2. Indicates values for standard mode.

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}		Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
			High resolution mode	Standard mode			
Super-narrow vision field; small; side-view; opening angle: 3°; simple adjustment Free-cut		E3X-DA□-S	460	340	1.2 mm ø (0.1 mm ø)	E32-A04	10 mm
			100				
		DA□-N	440	340	1.2 mm ø (0.01 mm ø)		
			170				
		E3X-MDA	300	220	1.2 mm ø (0.1 mm ø)		
			100				
		NA□(V)	---		---		
		NA□F					

*1. Sensing distance based on white paper.
*2. Indicates values for standard mode.

Retroreflective

Diffuse reflective fiber

Features	Shape	Applicable Amplifier Unit	Sensing distance (mm) ^{*1}		Standard object ^{*2} (min. sensing object: Gold wire)	Model	Permissible bending radius
			High resolution mode	Standard mode			
Opaque object detection Free-cut		E3X-DA□-S	10 to 250	10 to 250	35 mm ø (0.1 mm ø)	E32-R21 + E39-R3 (Attachment)	10 mm
			10 to 250	10 to 250			
		E3X-DA□-N	10 to 250	10 to 250			
			10 to 250	10 to 250			
		E3X-MDA	10 to 250	10 to 250			
Opaque object detection		E3X-DA□(V)	10 to 250		35.0 mm ø (0.3 mm ø)	E32-R16 + E39-R1 (Attachment)	25 mm
		E3X-NA□F	10 to 250		35.0 mm ø (0.5 mm ø)		
		E3X-DA□-S	150 to 1,500	150 to 1,500	35 mm ø (0.2 mm ø)		
			150 to 1,500	150 to 1,500			
		E3X-DA□-N	150 to 1,500	150 to 1,500			
		E3X-MDA	150 to 1,500	150 to 1,500			
			150 to 1,500	150 to 1,500			
		E3X-NA□(V)	150 to 1500		35.0 mm ø (0.6 mm ø)		
		E3X-NA□F	150 to 1000		35.0 mm ø (0.4 mm ø)		

*1. Sensing distance based on white paper.
*2. Indicates values for standard mode.

Rating/Performance

Fiber Units

Through-beam fiber unit

Type/application		Long distance, general purpose, Thin fiber, side view	Flexible (break-resistant)	Chemical resistant	
Item			E32-T11, E32-T21, E32-T22B	E32-T12F, E32-T14F	E32-T81F
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)			-40° to 200°C (with no icing or condensation)
	Storage				-40° to 110°C (with no icing or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)			
Admissible bending radius		25 mm min. (10 mm min. for 1 mm dia. fiber)	4 mm min.	40 mm min.	10 mm min.
Fiber sheath material		Black polyethylene	Vinyl chloride	Teflon (*) covered	
Protective structure		IEC 60529 IP67			

* Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Type/application		Flexible					
		E32-T12R	E32-T22R	E32-T16WR	E32-T16JR E32-T16PR	E32-T24R	E32-T14LR E32-ET11R E32-ET21R
Item							
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)		-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)		
	Storage	-40° to 70°C (with no condensation)					
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
Admissible bending radius		1 mm min.					
Fiber sheath material		Mixed vinyl chloride	Black polyethylene	Mixed vinyl chloride		Black polyethylene	Mixed vinyl chloride
Protective structure		IEC 60529 IP67		IEC 60529 IP50		IEC 60529 IP67	

Type/application		Heat resistant				
		300 °C	200°C		150°C	
Item		E32-T61	E32-T84S	E32-T81R	E32-ET51	E32-T54
Ambient temperature	Operation	-40° to 300°C *1 (with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 150°C *2 (with no incing or condensation)	
	Storage	-40° to 110°C (with no icing or condensation)				
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Admissible bending radius		25 mm min.		10 mm min.	35 mm min.	
Fiber sheath material		SUS303		Fluororesin		
Protective structure		IEC 60529 IP67				

*1 Since the heat resistance changes depending on the fiber area, refer to the external dimensions.

*2 For continuous operation, use the products within a temperature range of -40°C to 130°C

Type/application		Slot Sensor	Narrow vision field	Area sensing			
Item		E32-G14	E32-T22S E32-T24S	E32-T16W	E32-T16J	E32-T16	E32-T16P
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)		-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)		
	Storage	-40° to 70°C (with no icing or condensation)					
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)					
Admissible bending radius		25 mm min.		10 mm min. (25 mm max. for E32-T16 only)			
Fiber sheath material		Black polyethylene	Mixed vinyl chloride	Vinyl chloride (black polyethylene for E32-T16 only)			
Protective structure		IEC 60529 IP67		IEC 60529 IP50 (IP67 for E32-T16 only)			

Type/application		Mapping Sensor	
Item		E32-A03	E32-A04
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)	
	Storage		
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)	
Admissible bending radius		1 mm min.	10 mm min.
Fiber sheath material		Black polyethylene	
Protective structure		IEC 60529 IP50	

Fiber Units with Reflective Sensor

Type/application		Long distance, general purpose, thin fiber, side view	Coaxial				Flexible (resists breaking)
Item			E32-EC31	E32-EC41	E32-C42	E32-D32	E32-D11, E32-D21, E32-D21B, E32-D22B
Differential distance		20% max. of sensing distance					
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)					
	Storage						
Ambient humidity	Operation	35% to 85%RH (with no condensation)					
	Storage	35% to 95%RH (with no condensation)					
Admissible bending radius		25 mm min. (10 mm min. for 1 mm dia. fiber)	25 mm min.				4 mm min.
Fiber sheath material		Black polyethylene					Vinyl chloride
Protective structure		IEC 60529 IP67					

Type/application		Flexible			
Item		E32-D12R	E32-D22R, E32-D24R	E32-D14LR, E32-ED11R	E32-ED21R
Differential distance		20% max. of sensing distance			
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)			
	Storage				
Ambient humidity	Operation	35% to 85%RH (with no condensation)			
	Storage	35% to 95%RH (with no condensation)			
Admissible bending radius		1 mm min.			
Fiber sheath material		Mixed vinyl chloride	Black polyethylene	Mixed vinyl chloride	Black polyethylene
Protective structure		IEC 60529 IP67			

Type/application		Chemical resistance	Heat resistance			
Item		E32-D12F	150°C	200°C	300 °C	400 °C
			E32-ED51	E32-D81R	E32-D61	E32-D73
Differential distance		20% max. of sensing distance				
Ambient temperature	Operation	-30°C to 70°C (with no icing or condensation)	-40° to 150°C *1(with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 300°C *2(with no icing or condensation)	-40° to 400°C (with no icing or condensation)
	Storage	-30°C to 70°C (with no icing or condensation)	-40° to 110°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Admissible bending radius		40 mm min.	35 mm min.	10 mm min.	25 mm min.	
Fiber sheath material		Teflon (*3) covered	Fluororesin		SUS	
Protective structure		IEC 60529 IP67				

*1 For continuous operation, use the products within a temperature range of -40°C to 130°C

*2 Since the heat resistance changes depending on the fiber area, refer to the external dimensions on page AB- for details.

*3 Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Type/application		Retroreflective		Limited reflective		Area sensing
		E32-R21	E32-R16	E32-L25, E32-L25A	E32-L25L, E32-L24L	E32-D36P1
Item						
Differential distance		20% max. of sensing distance			5% max. of sensing distance	20% max. of sensing distance
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)	-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)	-40°C to 105°C * (with no icing or condensation)	-40° to 70°C (with no icing or condensation)
	Storage	-40° to 70°C (with no icing or condensation)			-40°C to 95°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Admissible bending radius		10 mm min.				25 mm min.
Fiber sheath material		Black polyethylene			Reinforced polyethylene	Black polyethylene
Protective structure		IEC 60529 IP67	IEC 60529 IP66	IEC 60529 IP50		---

* For continuous operation, use the products within a temperature range of -40°C to 90°C.

Type/application		Limited reflective
Item	Model	E32-L56E1/E32-L56E2
Standard sensing object		Soda glass (SCG) having 7% reflection factor T=0.7 end face radius chamfering
Work inclination		2°
Sensing position accuracy		+0.1/-0.3
Differential distance		20% max. of sensing distance
Ambient temperature	Operation	0°C to 70°C *
	Storage	-40° to 70°C
Ambient humidity	Operation	35% to 85%
	Storage	35% to 95%
Protective structure		IEC 60529 IP40
Material	Case	Aluminum
	Cover	SPCC steel sheet
	Lens	Glass (BK7)
	Fiber cladding	Fluororesin

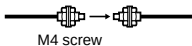
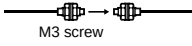
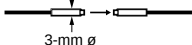
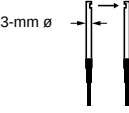
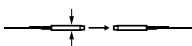
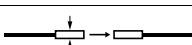
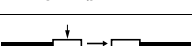
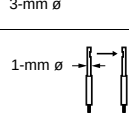
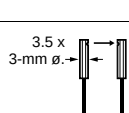
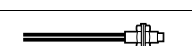
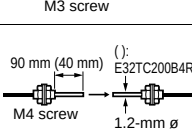
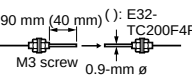
* +200°C for short-time use.

Flexible fiber unit

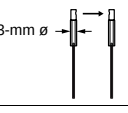
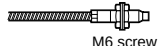
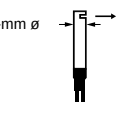
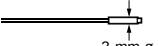
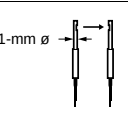
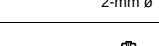
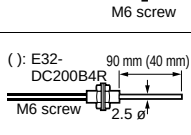
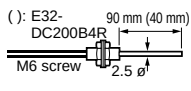
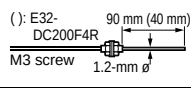
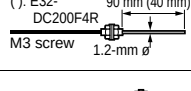
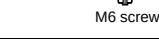
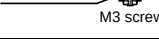
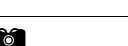
The following fibers are available as flexible type (1 week). (Up to 10 sets) Contact your trading company for the prices, delivery time and types.

Flexible fiber (R1) type

Throughbeam

Application	Shape	Model
General purpose		E32-ET11R
General purpose		E32-ET21R
General purpose		E32-T12R
Side view		E32-T14LR
Area sensing		E32-T16JR
Area sensing		E32-T16PR
Area sensing		E32-T16WR
Small fibre head		E32-T22R
Narrow vision field		E32-T22SR
Narrow vision field		E32-T22SR
Small fibre head		E32-T24R
Narrow vision field		E32-T24SR
Heat resistance		E32-T81R
General purpose		E32-TC200AR
General purpose		E32-TC200B4R
General purpose		E32-TC200F4R

Reflective model

Application	Shape	Model
Mapping Sensor		E32-A03
Coaxial fibre		E32-CC200R
General purpose		E32-D12R
Side view		E32-D14LR
Small fibre heat		E32-D22R
Side view		E32-D24R
Coaxial fibre		E32-D32LR
Coaxial fibre		E32-D32R
Heat resistant		E32-D81R
General purpose		E32-DC200B4R
General purpose		E32-DC200BR
General purpose		E32-DC200F4R
General purpose		E32-DC200FR
General purpose		E32-ED11R
General purpose		E32-ED21R
Limited reflective		E32-L24LR
Limited reflective		E32-L25LR
Liquid-level detection		E32-L25TR

Special compatibility of fiber units

Sensing distance (Unit: mm)

Fiber type	Amplifier type	Mode	Standard product	R5	R7.5	R10	R12.5
E32-TC200B	E3X-DA11-N	Super-long-distance	950	590	770	840	950
		Standard	760	470	610	670	760
		Super-high-speed	280	170	220	250	280
E32-TC200F		Super-long-distance	250	110	250	250	250
		Standard	220	100	220	220	220
		Super-high-speed	90	40	90	90	90
E32-DC200F		Super-long-distance	100	70	100	100	100
		Standard	80	55	80	80	80
		Super-high-speed	30	20	30	30	30

Long fiber type

Applicable model (default type)

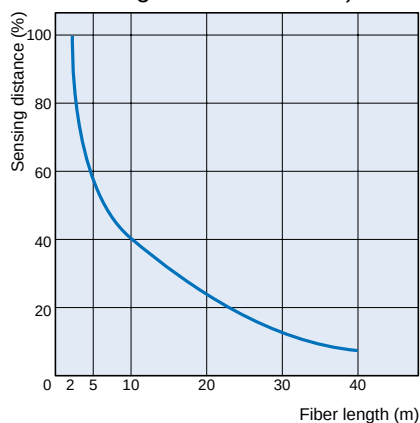
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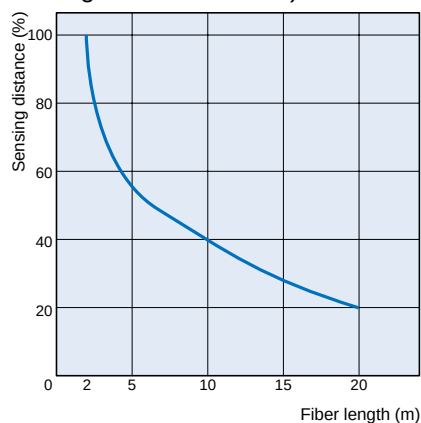
1 m increments in the range $6\text{ m} \leq l \leq 20\text{ m}$ [$l=2\text{ m}$, $l=5\text{ m}$ (E32-T11L/E32-T11/E32-TC200/E32-DC200 only) are standard products.]

Fiber length vs. sensing distance

Through-beam fiber unit (assuming that the fiber length of 2 m is 100%)



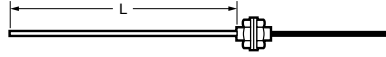
Reflective fiber unit (assuming that the fiber length of 2 m is 100%)



Different stainless steel tube length type

Applicable model

E32-TC200F (tube diameter 0.9 mm) E32-TC200B, E32-DC200F (tube diameter 1.2 mm) E32-DC200B (tube diameter 2.5 mm)



Can be produced within the range $10 \text{ mm} \leq L \leq 120$

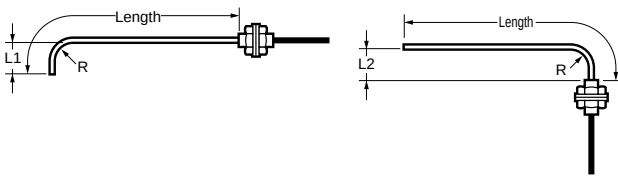
Tolerance: $\pm 1 \text{ mm}$ when $L \geq 40 \text{ mm}$, $\pm 2 \text{ mm}$ when $L < 40 \text{ mm}$ ($L=90 \text{ mm}$, $L=40 \text{ mm}$ is a standard product.)

Stainless steel tube front-end or root bent type

Applicable model

E32-TC200B, E32-TC200F, E32-DC200F

(When tube is bent at front end) (When tube is bent at root)



Bending radius and L1, L2 dimensions (Unit: mm)

Bending radius	Control No.	L1		L2		SUS tube full length
		1	2	3	4	S□
R5	A	10	15	5	10	120 max.
R7.5	B	12.5	17.5	7.5	17.5	
R10	C	15	20	10	20	
R12.5	D	17.5	22.5	12.5	22.5	

Note: Only the products of the above dimensions can be manufactured. If the product is bent to other than the above dimension, the sleeve bender E39-F11 (option) is available.

Type list based on bending radius and L1, L2 dimensions

(When only L1 is specified) (Unit: mm)

Bending radius	L1 (± 1)	Model
R5	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A1
	15	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A2
R7.5	12.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B1
	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B2
R10	15	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C1
	20	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C2
R12.5	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D1
	22.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D2

- *1 "T" for through-beam type, "D" for reflective type.
 *2 B or "F" at the end of E32-TC200B.
 *3 "50" for 50 mm full length. Full length $\leq 120 \text{ mm}$

(If only L2 is specified) (Unit: mm)

Bending radius	L2 (± 1)	Model
R5	5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A3
	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A4
R7.5	7.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B3
	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B4
R10	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C3
	20	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C4
R12.5	12.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D3
	22.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D4

- *1 "T" for through-beam type, "D" for reflective type.
 *2 B or "F" at the end of E32-TC200B.
 *3 "50" for 50 mm full length. Full length $\leq 120 \text{ mm}$

(When L1 and L2 are both specified) (Unit: mm)

Bending radius	L1 (± 1)	L2 (± 1)	Model
R5	10	5	E32- ^F ₁ C200 ^F ₂ -A13
	10	10	E32- ^F ₁ C200 ^F ₂ -A14
	15	5	E32- ^F ₁ C200 ^F ₂ -A23
	15	10	E32- ^F ₁ C200 ^F ₂ -A24
R7.5	12.5	7.5	E32- ^F ₁ C200 ^F ₂ -B13
	12.5	17.5	E32- ^F ₁ C200 ^F ₂ -B14
	17.5	7.5	E32- ^F ₁ C200 ^F ₂ -B23
	17.5	17.5	E32- ^F ₁ C200 ^F ₂ -B24
R10	15	10	E32- ^F ₁ C200 ^F ₂ -C13
	15	20	E32- ^F ₁ C200 ^F ₂ -C14
	20	10	E32- ^F ₁ C200 ^F ₂ -C23
	20	20	E32- ^F ₁ C200 ^F ₂ -C24
R12.5	17.5	12.5	E32- ^F ₁ C200 ^F ₂ -D13
	17.5	22.5	E32- ^F ₁ C200 ^F ₂ -D14
	22.5	12.5	E32- ^F ₁ C200 ^F ₂ -D23
	22.5	22.5	E32- ^F ₁ C200 ^F ₂ -D24

- *1 "T" for through-beam type, "D" for reflective type.
 *2 B or "F" at the end of E32-TC200B.

Precautions

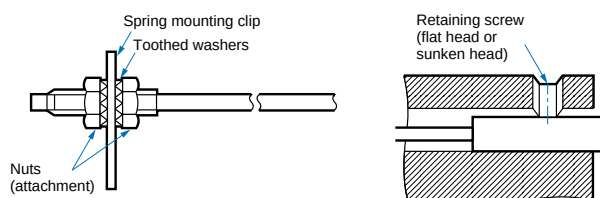
Fiber Units

Installation

Tightening Force

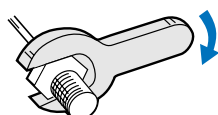
The tightening force applied to the Fiber Unit should be as follows:

Screw-mounting Model Cylindrical Model



Fiber Units	Clamping torque
M3/M4 screw	0.78 Nm max.
M6 screw/6-mm dia. column	0.98 Nm max.
1.5-mm dia. column	0.2 Nm max.
2-mm dia./3-mm dia. column	0.29 Nm max.
E32-T12F 5-mm dia. Teflon model	0.78 Nm max.
E32-D12F 6-mm dia. Teflon model	
E32-T16	0.49 Nm max.
E32-R21	0.59 Nm max.
E32-M21	0.49 Nm max. for up to 5 mm from front end, 0.78 Nm max. for more than 5 mm from front end
E32-L25A	0.78 Nm max.
E32-T16P E32-T16PR E32-T24S E32-L24L E32-L25L E32-T16J E32-T16JR	0.29 Nm max.
E32-T16W E32-T16WR	0.3 Nm max.

Use a proper-sized wrench.

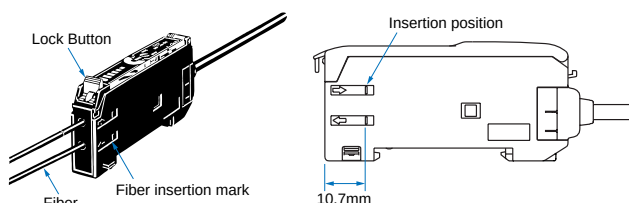


Fiber Connection and Disconnection

The E3X Amplifier Unit has a lock button. Connect or disconnect the fibers to or from the E3X Amplifier Unit using the following procedures:

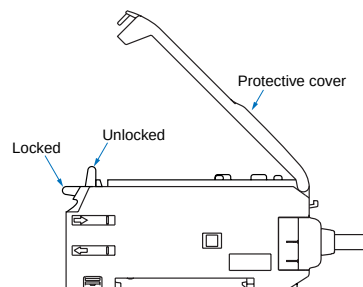
1. Connection

Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.



2. Disconnection

Remove the protective cover and raise the lock button to pull out the fiber.



Note: To maintain the fiber properties, confirm that the lock is released before removing the fiber.

3. Precautions for Fiber Connection/Disconnection

Be sure to lock or unlock the lock button within an ambient temperature range between -10°C and 40°C.

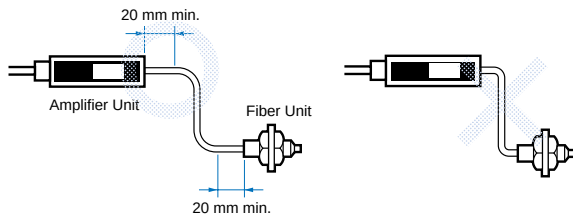
Cutting Fiber

- Insert a fiber into the Fiber Cutter and determine the length of the fiber to be cut.
- Press down the Fiber Cutter in a single stroke to cut the fiber.
- The cutting holes cannot be used twice. If the same hole is used twice, the cutting face of the fiber will be rough and the sensing distance will be reduced. Always use an unused hole.
- Cut a thin fiber as follows:

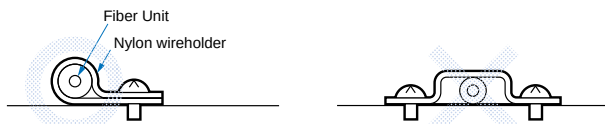
①	An attachment is temporarily fitted to a thin fiber before shipment.	Thin fiber attachment (E39-F9) Temporarily fitted
②	Secure the attachment after adjusting the position of it in the direction indicated by the arrow.	
③	Insert the fiber to be cut into the E39-F4.	E39-F4 fiber cutter Two holes for thin fiber Three holes for standard fiber (2.2-mm dia.)
④	Finished state (proper cutting state)	Approx. 0.5 mm Insertion direction Note: Insert the fiber in the direction indicated by the arrow.

Connection

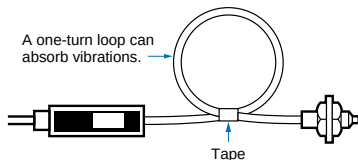
- Do not strain the fiber unit, e.g. do not apply tensile or compression force. (Within 9.8 Nm or 29.4 Nm) Use special care since the fiber is thin.
- The bending radius of the fiber unit should exceed the admissible bending radius given in "Type/standard price" and "Ratings/performance".
- Do not bend the edge of the fiber units (excluding the E32-T□R and E32-D□R).



- Do not apply excess force on the fiber units.

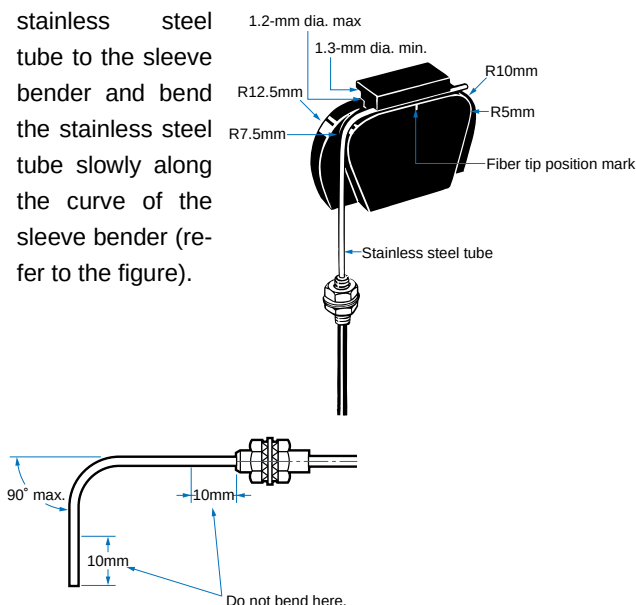


- The fiber head could be break from excessive vibration. To prevent this, the following is applied:



E39-F11 Sleeve Bender

- The bending radius of the stainless steel tube should be as large as possible. The smaller the bending radius becomes, the shorter the sensing distance will be.
- Insert the tip of the stainless steel tube to the sleeve bender and bend the stainless steel tube slowly along the curve of the sleeve bender (refer to the figure).

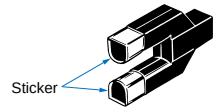


Heat-resistant fibers (E32-D51, E32-T51)

- The bending radius should be 35 mm up.
- The fiber connector E39-F10 cannot be used for extension.
- +130 max. for continuous operation at high temperature. The upper limit of the short-time operable temperature is +150

E32-T14/E32-G14

The presence of a reflective object at the front ends of the lenses may place the unit in an incident state. In this case, apply the supplied black seals to the front ends of the lenses.

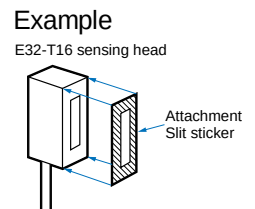


Wafer sensor (E32-L25 (A))

- Insert the fiber with a white line into the emission side of the amplifier.
- When installing the sensor head, tighten it to the 0.78Nm torque.
- Do not expose the sensor to water.

Supplied slit for E32-T16

When using the supplied slit, peel off the back paper and apply it along the outline of the sensing surface. For use at 45 mm or less, always fit a slit of 0.5 mm width.



E32-M21

Set the four fibers at a sufficient distance to avoid interfering with each other.

Adjustment

E32-G14

Because of a short sensing distance, the incident level becomes excessive, disabling "without-work teaching". Use with/without-work teaching.

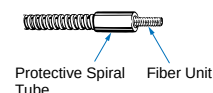
Accessories

Use of E39-R3 Reflector

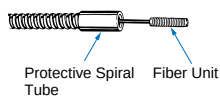
1. When using an adhesive tape on the rear face, apply it after washing off oil, dust, etc. with detergent from the place of application. The reflector cannot be installed if there remains oil, etc.
2. The E39-R3 cannot be used in places where it is exposed to oil or chemicals.

Protective Spiral Tubes

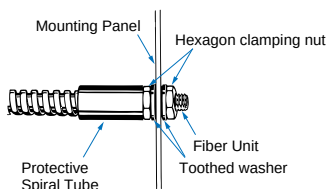
1. Insert a fiber to the protective spiral tube from the head connector side (screwed) of the tube.



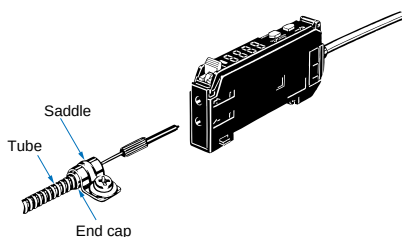
2. Push the fiber into the protective spiral tube. The tube should be straight so that the fiber is not twisted when inserted. Then turn the end cap of the spiral tube.



- Secure the protective spiral tube at a suitable place with the attached nut.

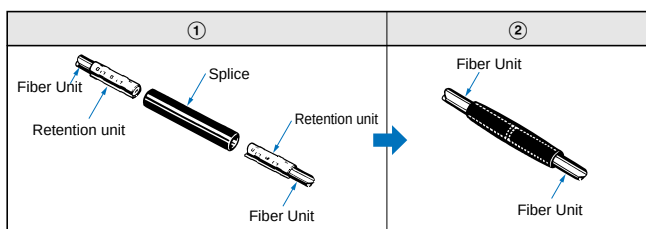


- Use the attached saddle to secure the end cap of the protective spiral tube. To secure the protective spiral tube at a position other than the end cap, apply tape to the tube so that the portion becomes thicker in diameter.



E39-F10 Fiber Connector

Fit the connector in the following procedure.



- The fiber units should be as close as possible when they are connected. Sensing distance will be reduced by approximately 25% when fibers are connected.

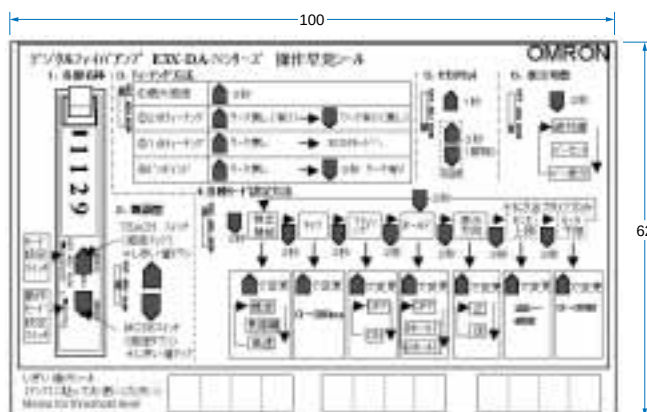
Only 2.2 mm dia. fibers can be connected.

For E3X-DA-N

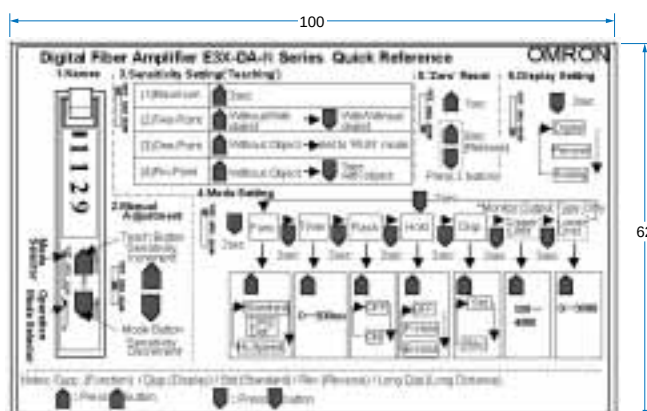
Operating Instructions Sticker E39-Y1

- Apply this seal next to the sensor.
- (1 English and 1 Japanese stickers per set)
- Material: (Front) Paper, (rear) adhesive tape

Japanese Sticker



English Sticker



Dimensions

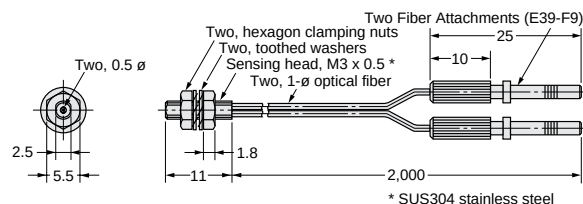
General purpose

Throughbeam

E32-ET11R CAD file: E32_69 Two, hexagon clamping nuts Two, toothed washers Sensing head, M2.6 x 0.7 * 2.2-$\varnothing$ optical fiber 151, 0.075 $\varnothing$ 3.2 7 3 14 2.4 2,000 * Nickel-plated brass	E32-ET21R CAD file E32_70 Two, hexagon clamping nuts Two, toothed washers Sensing head, M3 x 0.5 * 2.2-$\varnothing$ optical fiber 151, 0.037 $\varnothing$ 5.5 1.8 9.5 13.5 2,000 * Nickel-plated brass
E32-T11U M2.6 x 0.45 Sensing head M4 x 0.7 *1 Two hexagonal nuts Two washers Protection tube Optical fiber 2.2 $\varnothing$ *2 16- $\varnothing$ 0.265 3.2 7 3.3 2.4 15 14 2,000 *1 Material: nickel-plated brass *2 Sheath: fluororesin	E32-T12R CAD file E32_34 151, 0.075 $\varnothing$ 2.4 $\varnothing$ Sensing head, 3 $\varnothing$ * 3 11 (14) 2,000 * Nickel-plated brass
E32-TC200 CAD file E32_50 Two, hexagon clamping nuts Two, toothed washers Sensing head, M2.6 x 0.45 * Sensing head, M4 x 0.7 * 2.2-$\varnothing$ optical fiber 1.0 $\varnothing$ 3.2 7 3 14 2.4 2,000 * Nickel-plated brass	E32-TC200A CAD file E32_51 Two, hexagon clamping nuts Two, toothed washers Sensing head, M3 x 0.5 * 2.2-$\varnothing$ optical fiber 1.0 $\varnothing$ 5.5 1.8 3 7 1.4 2,000 * Nickel-plated brass
E32-TC200E CAD file E32_49 Two, hexagon clamping nuts Two, toothed washers Sensing head, M3 x 0.5 * 1 $\varnothing$ optical fiber Fiber Attachment (E39-F9) 0.5 dia. 2.5 5.5 1.8 11 10 25 2,000 * Nickel-plated brass	
Diffuse reflective	
E32-D11U Sensing head M6 x 0.75 (Nickel-plated brass) Two hexagonal nuts Two washers Protection tube Optical fiber: two 2.2-mm $\varnothing$ (fluororesin) 16- $\varnothing$ 0.265 5.2 10 2.4 17 15 2,000 *1. material: nickel plated brass *2. outside: kind of fluorine resin	E32-D12R CAD file E32_66 2-151, 0.075 $\varnothing$ 3 $\varnothing$ 15 135 2,000 Sensing head * Heat-shrinkable tubing Two, 2.2-$\varnothing$ optical fiber * SUS304 stainless steel
E32-D22R CAD file E32_08 Two Fiber Attachments (E39-F9) Sensing head, 3 $\varnothing$ * 2-151, 0.037 $\varnothing$ 2.7 $\varnothing$ 3 15 10 25 2,000 * Nickel-plated brass	E32-DC200 CAD file E32_18 Two, 1 $\varnothing$ 4 $\varnothing$ Two, hexagon clamping nuts Two, toothed washers Sensing head * M6 x 0.75 4.8 10 3 17 2.4 2,000 * ADC

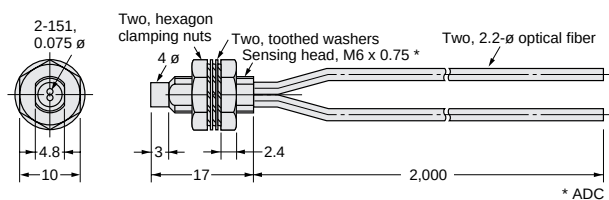
E32-DC200E

CAD file E32_17



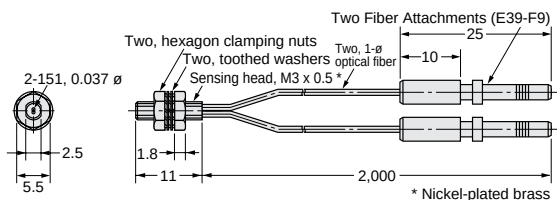
E32-ED11R

CAD file E32_67



E32-ED21R

CAD file E32_68

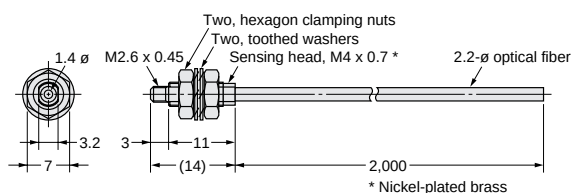


Long Distance

Throughbeam

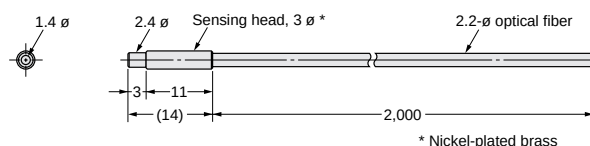
E32-T11L

CAD file E32_32



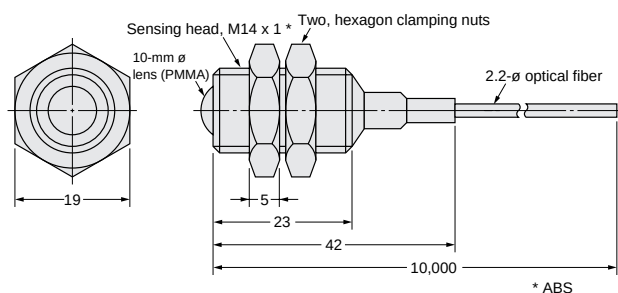
E32-T12L

CAD file E32_34



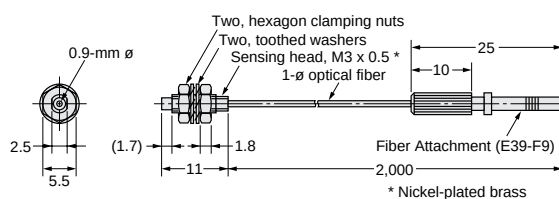
E32-T17L

CAD file E32_38



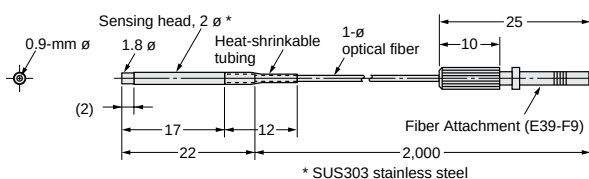
E32-T21L

CAD file E32_40



E32-T22L

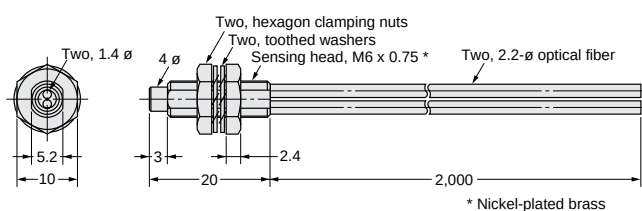
CAD file E32_42



Diffuse reflective

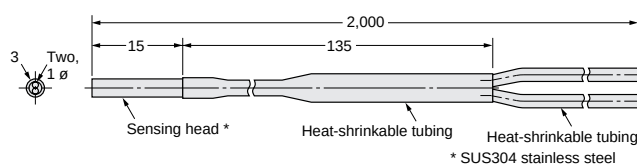
E32-D11L

CAD file E32_03

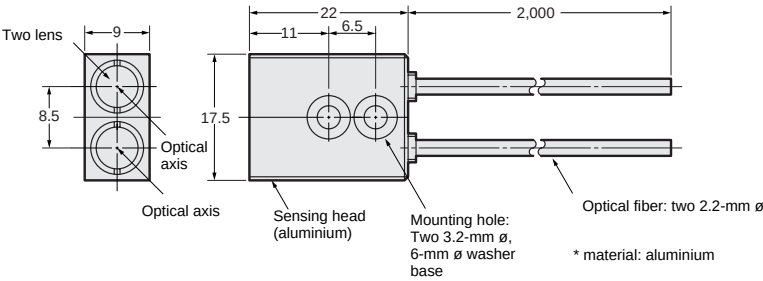


E32-D12

CAD file E32_66

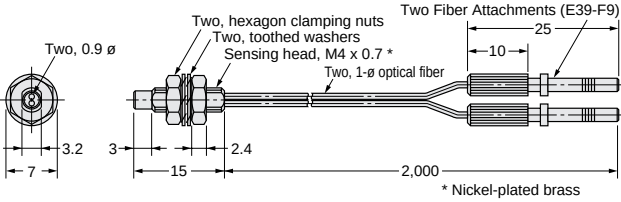


E32-D16



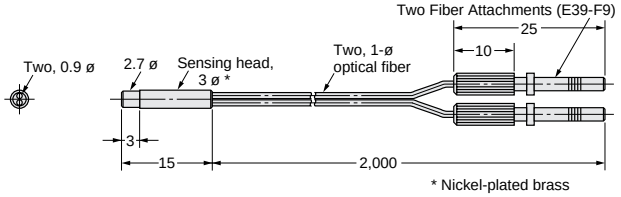
E32-D21L

CAD file E32_07



E32-D22L

CAD file E32_08

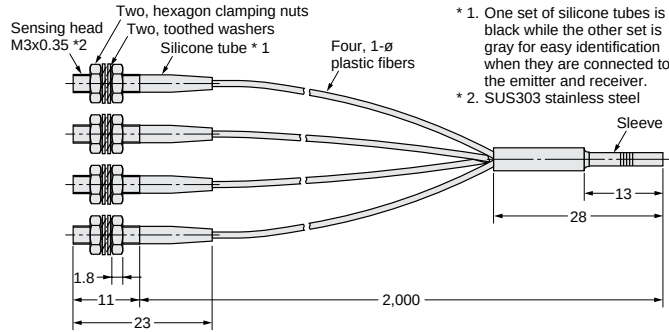


Area sensing

Throughbeam

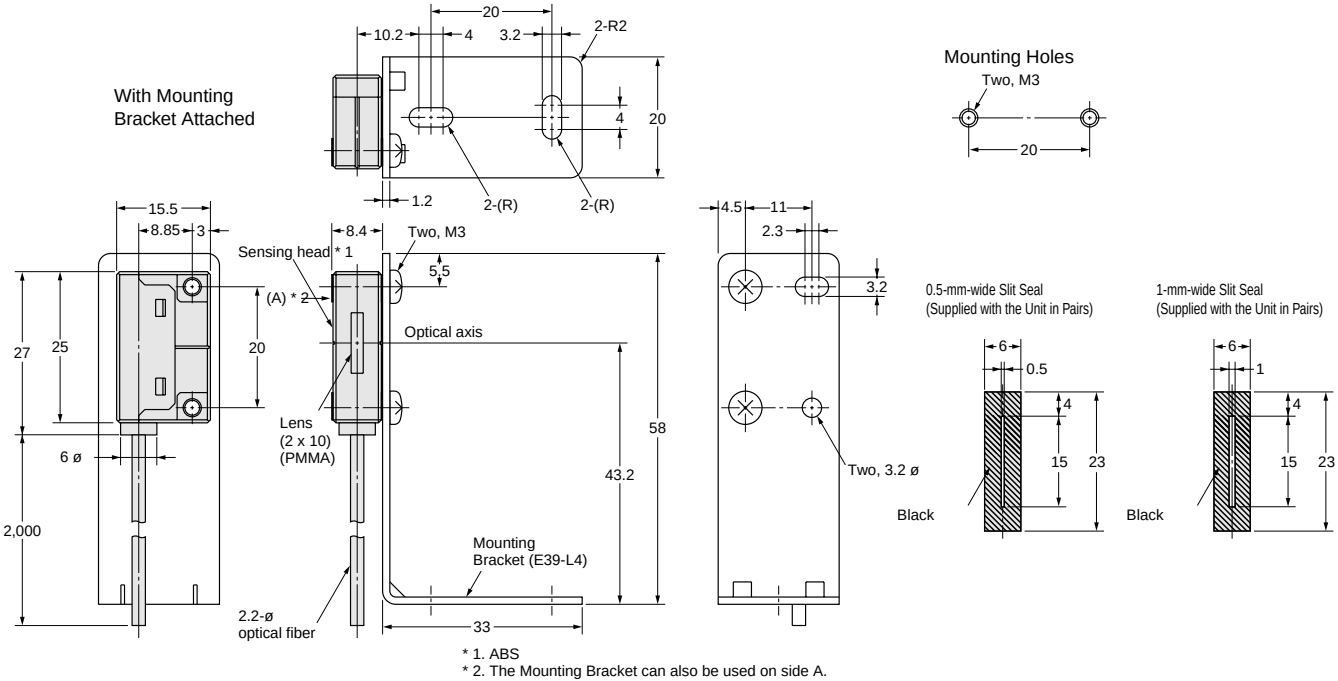
E32-M21

CAD file E32_28



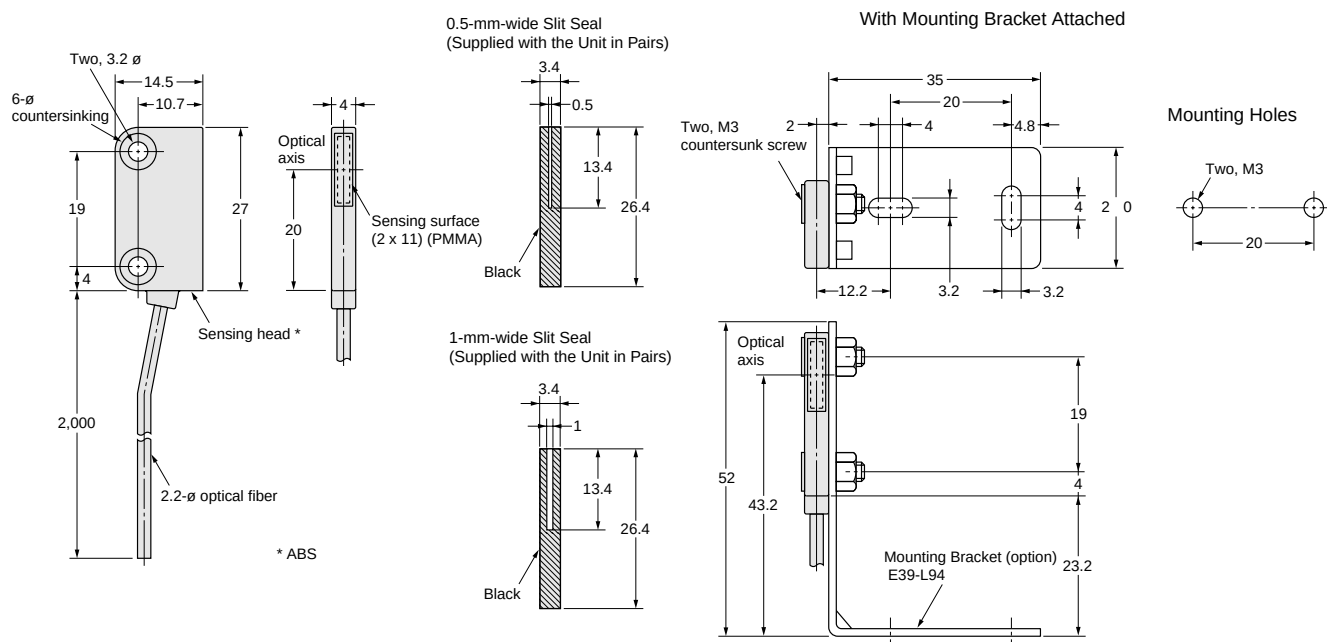
E32-T16

CAD file E32_37



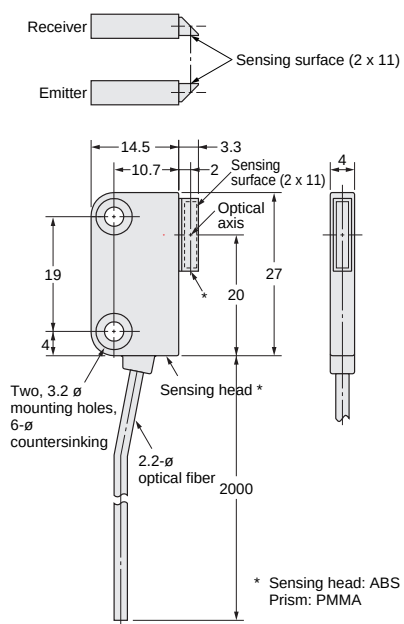
E32_T16P
E32_T16PR

CAD file E32_T01

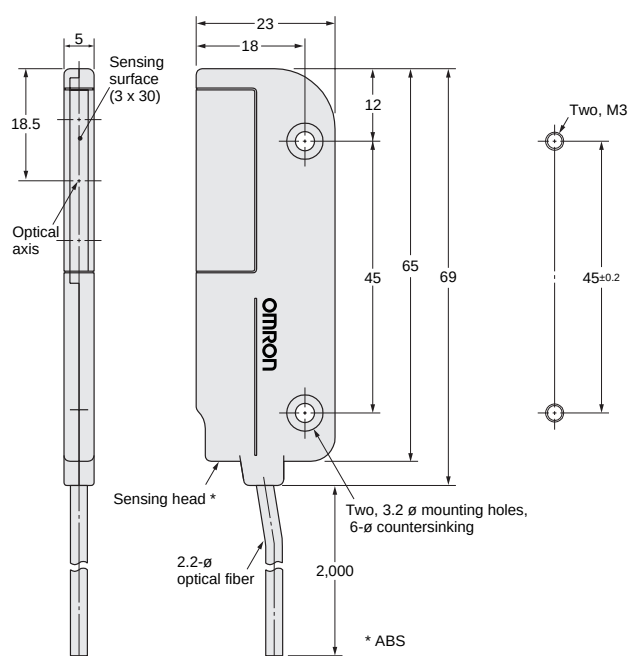


E32-T16J
E32-T16JR

CAD file E32_77



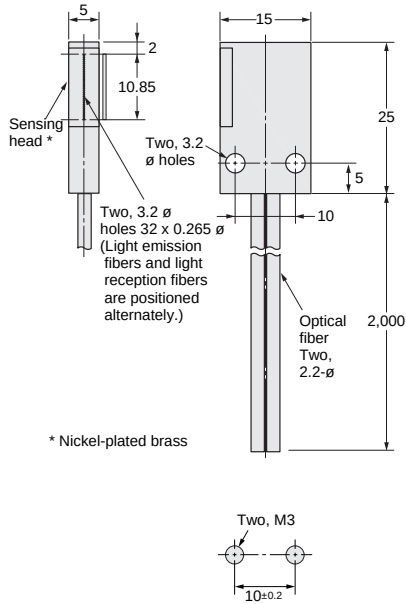
E32-T16W
E32-T16WR



Diffuse reflective

E32-D36P1

CAD file E32_78

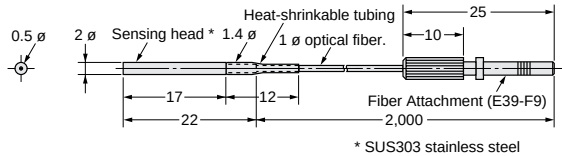


Small fiber head

Throughbeam

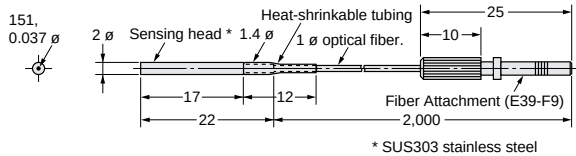
E32-T22

CAD file E32_41



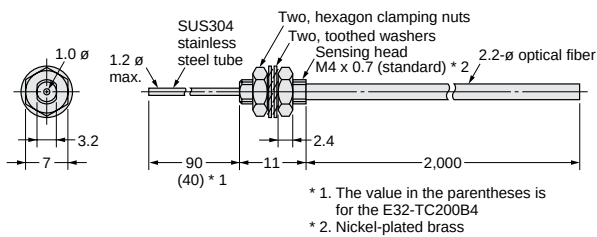
E32-T22R

CAD file E32_41



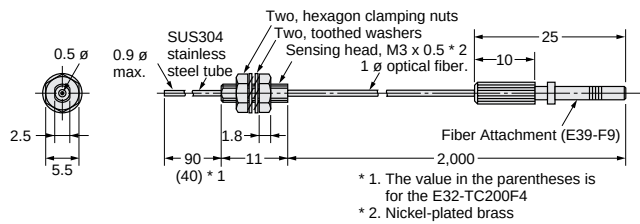
E32-TC200B
E32-TC200B4

CAD file E32_52



E32-TC200F
E32-TC200F4

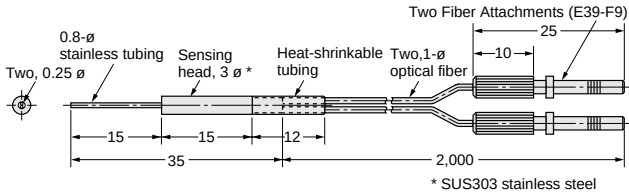
CAD file E32_55



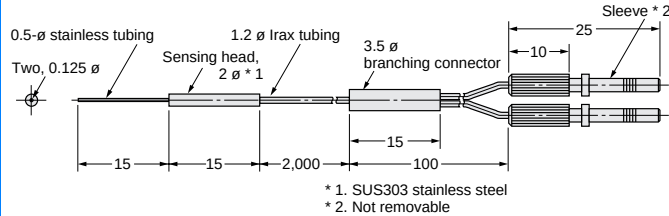
Diffuse reflective

E32-D33

CAD file E32_12

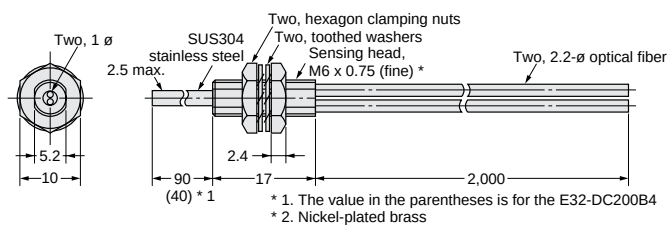


E32-D331



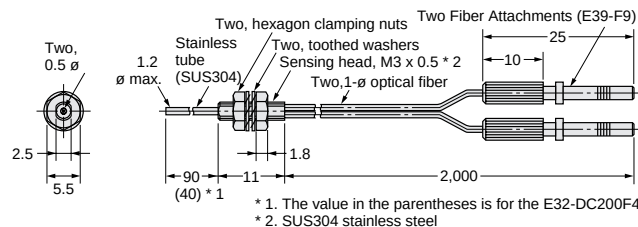
E32-DC200B
E32-DC200B4

CAD file E32_19



E32-DC200F
E32-DC200F4

CAD file E32_22

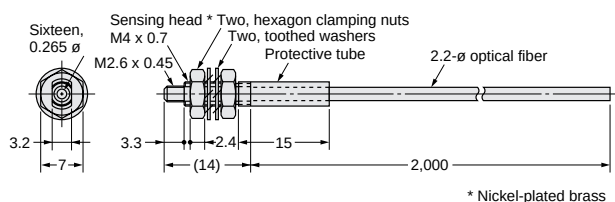


Fiber for Robot Application R4

Throughbeam

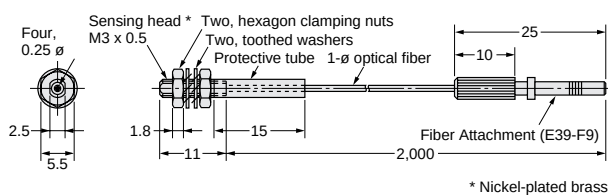
E32-T11

CAD file E32_31

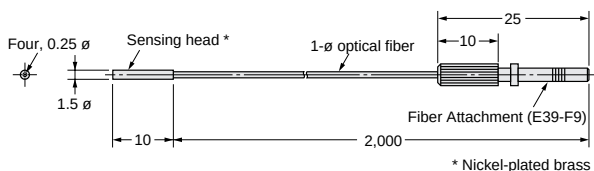


E32-T21

CAD file E32_39



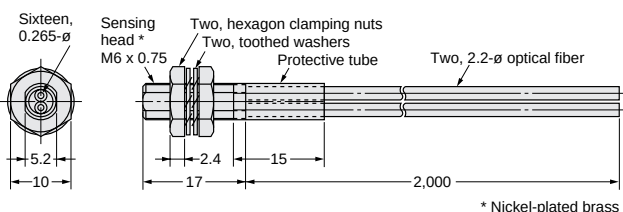
E32-T22B



Diffuse reflective

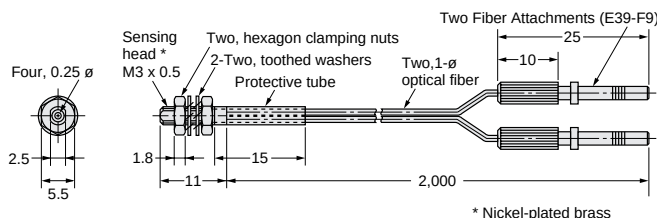
E32-D11

CAD file E32_02

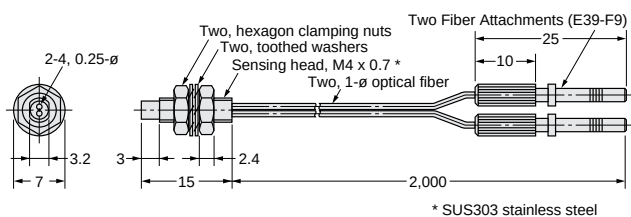


E32-D21

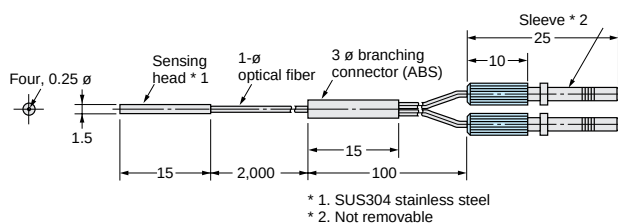
CAD file E32_06



E32-D21B



E32-D22B

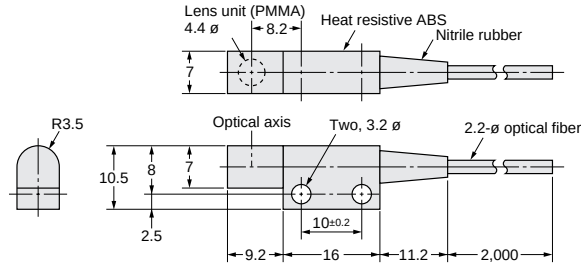


Side view

Throughbeam

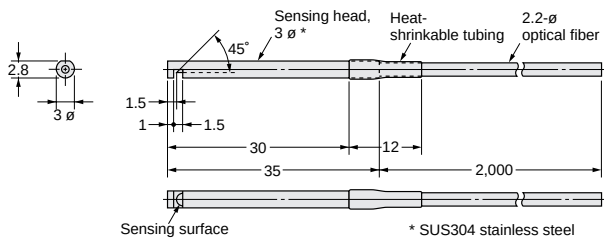
E32-T14

CAD file E32_35



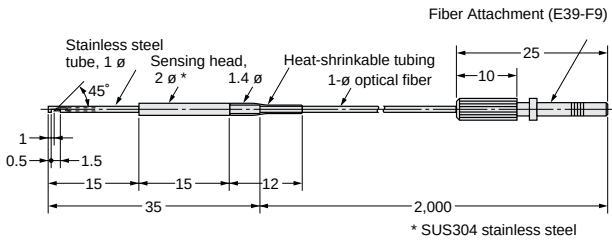
E32-T14L
E32-T14LR

CAD file E32_36



E32-T24
E32-T24R

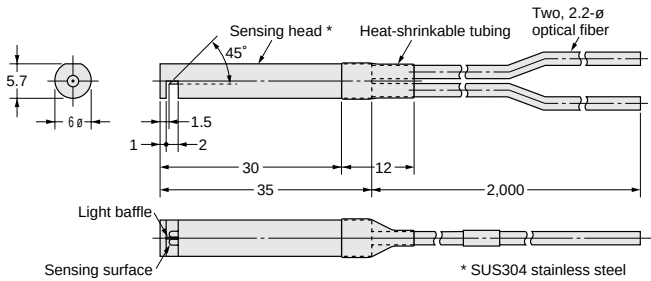
CAD file E32_44



Diffuse reflective

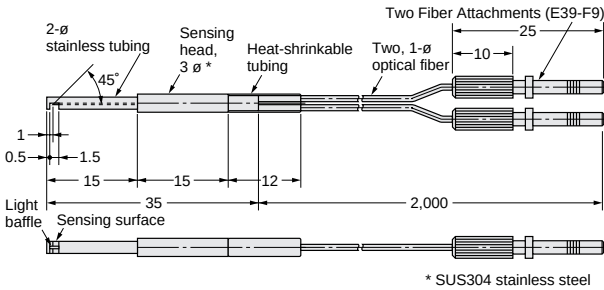
E32-D14L
E32-D14LR

CAD file E32_05



E32-D24
E32-D24R

CAD file E32_09

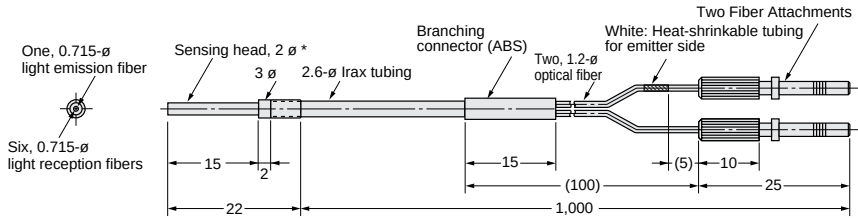


Coaxial fiber

Diffuse reflective

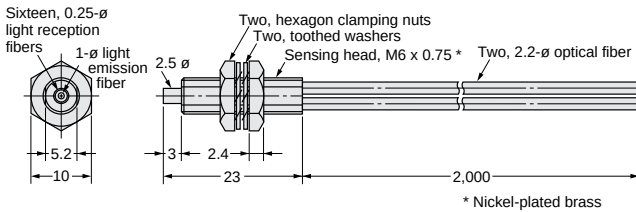
E32-C42

CAD file E32_81



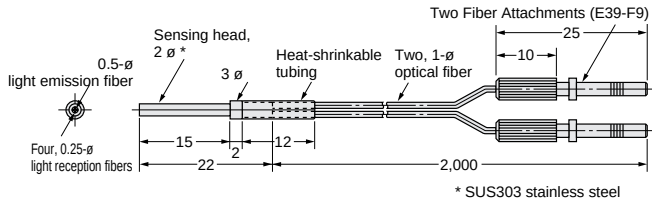
E32-CC200

CAD file E32_01



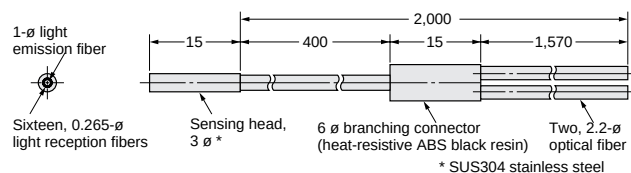
E32-D32

CAD file E32_10

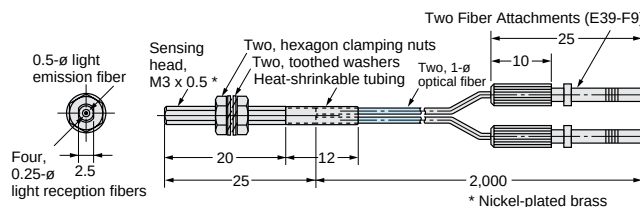


E32-D32L

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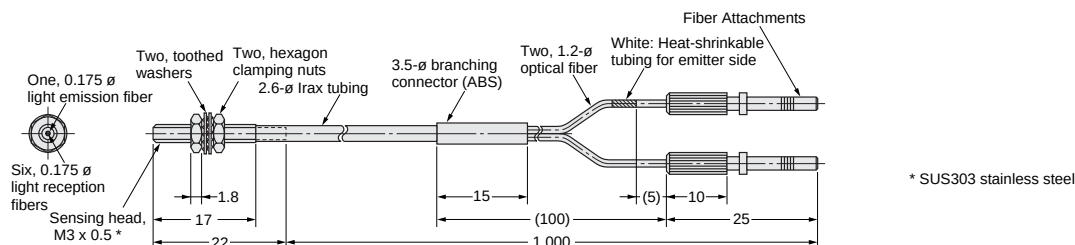


E32-EC31



E32-EC41

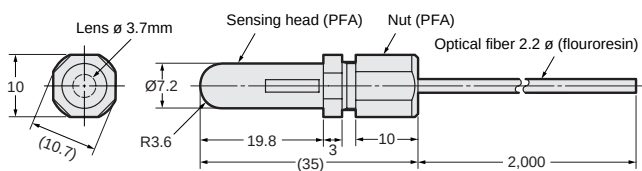
CAD file E32_80



Chemical resistant

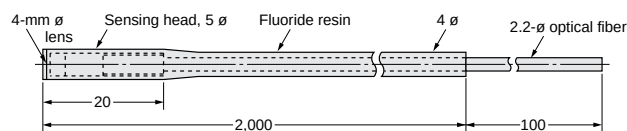
Throughbeam

E32-T11F



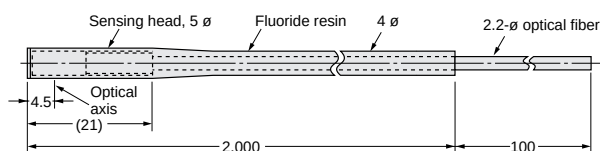
E32-T12F

CAD file E32_33

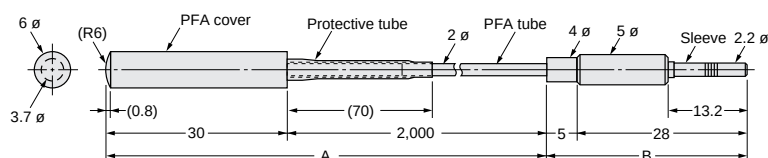


E32-T14F

CAD file E32_61



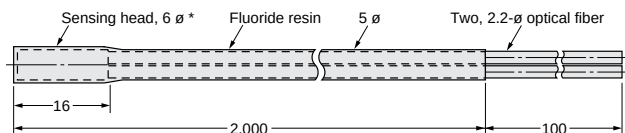
E32-T81F-S



Diffuse reflective

E32-D12F

CAD file E32_04



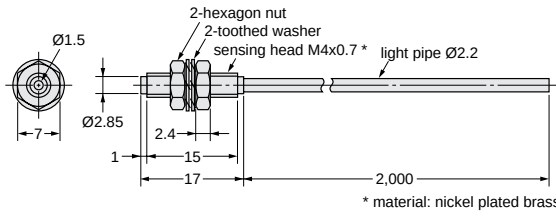
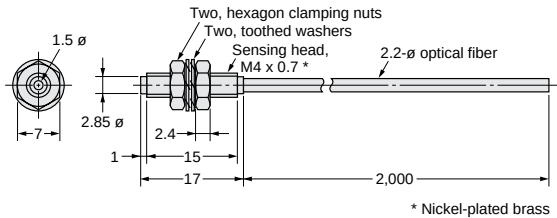
Heat resistant

Throughbeam

E32-ET51

CAD file E32_46

E32-T51

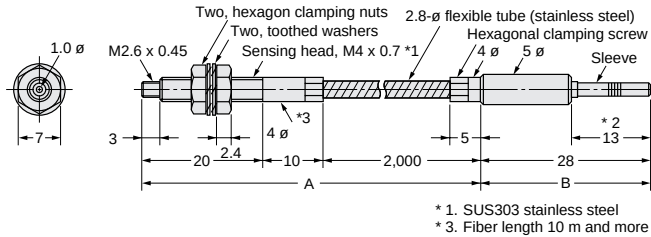
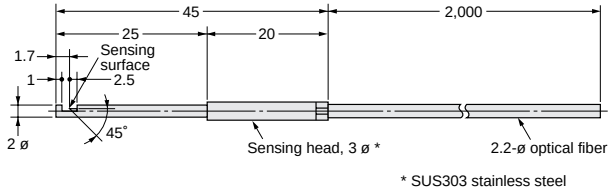


E32-T54

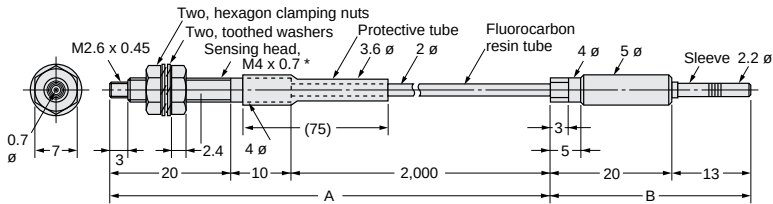
CAD file E32_63

E32-T61-S

CAD file E32_47

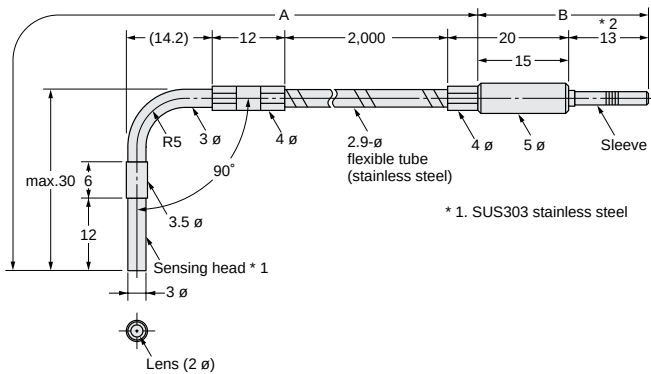


E32-T81R-S



E32-T84S-S

CAD file E32_48

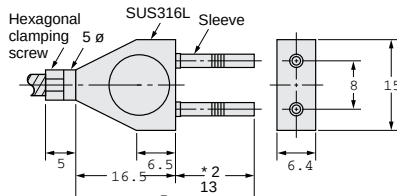
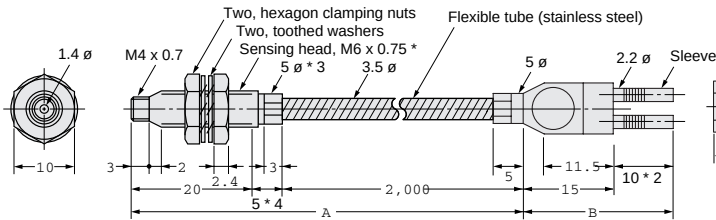


Diffuse reflective

E32-D61

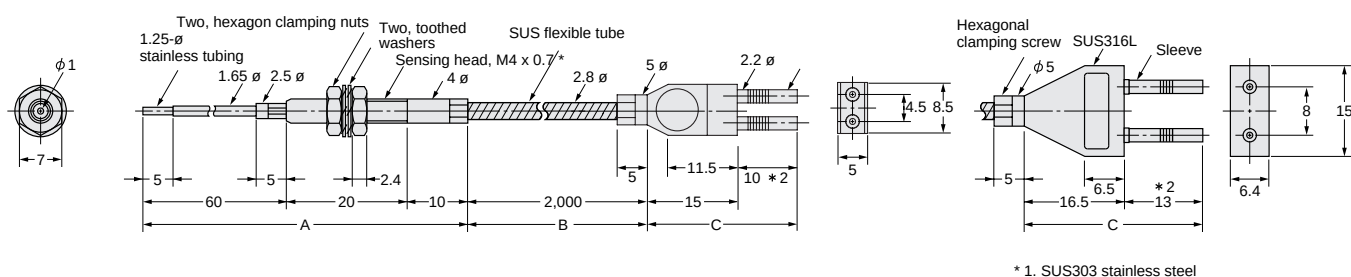
CAD file E32_14

E32-D61-S

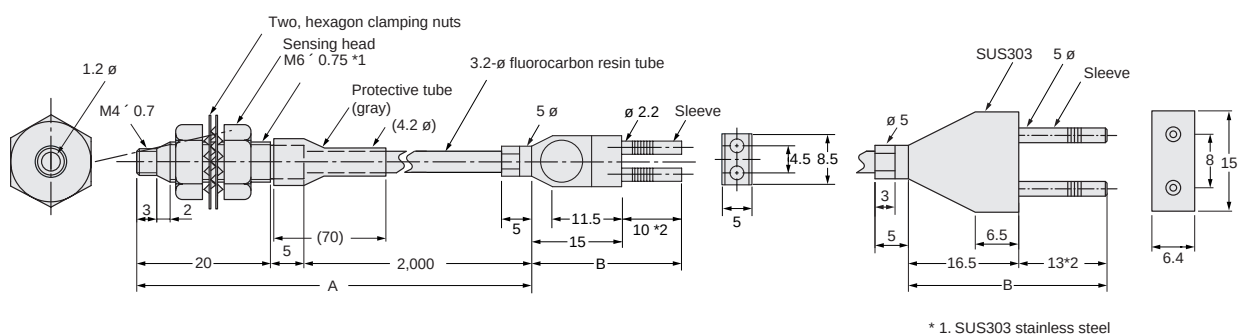


E32-D73
E32-D73-S

CAD file E32_15

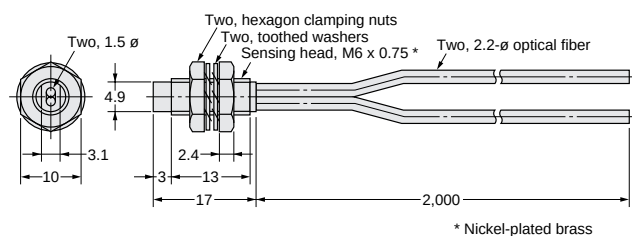


E32-D81R
E32-D81R-S



E32-ED51

CAD file E32_13

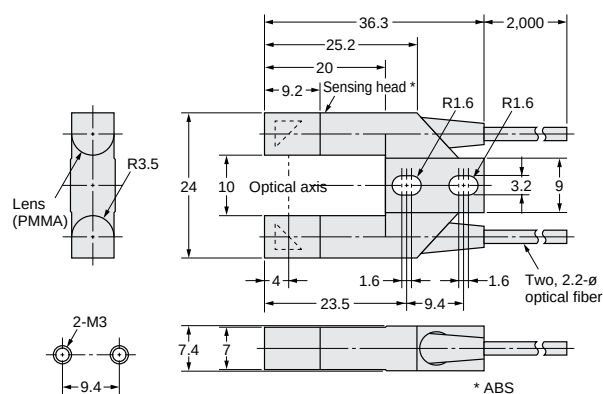


Grooved

Throughbeam

E32-G14

CAD file E32_24

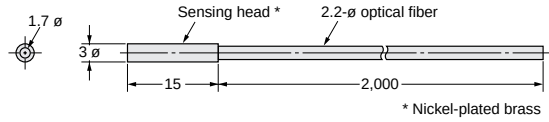


Narrow Vision Field

Throughbeam

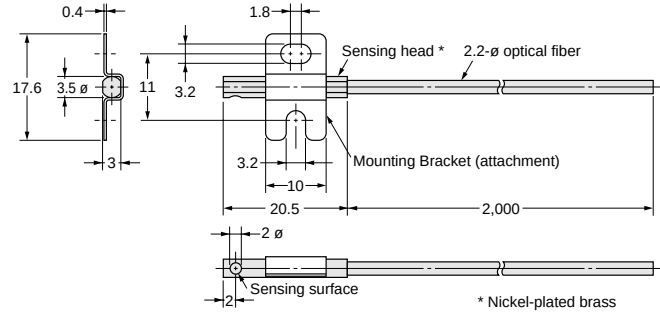
E32-T22S

CAD file E32_43



E32-T24S

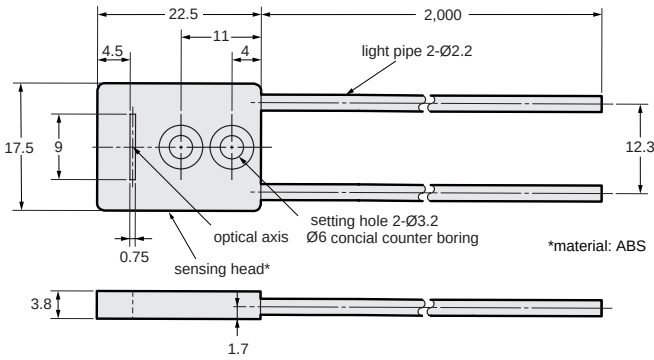
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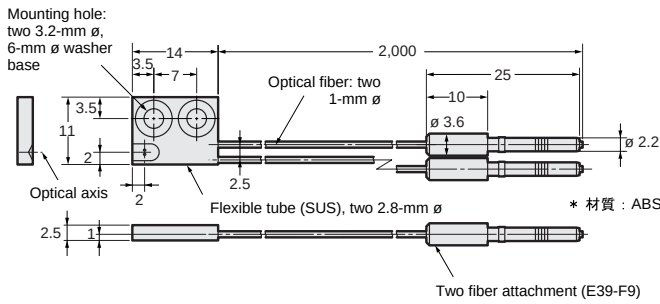
Limited-reflective

Diffuse reflective

E32-L16

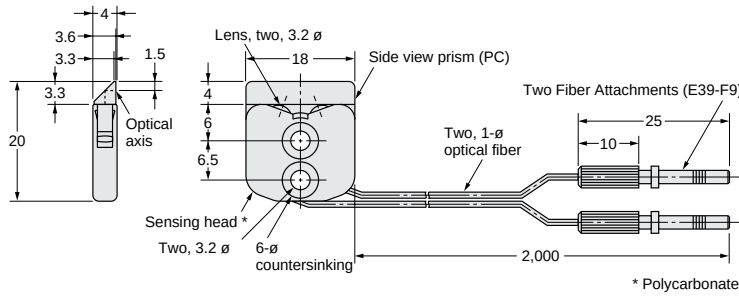


E32-L24S



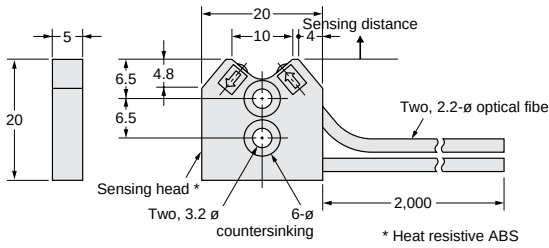
E32-L24L

CAD file E32_L01



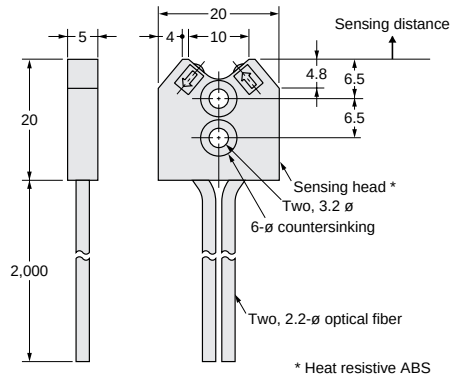
E32-L25

CAD file E32_25



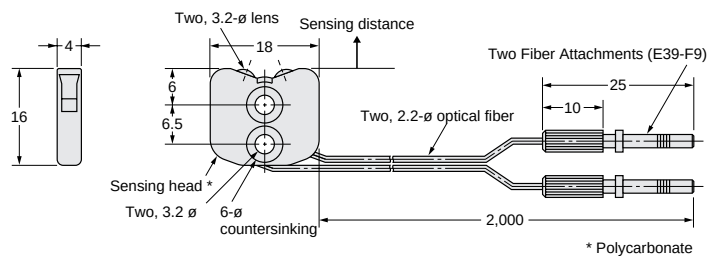
E32-L25A

CAD file E32_26



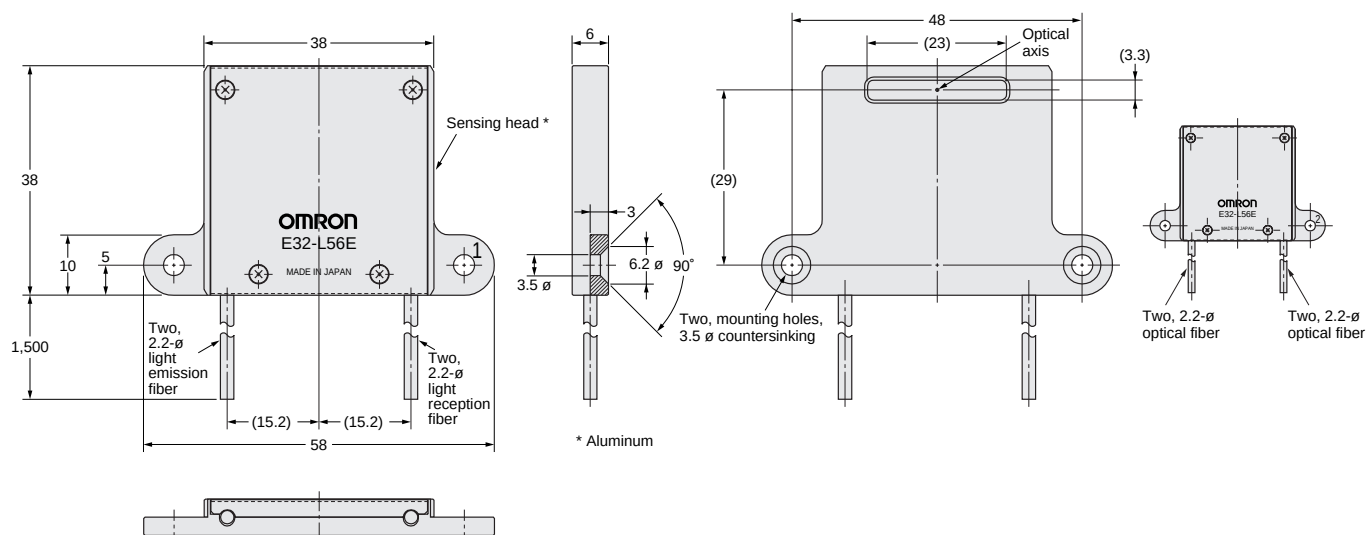
E32-L25L

CAD file E32_L02

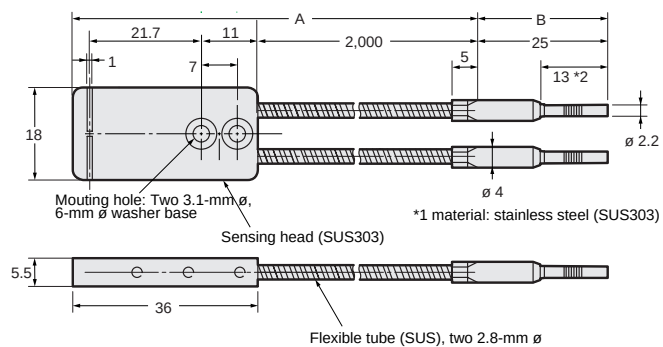


E32-L56E1
E32-L56E2

CAD file E32_76



E32-L66

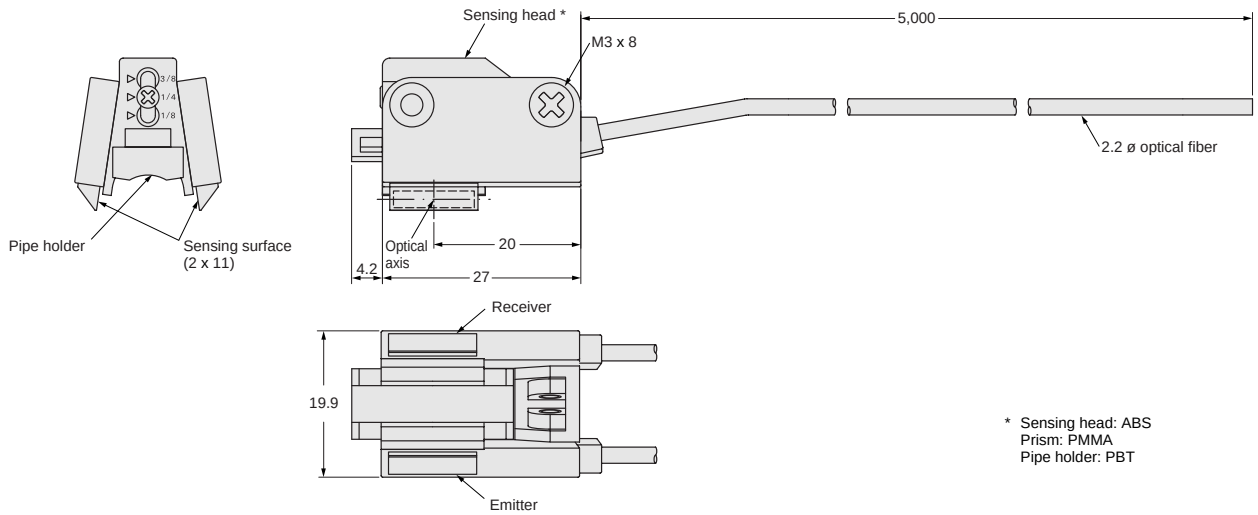


Note: Ambient temperature of A part is 300 degree C and of B part is 110 degree C.
When the part indicated by *2 is inserted into amplifier, ambient temperature of *2 part is the same as that of amplifier unit.

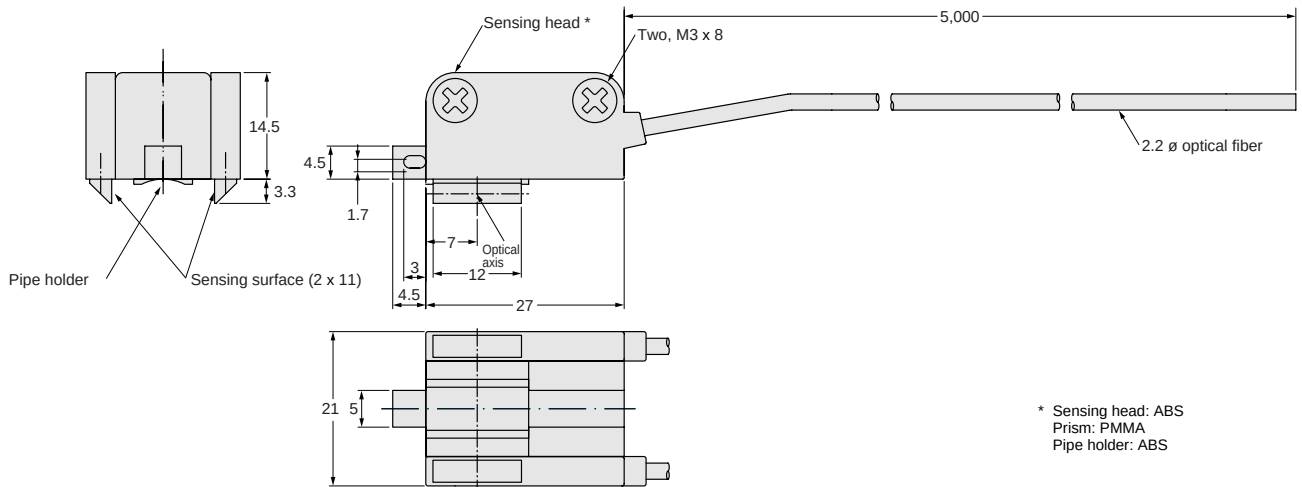
Fluid-level Detection Fiber Units

Diffuse reflective

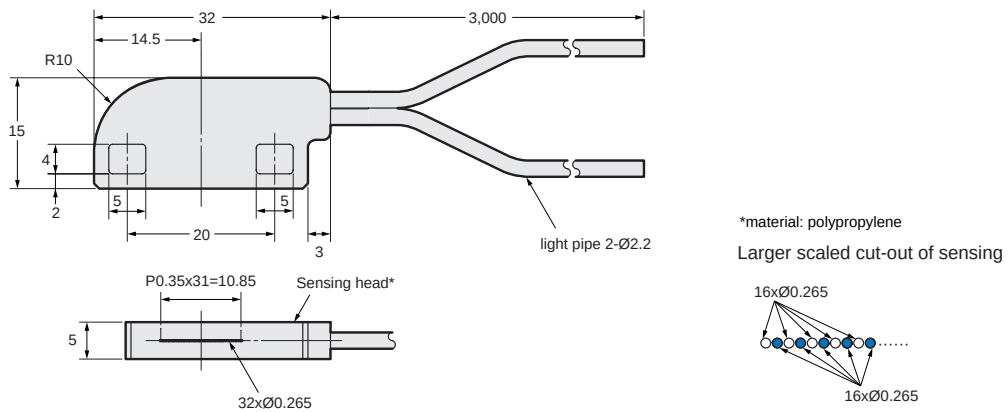
E32-A01



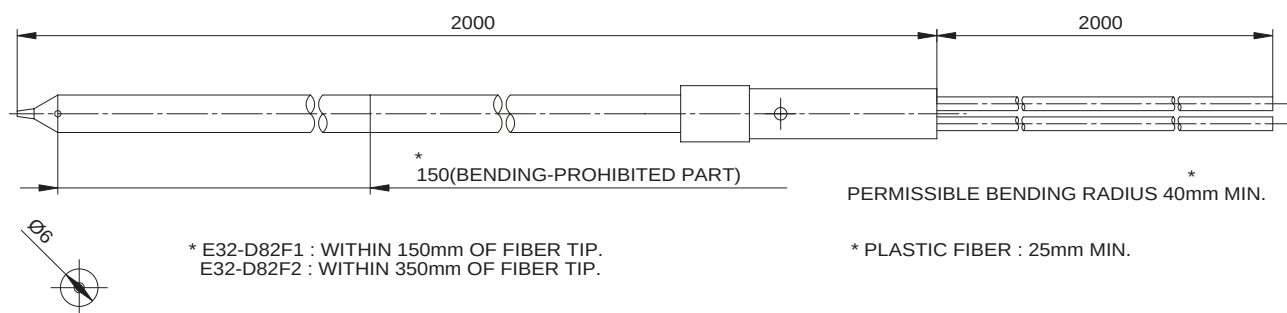
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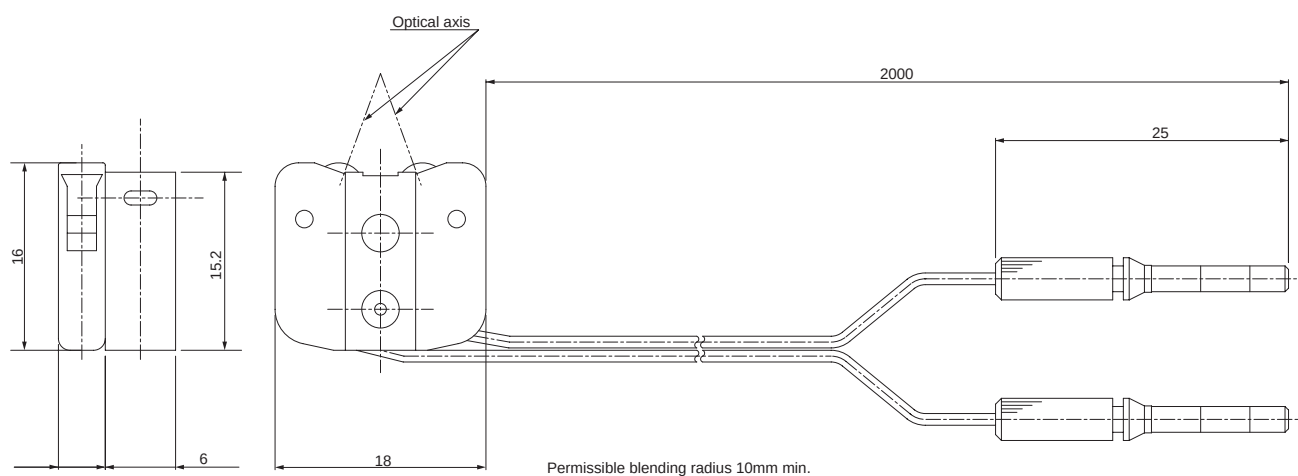
E32-D36F



E32-D82F1
E32-D82F2



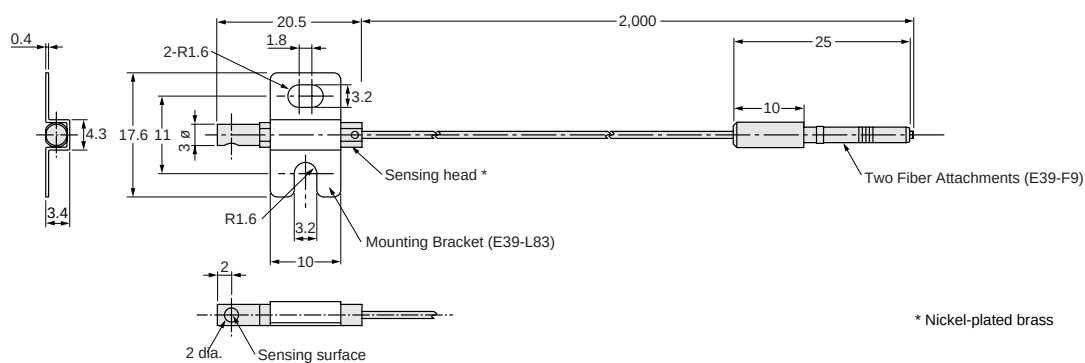
E32-L25T



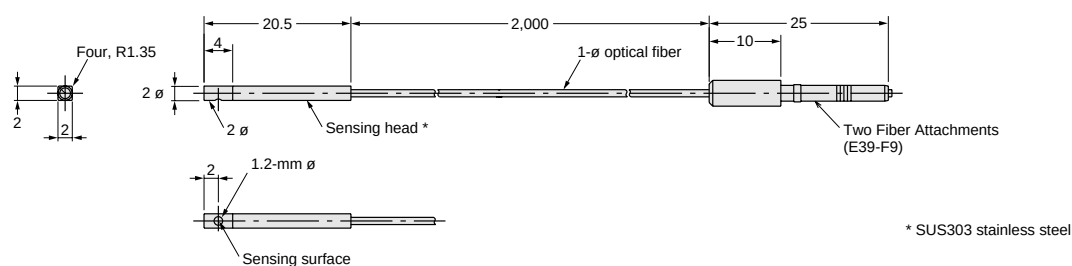
Mapping sensors

Diffuse reflective

E32-A03



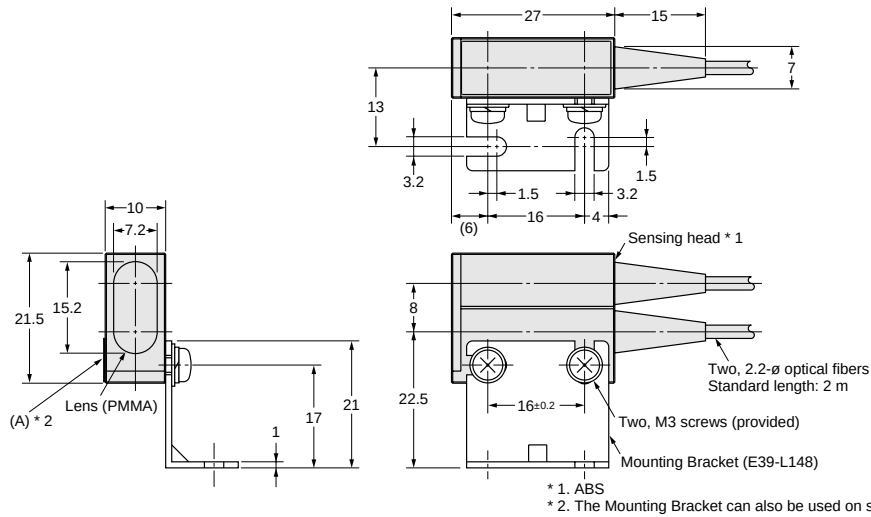
E32-A04



Retroreflective

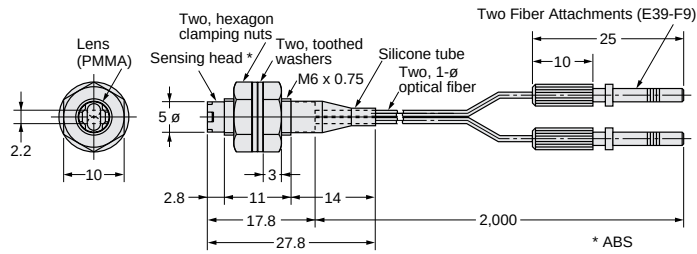
E32-R16-R1

CAD file E32_29



E32-R21-R3

CAD file E32_30



Fluid level sensor (contact type)

E32-D82F

High-accuracy detection of fluid level in washing tank.

- Uses Teflon (PFA) with excellent chemical and oil resistance.
- Capable of detecting high-temperature fluids such as sulfuric acid in a wafer washing tank. (-40 to +200°C)
- Achieves a high repetition precision of 0.5 mm (in pure water).
- Employs a dripping prevention mechanism.



Ordering Information

Fiber Units

Sensor type	Shape	Model	Remarks
Diffuse-reflective		E32-D82F1	Length of no-bending section: 150 mm from tip
		E32-D82F2	Length of no-bending section: 350 mm from tip

Applicable amplifier unit

Model
E3X-DA-N
E3X-NA

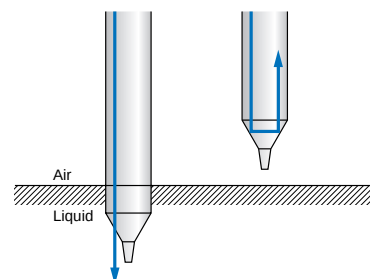
Rating/performance

Sensor type		Diffuse-reflective	
Item	Model	E32-D82F1	E32-D82F2
Standard sensing object		Pure water at 25°C	
Differential distance		3 mm max.	
Repetition precision		0.5 mm or less	
Permissible angle of detection object inclination		±10° or less	
Perimeter Temperature	Teflon section within 1.5 m of fiber tip*1	Operating: -40 to +200°C, Storage: -40°C to +85°C (with no icing or condensation)	
	Parts other than the above	Operating/storage: -40 to +85°C (no ice formation or condensation)	
Ambient humidity		Operating/storage: 35 to 85% RH	
Peripheral pressure		Operating: -50 kPa to 500 kPa	
Admissible bending radius (10% under fluid level)		40 mm or higher (25 mm for plastic fiber section)	
average)	Length of no-bending section	150 mm from tip	350 mm from tip
Material	Sensor case	Teflon (PFA)	
	Fiber cladding	Black polyethylene	
	Connector	Brass-nickel coating	
Protective structure		IEC Standard IP68*2	
Weight (Packed state)		Approx. 75 g	
Accessories		Fiber cutter	

*1. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

*2. Only applies to Teflon section; the standard requires no bubbling when air at 98 kPa is injected for 30 seconds at a depth of 100 mm in water.

Principle of operation



- In air, the difference between the index of refraction of the Teflon section and that of air is larger, and the light is reflected by the detected surface and returns to the light receiver.
- In the fluid, there is almost no difference between the index of refraction of the Teflon section and that of the fluid, and the light radiates into the fluid.

Operation

● Teaching type

1. Using teaching without work

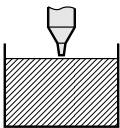
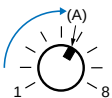
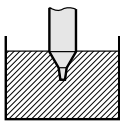
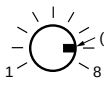
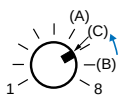
Perform teaching with the tip of the fiber unit in the fluid. (The sensitivity is set to the top 10% of the received light intensity in fluid for stronger performance with respect to fluctuations in received light intensity due to fluid leakage, and thus teaching without work for high viscosity fluids is effective.)

2. Using teaching with/without work

Perform teaching after the object has been removed from the fluid, and then repeat teaching with the object in the fluid. (Teaching with/without work is effective for fluids in which bubbles form at high temperature.)

Note: If set to the maximum sensitivity with the object removed from the fluid, detection of the fluid will no longer be possible.

● Sensitivity control type

Sequence	Detection state	Sensitivity adjuster	Indicator state		Adjustment procedure
1			Green OFF	Red OFF	Determine the position A at which the incident light indicator lamp (red) illuminates as the sensitivity control is gradually increased from the minimum setting after the object has been removed from the fluid.
2			Green OFF	Red OFF	- If the red indicator lamp illuminates at the maximum sensitivity setting, gradually decrease the sensitivity control from the maximum setting with the object in the fluid, and determine the position B at which the incident light indicator lamp (red) goes off. - If the red indicator lamp goes off at the maximum sensitivity
3	---		Green ON	Red OFF	Set the sensitivity control to C midway between A and B. At this time, verify that the stability indicator lamp (green) illuminates both with and without fluid.

Precautions

Correct Use

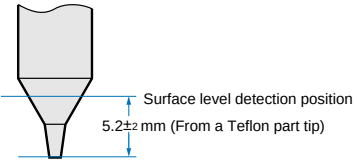
Installation

- Use the no-bending section to secure the fiber unit. If the fiber unit is secured without using the no-bending section, the fluid level detection position may shift.
- Influences from the sides or bottom may interfere with detection. In that case, remove to a distance that is not subject to these influences, or apply a black coating to the sides and bottom.
- If you need to use the system in a dangerous location, use only the fiber unit in the dangerous location and place the amplifier unit in a safe location.

● For adjustment

About the fluid level detection position

The fluid level detection position is located 5.2±2 mm from the tip of the Teflon section (see the diagram at right). The fluid level detection position will vary depending on the surface tension of the fluid and the dampness of the detection position of the fiber unit.

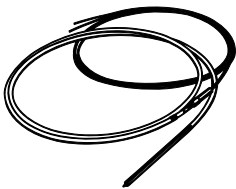


Miscellaneous

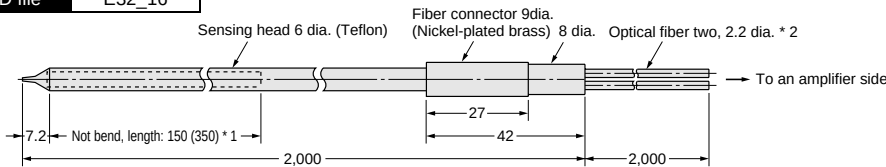
- Operation will not be stable in the following situations. ① Bubbles adhere to the cone of the detector head. ② Solutes have precipitated onto the cone of the detector head. ③ The fluid has a high viscosity.
- Some fluids such as those of a milky-white color may not permit detection.
- Take care not to strike the tip with any object. A damaged or deformed detector head may cause unstable operation.

Dimensions (Unit: mm)

E32-D82F1
E32-D82F2



CAD file E32_16



* 1. (): E32-D82F2 dimensions
* 2. Freely cut because 2m part of optical fiber at amplifier side is made from a plastic fiber.

Fluid level sensor (fiber pipe type)

E32-L25T

For installation of thin pipe (thickness of 10 mm) that can be used even in combustible atmospheres

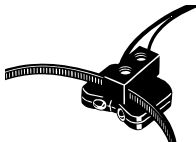
- Easy post-installation on unit or pipe using band.
- Affordable pricing makes a big contribution to cost reduction when upgrading equipment.
- Thin pipe of thickness = 10 mm. Contact mounting is possible to enable detection of level differences to a minimum of 4 mm.
- Can also be used in combustible atmospheres.*

* Plastic is used in the lens, unit case, and fiber coating. Avoid contact with solvents as these will cause corrosion and deterioration (clouding).



Ordering Information

Fiber Units

Sensor type	Shape	Model
Reflective model		E32-L25T

Applicable amplifier unit

Model
E3X-DA-N
E3X-NA

Rating/performance

Sensing method		Reflective model
Item	Model	E32-L25T
Clamping pipe (outer diameter)		Transparent pipe, 8 mm to 10 mm dia. (6 mm to 8 mm inner diameter)*1
Applicable pipe material		Transparent pipe (FEP or with equivalent transparency)
Sensing object		Fluid *2
Repetition precision		1 mm max.
Ambient temperature		Operating/storage: -40 to +70°C (no ice formation or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)
Permissible bending radius		10 mm min.
Material	Sensors	Polycarbonate
	Fiber	Plastic (polyethylene coating)
Protective structure		IEC 60529 IP50
Weight (Packed state)		Approx. 10 g
Accessories		Band, anti-reflection sheet, fiber cutter

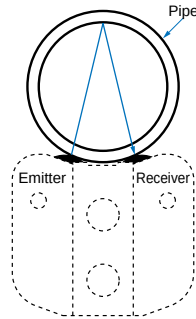
*1. The E32-L25T6 for a 6 mm dia. transparent pipe is also available. The model type is E32-L25T6.

*2. When using an opaque fluid, test detection with the unit before using.

Principle of operation

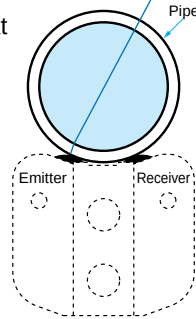
No fluid

If no detection fluid, light state.



Fluid

If there is detection fluid, set so that dark state is effective.

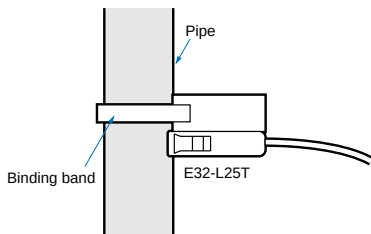


Precautions

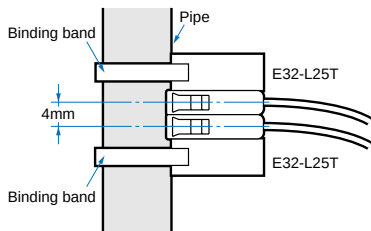
Correct Use

Installation

- If only the Fiber Unit is installed, proceed according to the following basic procedure.

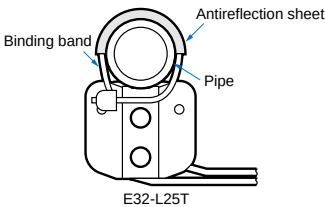


- Detection of level differences to a minimum of 4 mm is possible with the following installations.



- Do not expose the fiber unit to undo forces such as pulling or compression (no more than 0.1 Nm).
- The bending radius of the fiber unit should be no less than the allowed bending radius (both rated and performance).

- When securing with the band, take care that the fiber is not deformed.
- If an opaque pipe is used, this may result into incorrect operation.
- Water drops, air bubbles, or clouding in the pipe may cause incorrect operation.
- If the background exerts an effect, use the anti-reflection sheet (accessory) (see the diagram below). The anti-reflection sheet also serves to prevent shifting due to fiber unit vibration.



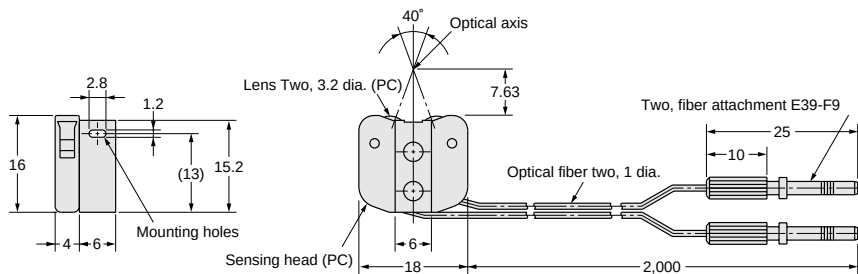
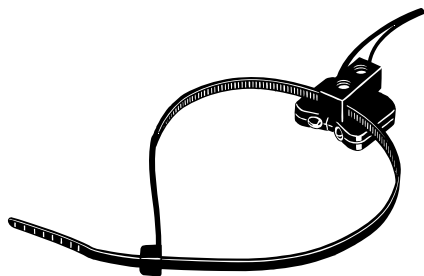
Miscellaneous

Polycarbonate is used in the case. Do not allow contact with chemicals such as alkalis, aromatic hydrocarbon, or chloro-aliphatic hydrocarbon, as these will dissolve the case.

Dimensions (Unit: mm)

E32-L25T

CAD file E32_27

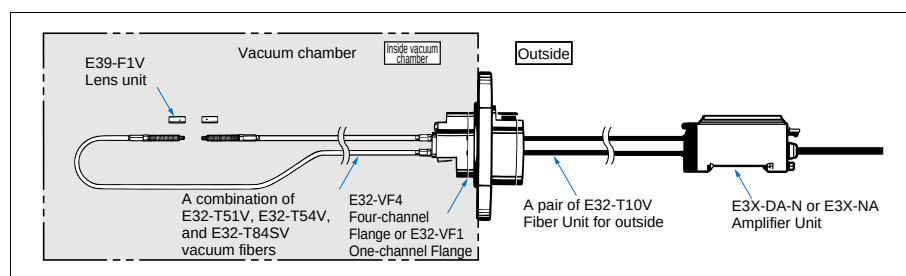


Vacuum Sensor E32-V

- The 4-CH multi-flange contributes to conserve vacuum chamber space.
- One-touch fiber installation significantly reduces man-hours (4-CH flange).
- The fiber unit for outside can be freely cut on both ends, thus avoiding messy routing.
- A screw-type 1-CH flange is also available.
- Heat-resistant vacuum fiber is also available for high-temperature environments.



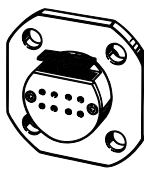
Configuration (typical example)



Ordering Information

Sensors

Flanges

Shape	Item	Model
	4-CH flange	E32-VF4
	1-CH flange	E32-VF1

Vacuum Fibers

Shape	Item	Model *
	Through-beam, straight model	E32-T51V 1M
	Through-beam, L-shaped model	E32-T54V 1M
	Through-beam, Heat-resistant model	E32-T84SV 1M

* A 0.5-m type is also available. Please inquire for more information.

Fiber Unit for Outside

Shape	Item	Model
	General	E32-T10V 2M

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L54V	2	Can be used with the E32-T54V.

Lens Unit

Shape	Model	Quantity	Remarks
	E39-F1V	2	Long distance lens unit: Can be used with the E32-T51V and E32-T54V.

Rating/Performance

Flanges

Number of channels	4	1 CH
Item	Model	
	E32-VF4	E32-VF1
Leakage	1 x 10 ⁻¹⁰ Pam ³ /s or less	
Ambient temperature	Operating/storage: -25 to +55°C	
Material	Aluminum (A5056)	Stainless steel (SUS304) Aluminum (A5056)
Flange seal material	Fluoroelastomer (Viton)	
Weight (Packed state)	Approx. 280 g	Approx. 240 g

Fiber Unit for Outside

Sensor type	Fiber Unit for Outside	
Item	Model	E32-T10V
Standard length	2 m (free cutting allowed)	
Ambient temperature	Operating/storage: -25 to +70°C	
Permissible bending radius	25 mm min.	
Weight (Packed state)	Approx. 170 g	
Material	Core	Acrylics
	Sheath	Fluororesin
	Protection tube	Black polyethylene

Vacuum Fibers

Sensor type			Vacuum-side fiber transmission type		
Item	Model		E32-T51V	E32-T54V	E32-T84SV
Standard length			1 m (no free cutting)		
Sensing distance	When using the E3X-DA-N	Super long-distance mode:	250 mm	200 mm	600mm
		Standard mode:	200 mm	130mm	480mm
		Super high-speed mode:	70mm	50 mm	180mm
	When using the E3X-NA		100 mm	65mm	250 mm
Ambient temperature			Operating/storage: -25 to +120°C		Operating/storage: -25 to +200°C
Admissible bending radius			30 mm min.		25 mm min.
Weight (Packed state)			Approx. 180 g	Approx. 170 g	Approx. 180 g
Material	Core		Quartz		Optical glass
	Sheath		Fluororesin		Optical glass
	Protection tube		Fluororesin		Stainless steel (SUS304)
	Fiber head/Connection tube		Aluminum (A5056)•Stainless steel (SUS304)		

Lens Unit

Sensor type			Long-Distance Lens Units	
Item		Model	E39-F1V	
Applicable Fiber			E32-T51V	E32-T54V
Sensing distance	When using the E3X-DA-N	Super-long-distance mode:	1280mm	630mm
		Standard mode:	1000mm	500 mm
		Super-high-speed mode:	360mm	250 mm
	When using the E3X-NA		600mm	390mm
Ambient temperature			Operating/storage: -25 to +120°C	
Weight (Packed state)			Approx. 5 g	
Material	Housing		Aluminum (A5056)	
	Lens		Optical glass	

Precautions

Important

Mounting

Cleaning

Although Flanges, Vacuum Fibers, and Lens Units are cleaned before shipping, clean them with alcohol before use in high-vacuum chambers to make sure there is no foreign matter on them.

Pulling and compression

Do not expose the fiber unit to pulling, compression, or other undo force (29.4 N or less).

Miscellaneous

Application

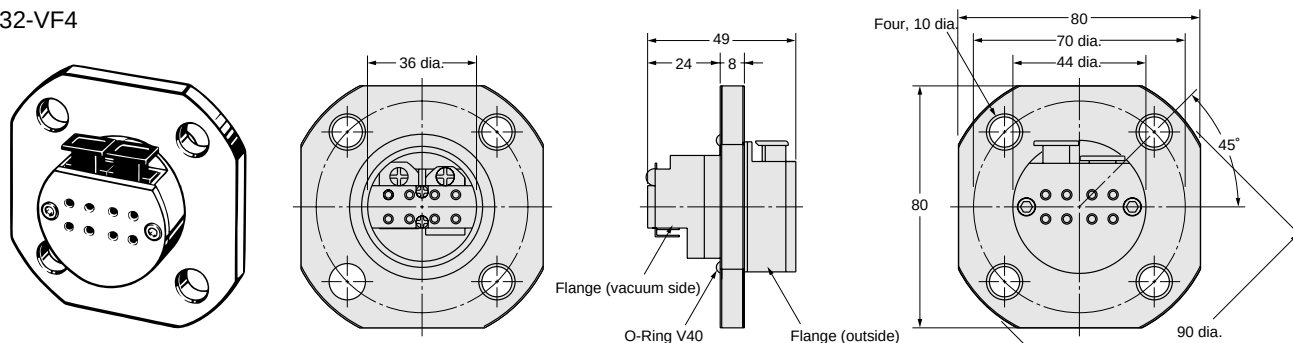
This vacuum-proof fiber unit is used to detect various types of work in a high-vacuum and 120°C (in parts 200°C) high-temperature chamber (vacuum chamber).

Dimensions (Unit: mm)

Sensors

Flanges

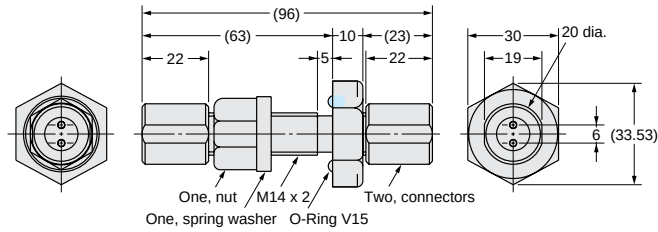
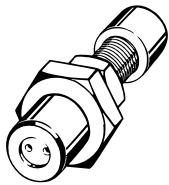
E32-VF4



- Note: 1. Set the O-Ring V40 to come to the wall of the vacuum chamber on the atmosphere side.
2. Mounting hole: 38±0.5 mm

CAD file E32_64

E32-VF1

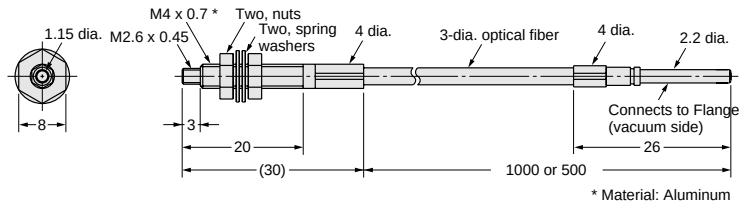


Note: 1. Set the O-Ring V15 to come to the wall of the vacuum chamber on the atmosphere side.
2. Mounting hole: 14.5±0.2 mm

CAD file E32_65

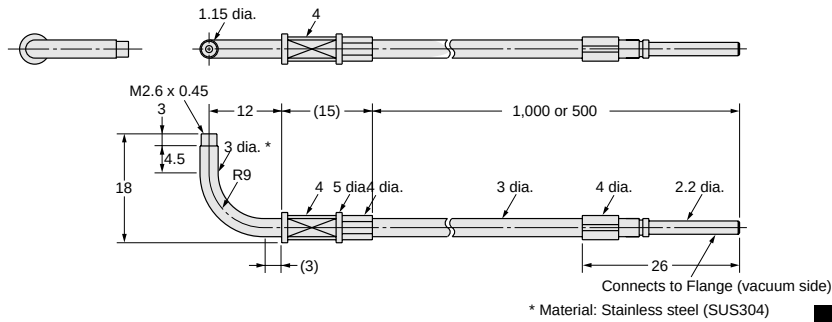
Vacuum Fibers

E32-T51V



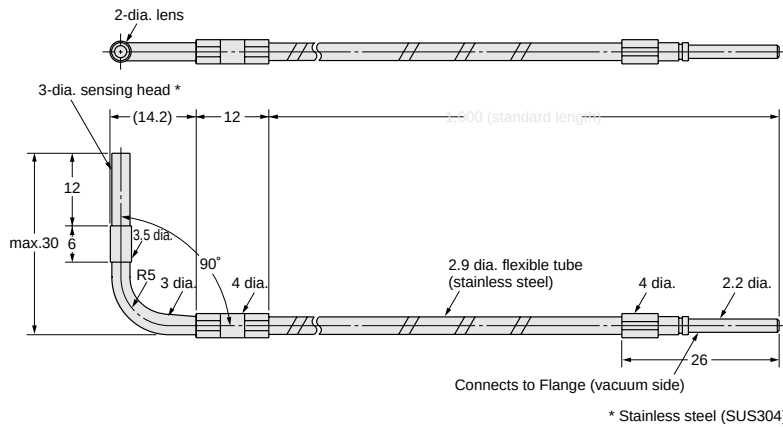
CAD file E32_58

E32-T54V



CAD file E32_60

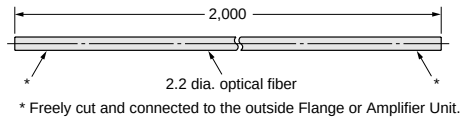
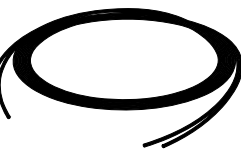
E32-T84SV



CAD file E32_62

Fiber Unit for Outside

E32-T10V



CAD file E32_59

Accessories (Order Separately)

Accessories for E32

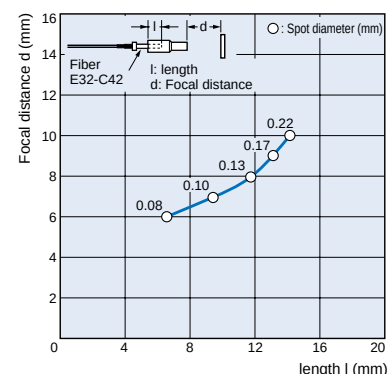
E32

Lens Unit

Shape	Application	Name	Model	Quantity	Applicable Fiber
	Increased sensing distance	Long distance lens units	E39-F1	A total of two pcs.: One each for emitter and receiver	E32-T11L E32-TC200 E32-T11R E32-T11 E32-T61 E32-T81R
	Conversion of detection direction into side view	side view unit	E39-F2		
	Conversion of through-beam model into long distance reflective model	Lens-equipped reflective Unit	E39-F3	One set	
	Conversion of through-beam model into side view reflective model	Reflective side view conversion attachment	E39-F5	1	E32-TC200A
	Detection at 0.1 to 0.6 mm dia. small spot	Small spot lens unit (variable)	E39-F3A	1	E32-C42 (3 mm dia.)
	Detection at 0.5 to 1 mm dia. small spot				E32-D32 (3 mm dia.)
	Focal length 7 mm Detection at 0.1 mm dia. spot	Small spot lens unit (fixed)	E39-F3A-5	1	E32-EC41
	Detection at 0.5 mm dia. spot in 7 mm focal length				E32-EC31
	17 mm focal length Detection at 0.2 mm dia. spot	Long distance/small spot lens unit (fixed)	E39-F3B	1	E32-EC41
	17 mm focal length Detection at 0.5 mm dia. spot				E32-EC31
	Short body for space-saving, max. 4 mm dia. spot in long 20 mm distance	Long distance lens unit (fixed)	E39-F3C	1	E39-EC31 E32-EC41
		Long distance lens unit	E39-F1V	2	E32-T51V and E32-T54V

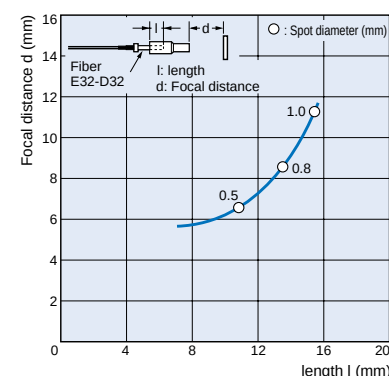
Beam spot characteristic

E39-F3A+E32-C42



Beam spot characteristic

E39-F3A+E32-D32

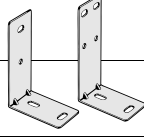
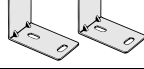


Reflectors

Shape	Name	Sensing distance (default)	Model	Quantity	Remarks
	Reflectors	1.5 m (150 mm) *	E39-R1	1	Retroreflective model attached to E32-R16.
	Small reflector	250 mm (25 mm) *	E39-R3	1	Retroreflective model attached to E32-R21.

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Mounting Brackets

Shape	Applicable type	Model	Quantity	Remarks
	E3X-DA-N series	E39-L143	1	---
	E3X-DA□V	E39-L148		
	E32-T16	E39-L4	1*	Attached to the product.
	E32-T16P	E39-L94	2	---
	E32-T54V	E39-L54V	2	---

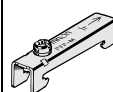
* For the through-beam type, please order two pcs. for the emitter and receiver.

Note: For details, refer to "Mounting bracket list".

Operating Instructions Sticker

Model	Remarks
E39-Y1	Apply this seal to near the sensor.

End Plate

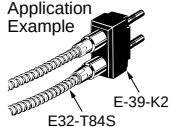
Shape	Model	Quantity
	PFP-M	1

Protective Spiral Tubes

Shape	Application	Model	Tube length	Applicable Fiber
	For protection of fiber	E39-F32A5	500 mm	E32-DC200E E32-D21 E32-DC200F(4) E32-D21R
		E39-F32A	1 m	
		E39-F32B5	500 mm	E32-T21L E32-TC200F(4) E32-TC200E E32-T21 E32-EC31 E32-T21R
		E39-F32B	1 m	
		E39-F32C5	500 mm	E32-T11L E32-T11 E32-TC200 E32-T51 E32-TC200B(4) E32-T11R
		E39-F32C	1 m	
		E39-F32D5	500 mm	E32-D11L E32-D11 E32-DC200 E32-CC200 E32-DC200B(4) E32-ED51 E32-ED11R
		E39-F32D	1 m	

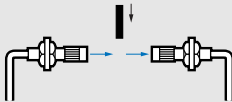
Other Accessories

Shape	Application	Name	Model	Applicable Fiber	Remarks
	Used for free cutting of fiber	Fiber Cutter	E39-F4	All fiber unit models that enable free cut	Attached to the fibers that can be cut freely.
	Attachments for small diameter fibers for insertion into amplifier	Attachments for small diameter fibers	E39-F9	E32-T21L E32-DC200E E32-T22L E32-DC200F(4) E32-TC200E E32-D33 E32-T22 E32-ED21R E32-T22R E32-D21 E32-TC200F(4) E32-D32 E32-T21 E32-D24 E32-T24 E32-D24R E32-T24R E32-R21 E32-D21L E32-EC31 E32-ED21R E32-A03 E32-D22L E32-A04 E32-D22R	---

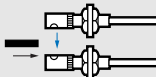
Shape	Application	Name	Model	Applicable Fiber	Remarks
	Used for adding to fiber	Fiber Con- nector	E39-F10	E32-T11L E32-T14 E32-T12L E32-G14 E32-T17L E32-D11L E32-TC200 E32-DC200 E32-TC200A E32-DC200B(4) E32-TC200B(4) E32-D14L E32-T14L E32-D12	---
	Used for bending the sleeve of sleeved fiber	Sleeve Bender	E39-F11	E32-TC200B(4) E32-TC200F(4) E32-DC200F(4)	---
	Prevention of fiber unit mounting section from breakage	Protective Attachment	E39-K2	E32-T61 E32-T84S	Application Example  E32-T84S E-39-K2

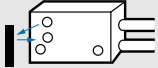
Rating/Performance

Lens Unit

Item	Name		Long distance lens units					
	Application		Increased sensing distance					
	Model		E39-F1					
	Sensor type		Through-beam 					
Applicable Fiber			E32-T11L	E32-TC200	E32-T61	E32-T11	E32-ET11R	E32-T81R
E3X-DA-N	Sensing distance	Super-long-distance	4,000 mm	4,000 mm *	4,000 mm *	4,000 mm *	4,000 mm *	2,600 mm
		Standard	3,200 mm	4,000 mm *	3,400 mm	3,600 mm	3,700 mm	2,100 mm
		Super-high-speed	1,200 mm	2,100 mm	1,300 mm	1,300 mm	1,400 mm	750 mm
Standard sensing object			Opaque: 4 mm dia. min.					
Directional angle			5 to 40°					
Differential distance			---					
Ambient temperature			Use the unit within the operating temperature range of the fiber used. When used with E32-T61, use the unit within the range -40 to +200°C.					
Material	Tube:		Brass					
	Lens		Optical glass					

* These models allow a longer sensing distance because their optical fiber length is 2 m.

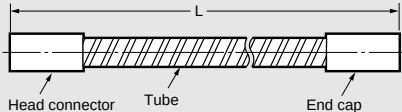
Item	Name		side view unit					
	Application		Conversion of detection direction into side view					
	Model		E39-F2					
	Sensor type		Through-beam 					
Applicable Fiber			E32-T11L	E32-TC200	E32-T61	E32-T11	E32-ET11R	E32-T81R
E3X-DA-N	Sensing distance	Super-long-distance	900 mm	800 mm	570 mm	780 mm	500 mm	350 mm
		Standard	800 mm	700 mm	450 mm	660 mm	400 mm	280 mm
		Super-high-speed	400 mm	300 mm	170 mm	250 mm	150 mm	100 mm
Standard sensing object			Opaque: 3 mm dia. min.					
Directional angle			20 to 60°					
Ambient temperature			Use the unit within the operating temperature range of the fiber used. When used with E32-T61, use the unit within the range -40 to +200°C.					
Material	Tube:		Brass					
	Lens		Optical glass					

Item	Name		Reflective side view conversion attachment unit
	Application		Conversion of through-beam model into side view reflective model
	Model		E39-F5
	Sensor type		Reflective model 
Applicable Fiber			E32-TC200A
E3X-DA-N	Sensing distance (Standard sensing object)	White paper super-long-distance	1 to 130 mm (100 x 100 mm)
		White paper Standard	1 to 120 mm (100 x 100 mm)
		White paper super-high-speed	2 to 45 mm (100 x 100 mm)
Differential distance			20% max. of sensing distance
Ambient temperature			-40° to 70°C (with no icing or condensation)
Material	Base:		Brass
	Reflector:		Stainless steel

Lens Unit (E39-F3□ series)

Item	Name		Spot lens unit						
	Spot diameter		Adjustable in the range 0.5 to 1.0 mm dia.	Adjustable in the range 0.1 to 0.6 mm dia.	Focal length 7mm 0.5 mm dia. fixed	Focal length 7mm 0.1 mm dia. fixed	Focal length 17mm 0.5 mm dia. fixed	Focal length 17mm 0.2 mm dia. fixed	4 mm max. at 0 to 20 mm
Model		E39-F3A		E39-F3A-5		E39-F3B		E39-F3C	
Applicable fiber type		E32-D32	E32-C42	E32-EC31	E32-EC41	E32-EC31	E32-EC41	E32-EC31	E32-EC41
Material	Tube:		Aluminum						
	Lens		Optical glass						

Protective Spiral Tubes

Item	Model	E39-F32A5	E39-F32A	E39-F32B5	E39-F32B	E39-F32C5	E39-F32C	E39-F32D5	E39-F32D
	Sensor type								
Ambient temperature		Operating/Storage: -40 to +150°C (Use the fiber placed inside within the operating temperature of that fiber)							
Ambient humidity		Operating: 35% to 85% Storage: 35% to 95%							
Bending radius		30 mm min.							
Tensile strength		Between head connector or end cap and tube: 1.5 Nm max., tube: 2 Nm max.							
Compression load		Tube: 29.4 N max.							
Material	Head connector	Brass nickel plating							
	End cap	Brass nickel plating							
	Tube	Stainless steel (SUS304)							

Dimensions

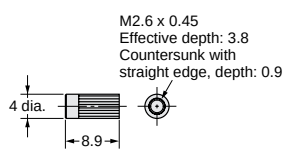
Accessories (Order Separately)

Reflectors A-216
 Mounting Brackets A-216
 End Plate
 PFP-M

Lens Unit

E39-F1 Long Distance Lens Units

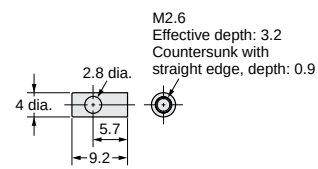
CAD file E39_01



Material: Tube: Brass Lens: Optical glass
 Note: One set includes two units

E39-F2 side view unit E39-F2

CAD file E39_02

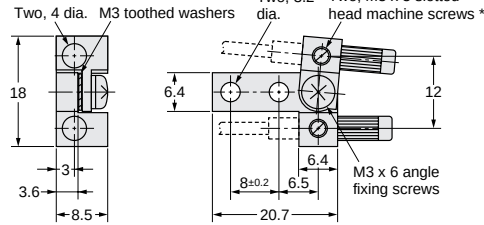
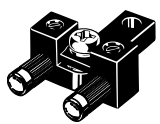


Material: Tube: Brass Lens: Optical glass
 Note: One set includes two units

Lens-equipped Reflective Unit

CAD file E39_03

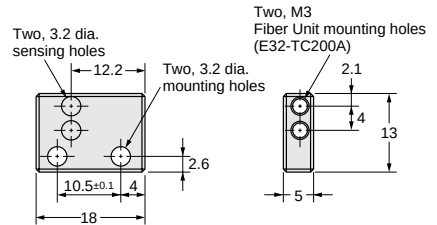
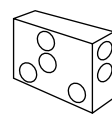
E39-F3



Material: Tube: Brass Base: Aluminum
 * Fix the fiber head using the slotted head machines screw.
 Do not insert the E39-F1 Lens.

E39-F5 side view Reflective Unit

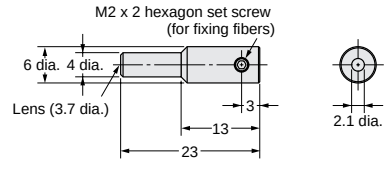
CAD file E39_08



Material: Base: Brass Reflector Stainless steel
 Note: Only the E32-TC200A can be mounted. When mounting it, remove all the supplied nuts and screw it into the E39-F5. (Screw it until it is stopped by the stopper.)

Small Spot Lens Unit E39-F3A

CAD file E39_07

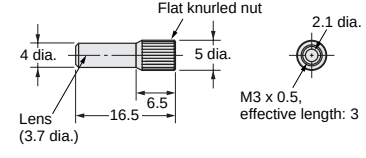


Material: Tube: Aluminum
 Optical lens: Optical glass

Note: E32-D32 is a Lens Unit for the E32-C42.

Small Spot Lens Unit E39-F3A-5

CAD file E39_44

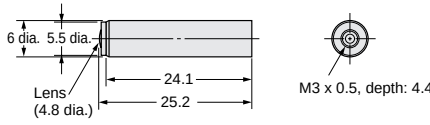


Material: Tube: Aluminum
 Optical lens: Optical glass

Note: E32-C31 is a Lens Unit for the E32-C41.

Small Spot Lens Unit E39-F3B

CAD file E39_45

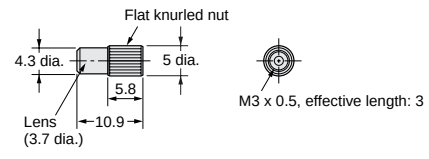


Material: Tube: Aluminum
 Optical lens: Optical glass

Note: E32-C31 is a Lens Unit for the E32-C41.

Small Spot Lens Unit E39-F3C

CAD file E39_46



Material: Tube: Aluminum
 Optical lens: Optical glass

Note: E32-C31 is a Lens Unit for the E32-C41.

MEMO

E32

Digital Fiber Sensors

E3X-DA-S

- The industry's first Power Tuning function in a digital amplifier.
- Two large easy to read displays that are clear even from a distance. Seven convenient display formats.
- The industry's first power tuning function in a digital amplifier
- Two large easy to read displays
- Stable long term performance due to OMRON's APC function.
- A wide array of advanced functions for even more applications.
- The same ease-of-use as the E3X-DA-N Amplifiers.
- Environmentally friendly design.
- Improved Mobile Console.

The next digital fiber amplifier generation with really Smart and easy operation concept



Features

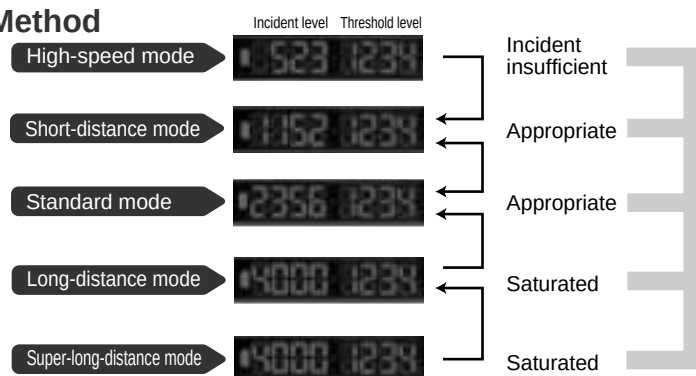
Industry's first power tuning function in a digital sensor.

No complicated mode settings.

Patent Pending

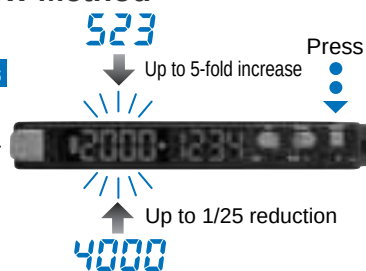
Troublesome power adjustments have been eliminated, so it isn't necessary to select from power mode settings, such as long-distance mode, standard mode, and short-distance mode. When the MODE Key is pressed once, the power tuning function shifts the power level so that the present incident level is set to the ideal level (2000 on the digital display.)

Earlier Method



The best mode for each application was selected from several power modes.

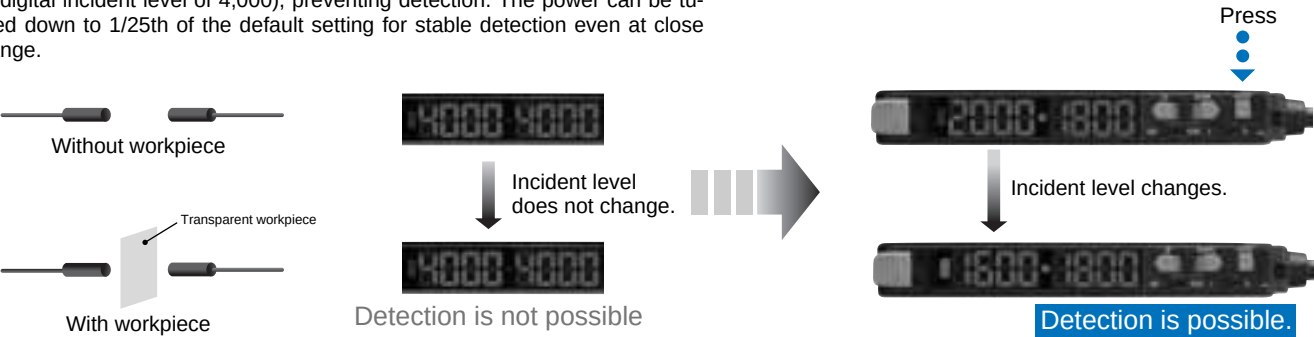
New Method



The Sensor can be used immediately without setting the mode. If the incident light level is too high or too low, just press the Mode key to achieve the optimum status.

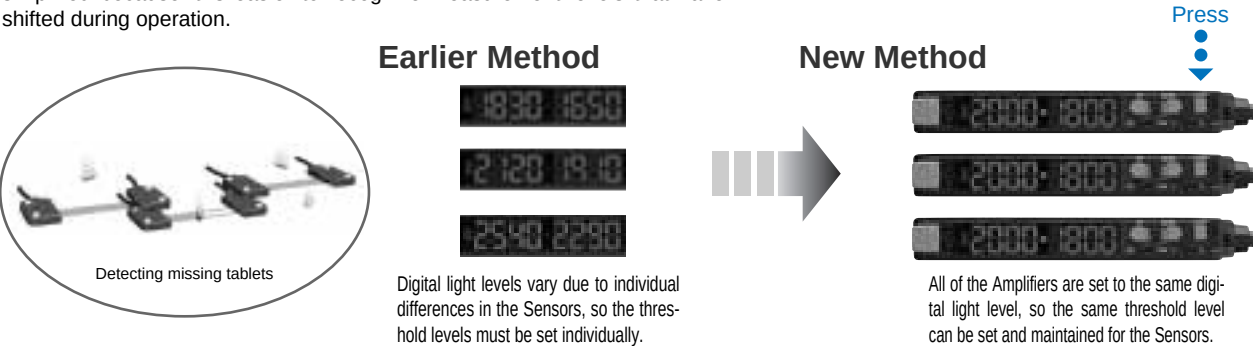
Insufficient light or saturation at short distances can be corrected.

The power tuning range is extended to the allowable limits to eliminate problems such as insufficient light or detection failures due to saturation. If the installation distance is too short, the incident light may saturate (i.e., to a digital incident level of 4,000), preventing detection. The power can be tuned down to 1/25th of the default setting for stable detection even at close range.

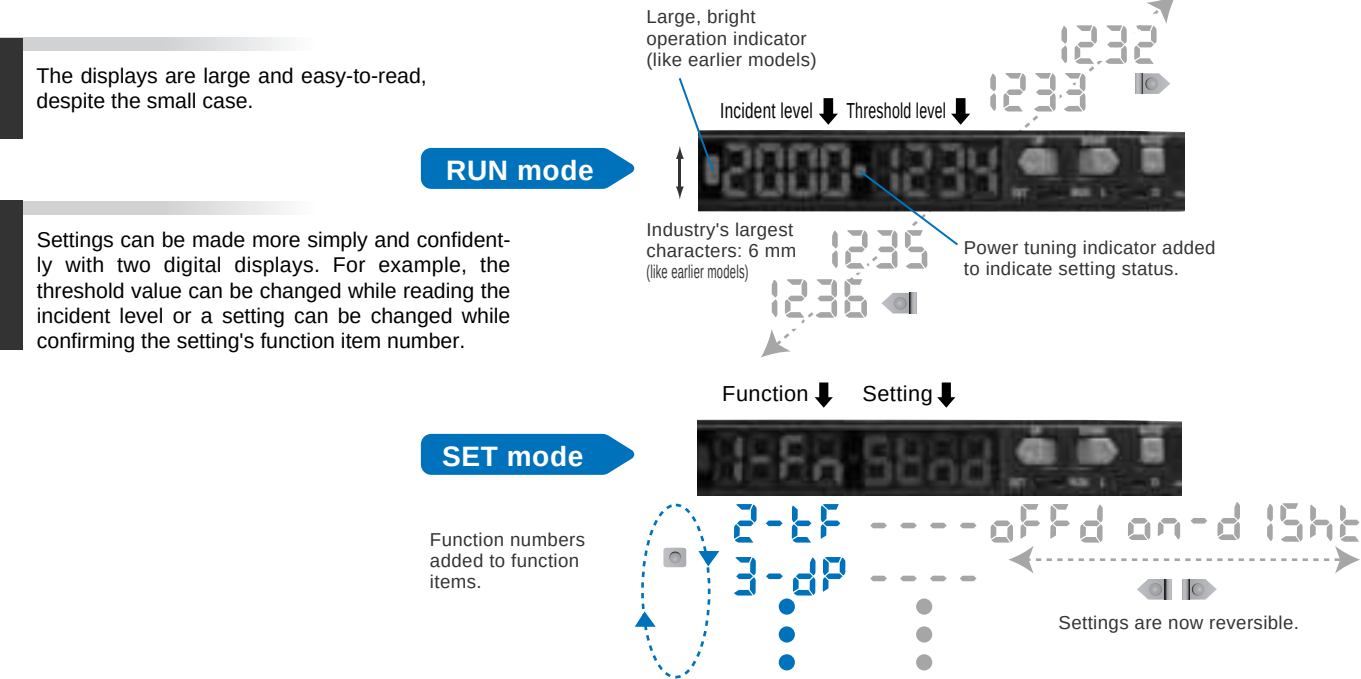


Variations between different Sensors can be eliminated.

Threshold levels had to be set and maintained separately for individual Sensors due to variations in the digital light levels measured by each Sensor. With power tuning, the incident level can be fine-tuned so the same threshold level can be set for each Sensor in an application. Maintenance is also simplified because it is easier to recognize measurement levels that have shifted during operation.



Large, easy-to-read displays: Clear even from a distance

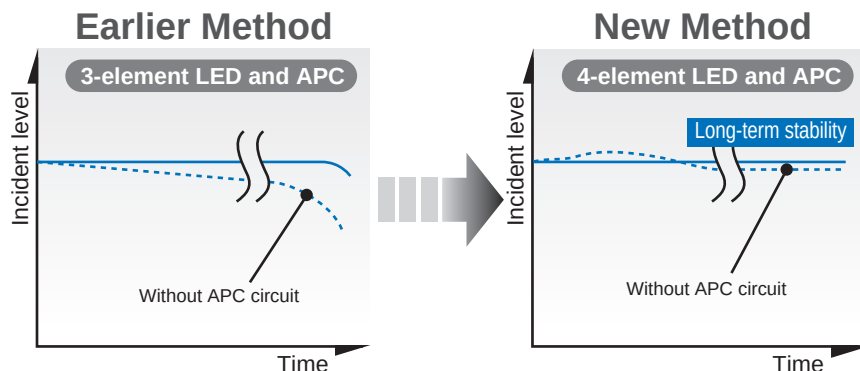


Stable, long-term performance with OMRON's APC function

OMRON provides the industry's most stable long-term detection Highest Level of Stability by using new 4-element LEDs and an APC (Auto Power Control) circuit.

In addition to our unique APC circuit used in the E3X-DA-N Amplifiers to compensate for the deterioration of the LED, the E3X-DA-S uses 4-element LEDs to counteract the deterioration of the light-emitting elements over time and achieve the industry's most stable long-term detection performance.

Furthermore, the circuit is designed with excess light capacity, so the Sensors can be used with high stability regardless of whether the APC circuit is ON or OFF.



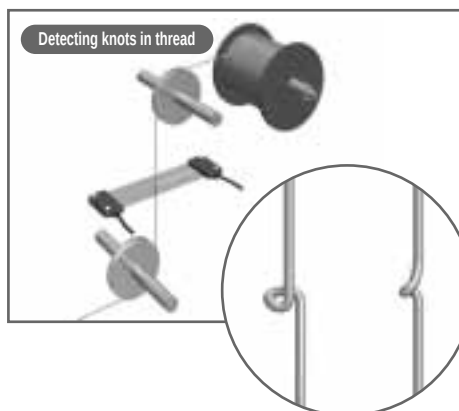
Compensate for the effects of contaminants and temperature variation with differential operation mode. (Advanced Models)

This operation mode uses a special OMRON algorithm to compensate for slight light level changes due to dirt or temperature variations and detect only the light level changes due to the workpiece.

Slight light level changes can be detected with stability and precision, eliminating the need for time-consuming manual adjustments for light level changes.

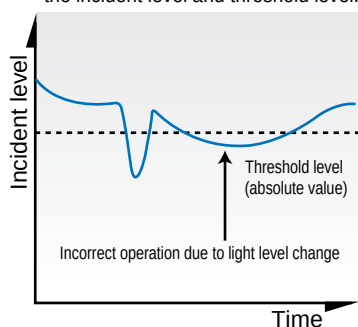
With the Twin-output Amplifiers, output 2 can function as an alarm output (light level operation) to indicate when the light level has changed due to dirt or other causes.

Patent Pending



Light Level Operation (Normal Operation)

Judges light level changes by comparing the incident level and threshold level.

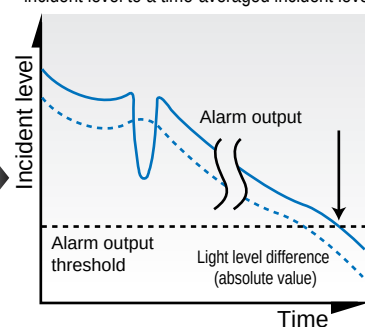


The light level varies due to dirt, temperature variations, or other environmental factors.

Incorrect operation

Differential Operation

Judges light level changes by comparing the incident level to a time-averaged incident level.



Detecting differences in the light level enables setting more subtle light level differences.

Minute changes are detected reliably.

The E3X-DA-S uses OMRON's own simplified wiring connectors that were introduced with the E3X-DA-N.

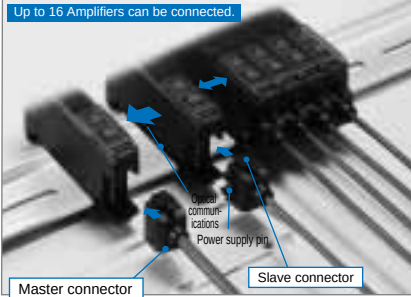
Patent Pending
Japan patent number 3266198

In Amplifiers with Connectors, the power supply is distributed to slave connectors through a single master connector. This design has three major advantages.

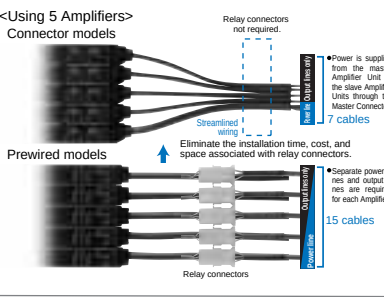
- 1. Wiring time is significantly reduced.
- 2. Relay connectors are unnecessary, so wiring takes up less space.
- 3. Storage and maintenance are simpler because it isn't necessary to distinguish between master connector and slave connectors on the Amplifier.

Simplified Connector Design

Up to 16 Amplifiers can be connected.

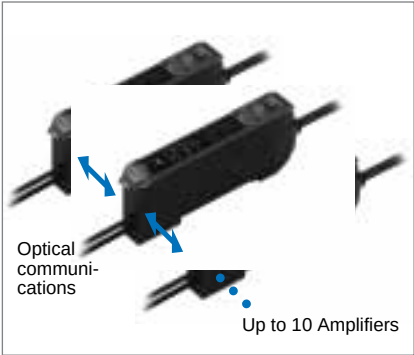
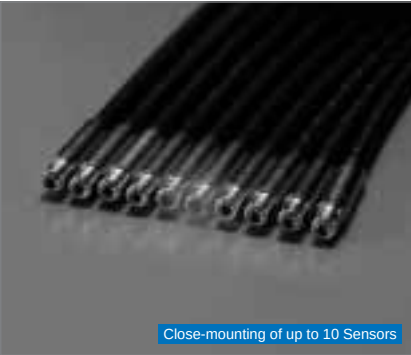


Reduced Power Wiring Saves Space



Optical communications prevents mutual interference.

Mutual interference is prevented with optical communications, so up to 10 Amplifiers can be mounted together.
(The number of Amplifiers depends on the operating conditions.)



Can also be used with Photoelectric Sensors with Separate Digital Amplifiers.



E3C-LDA
Photoelectric Sensor with Separate Digital Amplifier

E3X-MC-S
Mobile Console

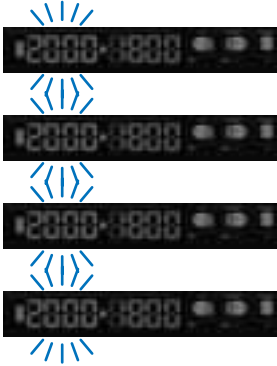
Group Power Tuning

With the group power tuning function, power tuning is possible for multiple Sensors at the same time.



Group Power Tuning

Easily set
multiple Sensors.



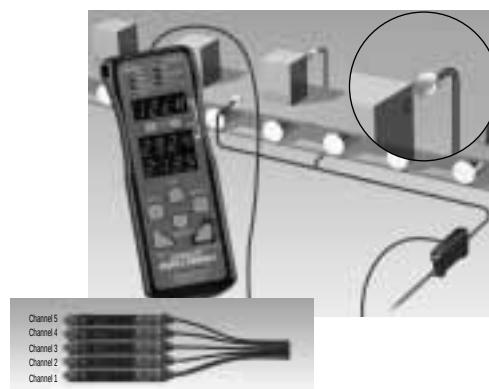
Retains all of the Previous Advantages of the Mobile Console.

*New and Improved
Fiber Sensor and
Mobile Console.*

Settings, teaching, and fine-tuning can be performed at the fiber tip.

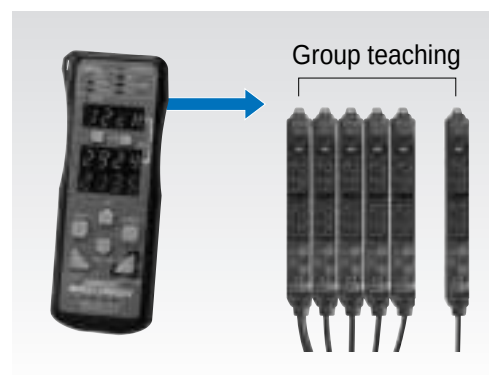
The Mobile Console can be used for settings and teaching at the tip of the fiber. Difficult adjustments can be made while checking the workpiece position.

Even if the Amplifier and Sensor head are separated during operation, it is still possible to flash the Sensor head and display the amplifier channels.



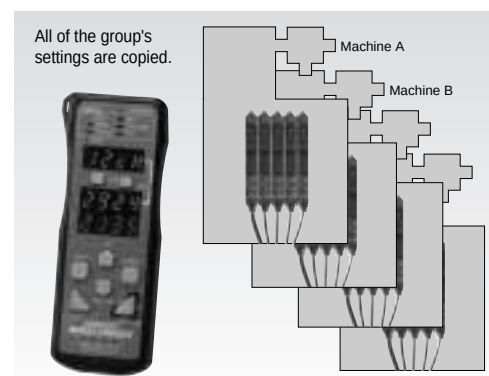
With Group Teaching, Teach Multiple Amplifiers Simultaneously.

The tedious teaching that had to be performed separately for each Amplifier can now be performed for several Amplifiers at once using the Mobile Console.



Copying Settings to Other Groups

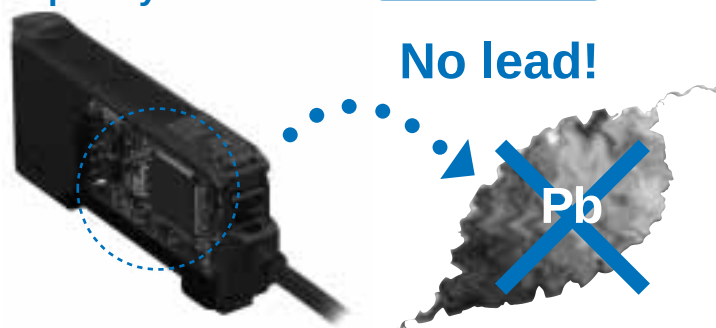
The settings for a group of Amplifiers on one machine can be copied to a group of Amplifiers on another machine. (The settings can also be copied to and from banks.)



Environmentally friendly features are essential in truly high-performance products.

Materials containing lead have been completely eliminated. First in the industry

The Fiber Sensor is the first in the industry to use environmentally friendly lead-free solder.



Ordering Information

Amplifier Units

Amplifier Units with Cables

Item		Appearance	Functions	Model	
				NPN output	PNP output
Standard models			---	E3X-DA11-S	E3X-DA41-S
Mark-detecting models	Green LED		---	E3X-DAG11-S	E3X-DAG41-S
	Blue LED		---	E3X-DAB11-S	E3X-DAB41-S
Advanced models	Twin-output models		Area output, self-diagnosis, differential operation	E3X-DA11TW-S	E3X-DA41TW-S
	External-input models		Remote setting, counter, differential operation	E3X-DA11RM-S	E3X-DA41RM-S

Amplifier Units with Connectors

Item		Appearance	Functions	Model	
				NPN output	PNP output
Standard models			---	E3X-DA6-S	E3X-DA8-S
Mark-detecting models	Green LED		---	E3X-DAG6-S	E3X-DAG8-S
	Blue LED		---	E3X-DAB6-S	E3X-DAB8-S
Advanced models	Twin-output models		Area output, self-diagnosis, differential operation	E3X-DA6TW-S	E3X-DA8TW-S
	External-input models		Remote setting, counter, differential operation	E3X-DA6RM-S	E3X-DA8RM-S

Amplifier Unit Connectors (Order Separately)

Item	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	3	E3X-CN11
			4	E3X-CN21
Slave Connector			1	E3X-CN12
			2	E3X-CN22

Combining Amplifier Units and Connectors

Amplifier Units and Connectors are sold separately. Refer to the following tables when placing an order.

Amplifier Unit				Applicable Connector (Order Separately)	
Model	NPN output	PNP output		Master Connector	Slave Connector
Standard models	E3X-DA6-S	E3X-DA8-S	+	E3X-CN11 (3-wire)	E3X-CN12 (1-wire)
Mark-detecting models	E3X-DAG6-S	E3X-DAG8-S			
	E3X-DAB6-S	E3X-DAB8-S		E3X-CN21 (4-wire)	E3X-CN22 (2-wire)
Advanced models	E3X-DA6TW-S	E3X-DA8TW-S			
	E3X-DA6RM-S	E3X-DA8RM-S			

When Using 5 Amplifier Units

Amplifier Units (5 Units)	+	1 Master Connector + 4 Slave Connectors

Mobile Console (Order Separately)

Appearance	Model	Remarks
	E3X-MC11-S (model number of set)	Mobile Console with Head, Cable, and AC adapter provided as accessories
	E3X-MC11-C1-S	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

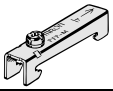
Note: Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles cannot be used.

Accessories (Order Separately)

Mounting Bracket

Appearance	Model	Quantity
	E39-L143	1

End Plate

Appearance	Model	Quantity
	PFP-M	1

Specifications

Ratings/Characteristics

Amplifier Units

Amplifier Units with Cables

Model Item		Type	Standard models	Mark-detecting models		Advanced, twin-out-put models	Advanced, external-input models
		NPN output	E3X-DA11-S	E3X-DAG11-S	E3X-DAB11-S	E3X-DA11TW-S	E3X-DA11RM-S
		PNP output	E3X-DA41-S	E3X-DAG41-S	E3X-DAB41-S	E3X-DA41TW-S	E3X-DA41RM-S
Light source (wavelength)			Red LED (650 nm)	Green LED (525 nm)	Blue LED (470 nm)	Red LED (650 nm)	
Supply voltage			12 to 24 VDC ±10%, ripple (p-p) 10% max.				
Power consumption			960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC)			1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC)	
Control output			Load power supply voltage: 26.4 VDC; NPN/PNP open collector; load current: 50 mA max.; residual voltage: 1 V max.				
Circuit protection			Reverse polarity for power supply connection, output short-circuit				
Response time	Super-high-speed mode	NPN	48 μs for operation and 50 μs for reset			80 μs for operation and reset respectively	48 μs for operation and 50 μs for reset ^{*1}
		PNP	53 μs for operation and 55 μs for reset				53 μs for operation and 55 μs for reset ^{*1}
	Standard mode		1 ms for operation and reset respectively				
	High-resolution mode		4 ms for operation and reset respectively				
Sensitivity setting			Teaching or manual method				
Functions	Power tuning		Light emission power and reception gain, digital control method				
	Differential detection		---			Switchable between single edge and double edge detection mode Single edge: Can be set to 250 μs, 500 μs, 1 ms, 10 ms, or 100 ms. Double edge: Can be set to 500 μs, 1 ms, 2 ms, 20 ms, or 200 ms.	
	Timer function		Select from OFF-delay, ON-delay, or one-shot timer. 1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)				
	Automatic power control (APC)		High-speed control method for emission current				
	Zero-reset		Display can be reset to zero when required (negative values can be displayed).				
	Initial reset		Settings can be returned to defaults as required.				
	Mutual interference prevention		Possible for up to 10 Units ^{*2, *3}				
	Counter		---				Switchable between up counter and down counter. Set count: 0 to 9,999,999
	I/O settings		---			Output setting (Select from channel 2 output, area output, or self-diagnosis.)	External input setting (Select from teaching, power tuning, zero reset, light OFF, or counter reset.)
Display			Operation indicator (orange), Power Tuning indicator (orange)			Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)	Operation indicator (orange), Power Tuning indicator (orange)
Digital display			Select from the following: Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel				Select from same displays as given at the left or a counter display.

Model Item	Type	Standard models	Mark-detecting models		Advanced, twin-out- put models	Advanced, external- input models
	NPN output	E3X-DA11-S	E3X-DAG11-S	E3X-DAB11-S	E3X-DA11TW-S	E3X-DA11RM-S
	PNP output	E3X-DA41-S	E3X-DAG41-S	E3X-DAB41-S	E3X-DA41TW-S	E3X-DA41RM-S
Display orientation		Switching between normal/reversed display is possible.				
Ambient illumination (receiver side)		Incandescent lamp:10,000 lux max. Sunlight:20,000 lux max.				
Ambient temperature		Operating:Groups of 1 to 2 Amplifiers: -25°C to 55°C Groups of 3 to 10 Amplifiers: -25°C to 50°C Groups of 11 to 16 Amplifiers: -25°C to 45°C (with no icing or condensation) Storage: -30°C to 70°C (with no icing or condensation)				
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)				
Insulation resistance		20 MΩ min. (at 500 VDC)				
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute				
Vibration resistance (destruction)		10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions				
Shock resistance (destruction)		500 m/s ² , for 3 times each in X, Y and Z directions				
Enclosure rating		IEC 60529 IP50 (with Protective Cover attached)				
Connection method		Prewired cable				
Weight (packed state)		Approx. 100 g				
Materials	Case	Polybutylene terephthalate (PBT)				
	Cover	Polycarbonate (PC)				
Accessories		Instruction sheet				

*1. When counter is enabled: 80 μs for operation and reset respectively.

*2. Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.

*3. Mutual interference prevention can be used for only up to 6 Units if power tuning is enabled.

Amplifier Units with Connectors

(Specifications different to those for Amplifier Units with cables)

Model Item	Type	Standard models	Mark-detecting models		Advanced, twin-out- put models	Advanced, external- input models
	NPN output	E3X-DA6-S	E3X-DAG6-S	E3X-DAB6-S	E3X-DA6TW-S	E3X-DA6RM-S
	PNP output	E3X-DA8-S	E3X-DAG8-S	E3X-DAB8-S	E3X-DA8TW-S	E3X-DA8RM-S
Connection method		Standard connector				
Weight (packed state)		Approx. 55 g				

Amplifier Unit Connectors

Item		E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)	
No. of insertions (destruction)		50 times (The figure for the number of insertions is for connection to the Amplifier Unit and the adjacent Connector.)	
Materials	Housing	Polybutylene terephthalate (PBT)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (packed state)		Approx. 55 g	Approx. 25 g

Mobile Console

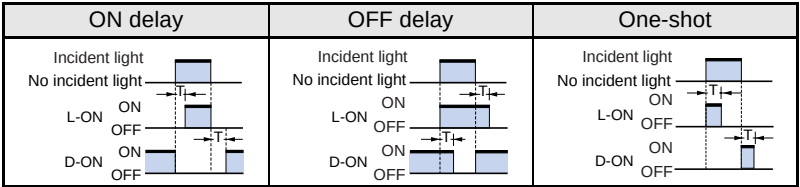
Item	E3X-MC11-S
Supply voltage	Charged with AC adapter
Connection method	Connected via adapter
Weight (packed state)	Approx. 580 g (Console only: 120 g)
Refer to <i>Operation Manual</i> provided with the Mobile Console for details.	

Output Circuits

NPN Output

Model	Mode selector	Timing chart	Mode selector	Output circuit
E3X-DA11-S E3X-DA6-S E3X-DAG11-S E3X-DAG6-S E3X-DAB11-S E3X-DAB6-S	LIGHT ON (L/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Light ON	
	DARK ON (D/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Dark ON	
E3X-DA11TW-S E3X-DA6TW-S	LIGHT ON (L/ON)	CH1/CH2 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Light ON	
	DARK ON (D/ON)	CH1/CH2 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Dark ON	
E3X-DA11RM-S E3X-DA6RM-S	LIGHT ON (L/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Light ON	
	DARK ON (D/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Dark ON	

Note: 1. The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are as follows:
LIGHT ON: ON when the incident level is between the thresholds for channels 1 and 2.
DARK ON: OFF when the incident level is between the thresholds for channels 1 and 2.
2. Time Charts for Timer Settings (T: Set Time)



PNP Output

Model	Mode selector	Timing chart	State of output transistor	Output circuit
E3X-DA41-S E3X-DA8-S E3X-DAG41-S E3X-DAG8-S E3X-DAB41-S E3X-DAB8-S	LIGHT ON (L/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Light ON	
	DARK ON (D/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Dark ON	
E3X-DA41TW-S E3X-DA8TW-S	LIGHT ON (L/ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Light ON	
	DARK ON (D/ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Dark ON	
E3X-DA41RM-S E3X-DA8RM-S	LIGHT ON (L/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Light ON	
	DARK ON (D/ON)	Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Dark ON	

Note: 1. The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are as follows:

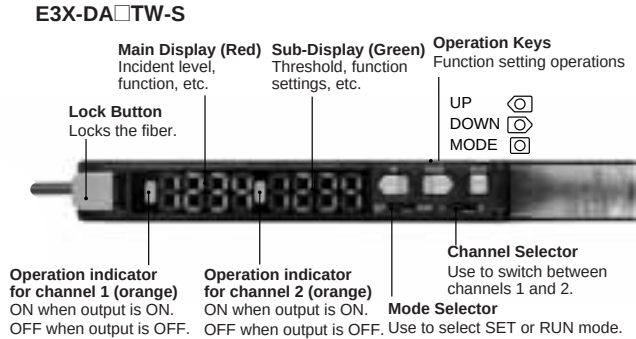
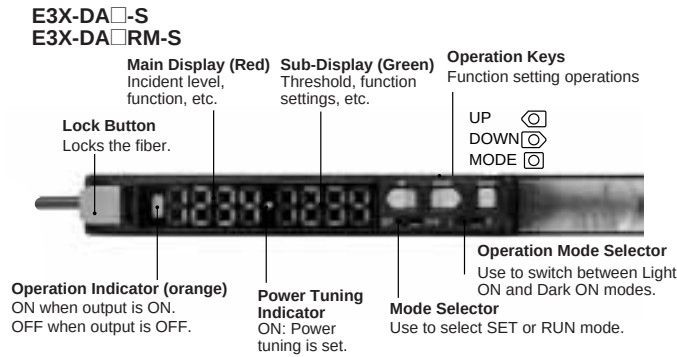
LIGHT ON: ON when the incident level is between the thresholds for channels 1 and 2.
 DARK ON: OFF when the incident level is between the thresholds for channels 1 and 2.

2. Time Charts for Timer Settings (T: Set Time)

ON delay	OFF delay	One-shot
Incident light No incident light L-ON ON OFF D-ON ON OFF T ₁	Incident light No incident light L-ON ON OFF D-ON ON OFF T ₁	Incident light No incident light L-ON ON OFF D-ON ON OFF T ₁

Nomenclature

Amplifier Units



Adjustment Methods

1. Setting the Operation Mode

The operation mode is set with the Mode Selector.

Operation mode		Operation
Light ON	L·ON	L (Factory-set)
Dark ON	D·ON	D

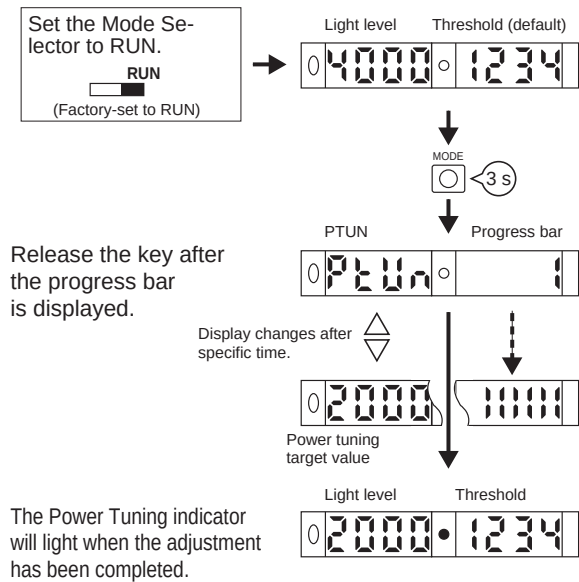
* E3X-DA□TW-S: The operation mode is set in SET mode. Refer to page A-331 5. *Setting Functions in SET Mode*.

* E3X-DA□TW-S: Set the Channel Selector to the desired channel before making any adjustments or settings. This is true for all adjustments and settings.

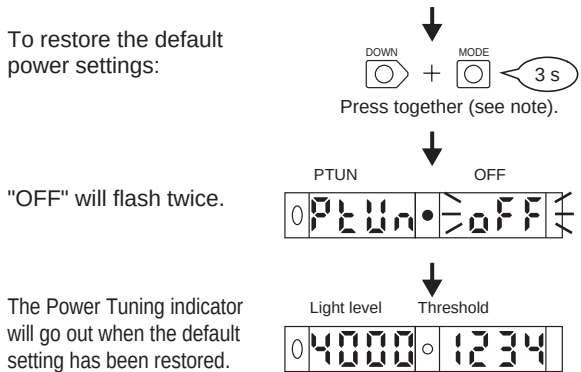
2. Adjusting the Power (RUN Mode)

The current incident light level can be adjusted to near the power tuning target value (default: 2,000).

* Confirm that the MODE key setting is PTUN (power tuning). The default setting is PTUN. Refer to page A-331 5. *Setting Functions in SET Mode*



To restore the default power settings:



* Setting Errors

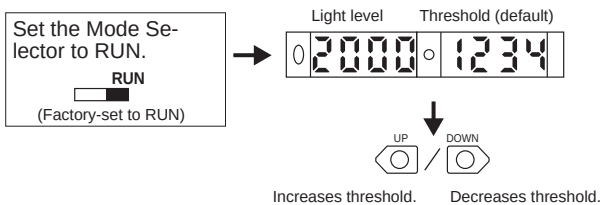
An error has occurred if one of the following displays appears after the progress bar is displayed.

Display	Error	Action
 PTUN OVER	Over Error The incident light level is too low for the power tuning target value.	The power will not be tuned. The power can be increased up to approximately 5 times the incident light value.
 PTUN BOTM	Bottom Error The incident light level is too high for the power tuning target value.	The power will be turned to the minimum level. The power can be decreased down to approximately 1/25th the incident light value.

Note: Press the DOWN key right after pressing the MODE key.

3. Setting Thresholds Manually (RUN Mode)

A threshold can be set manually. A threshold value can also be fine-tuned using manual setting after teaching.



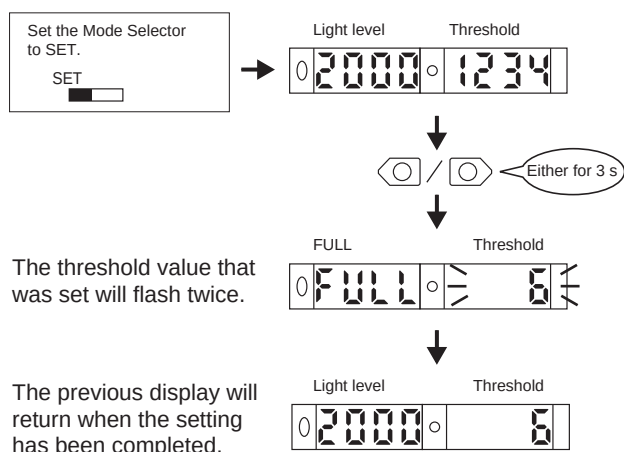
* Even if the display method for display switching is changed, the threshold will appear on the sub-display when the key is pressed.

4. Teaching the Threshold Value (SET Mode)

- * There are four methods that can be used for teaching, as described below. Use the method most suitable for the application.
- * An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. Repeat the operation from the beginning.

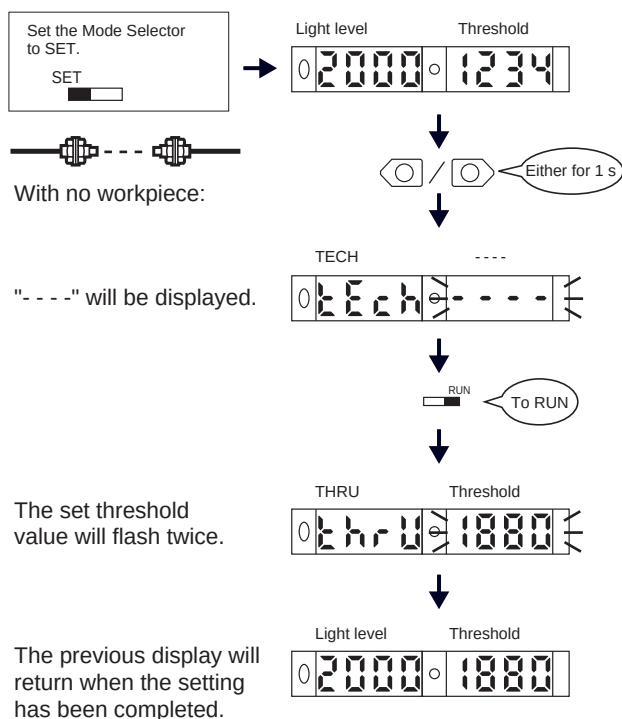
4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set at the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



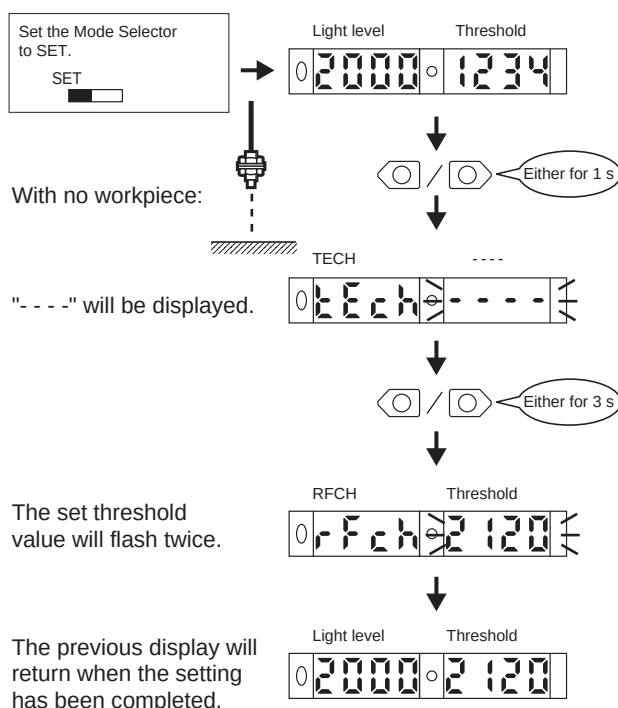
4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold value. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



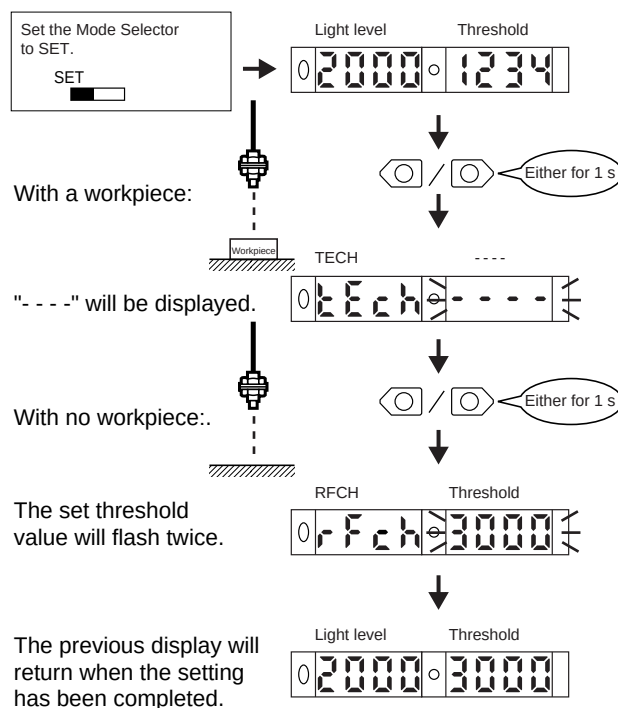
4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold value. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



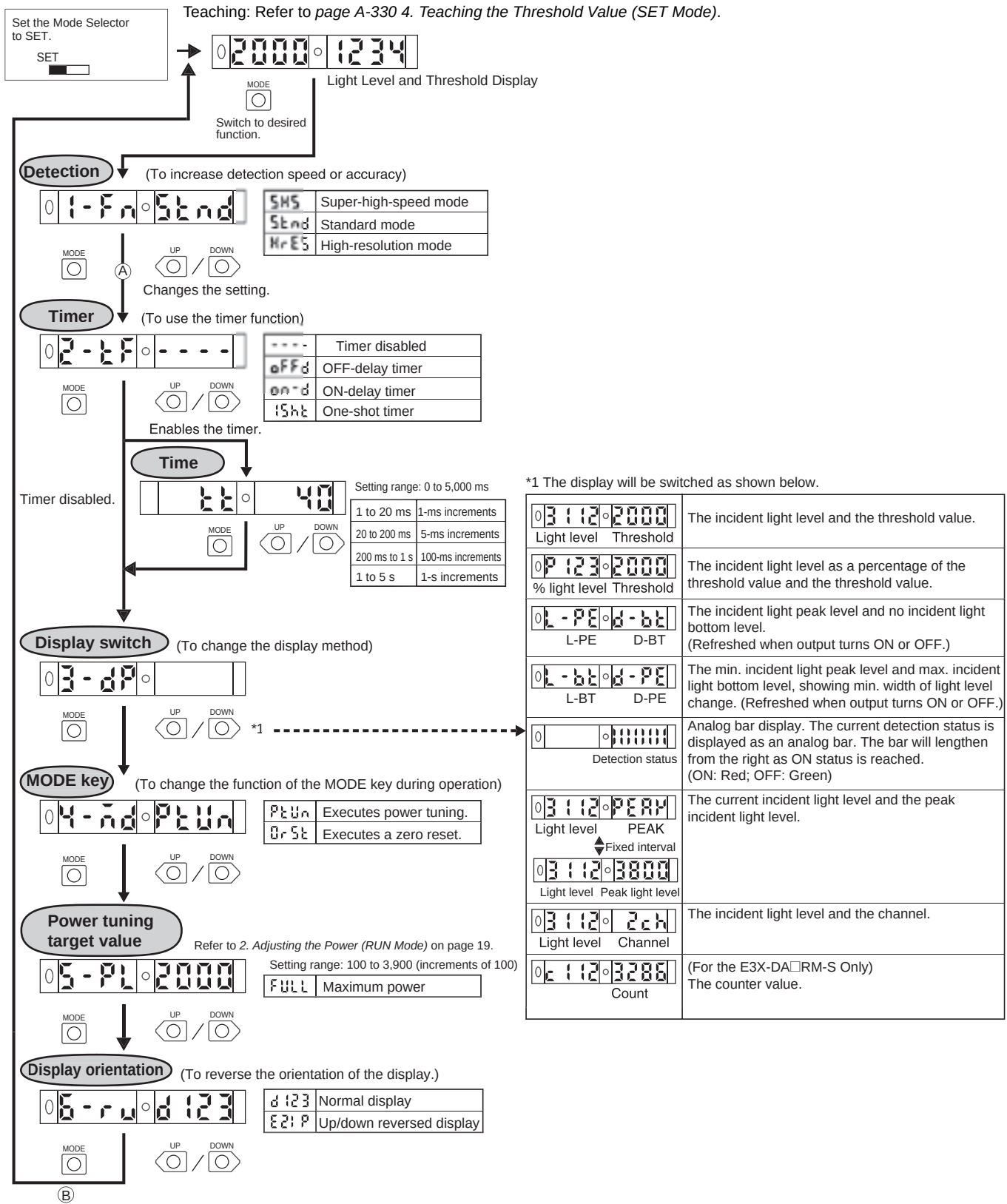
4-4. Teaching With and Without a Workpiece

Teaching can be performed twice, once with and once without a workpiece, and the value between the two measured value can be set as the threshold.



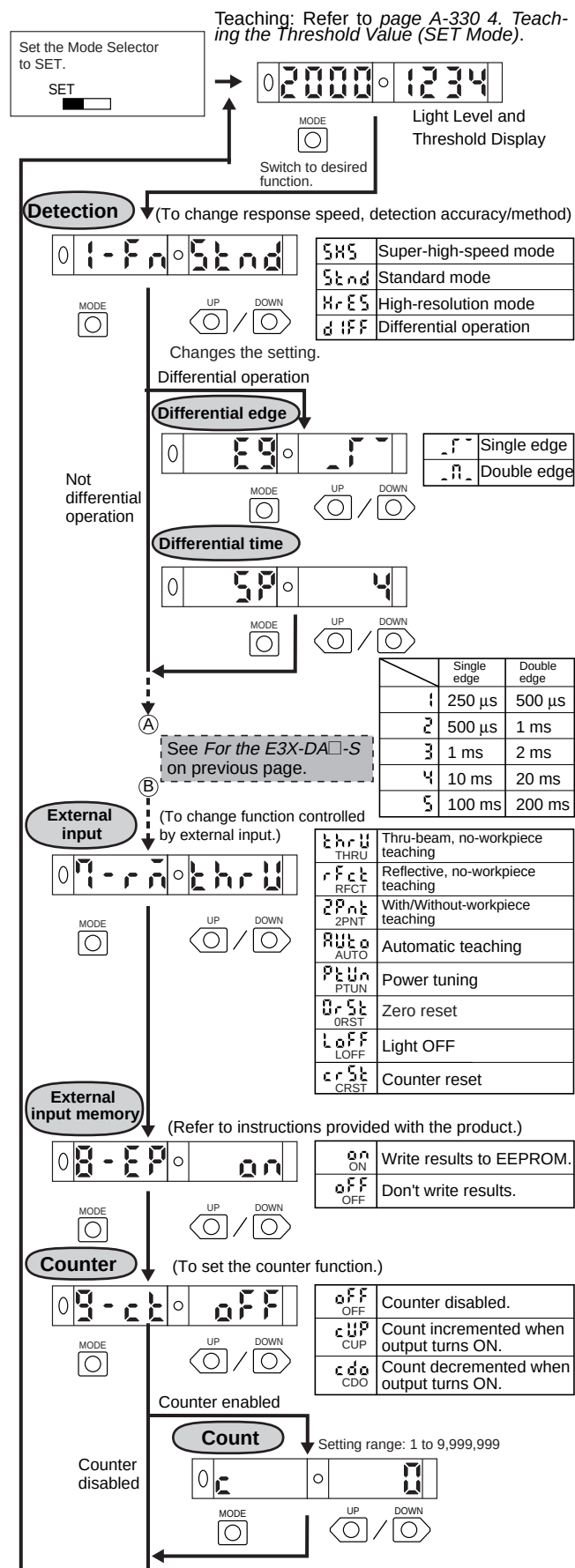
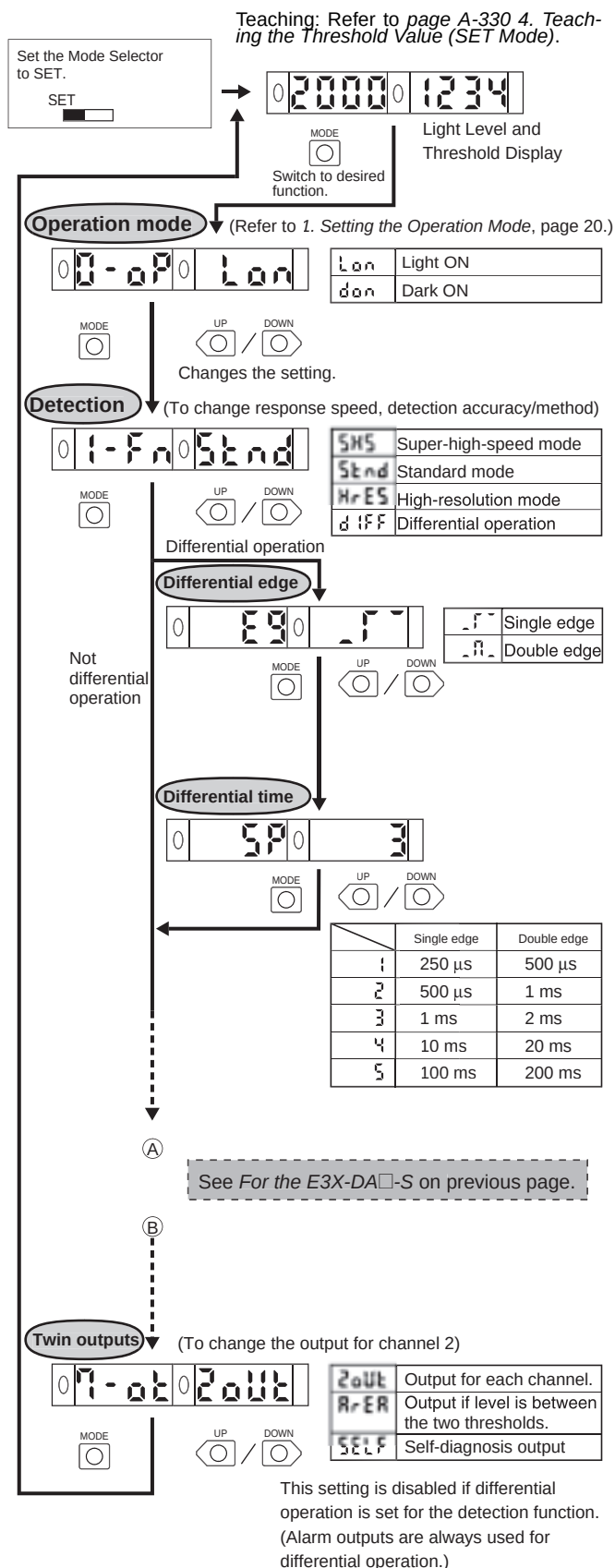
5. Setting Functions in SET Mode

*The default settings are shown in the transition boxes between functions.
For the E3X-DA□-S



For the E3X-DA□TW-S

For the E3X-DA□RM-S

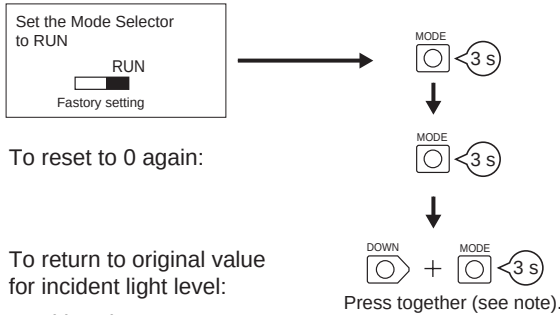


6. Convenient Functions

6-1. Zeroing the Digital Display

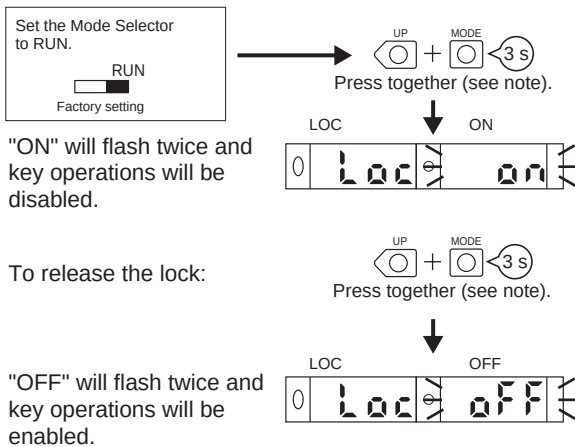
The incident light level on the digital display can be set to 0.

* Change the function to 0RST (zero reset) with the MODE key. The default setting is PTUN. Refer to page A-331 5. *Setting Functions in SET Mode.*



6-2. Locking the Keys

All key operations can be disabled.

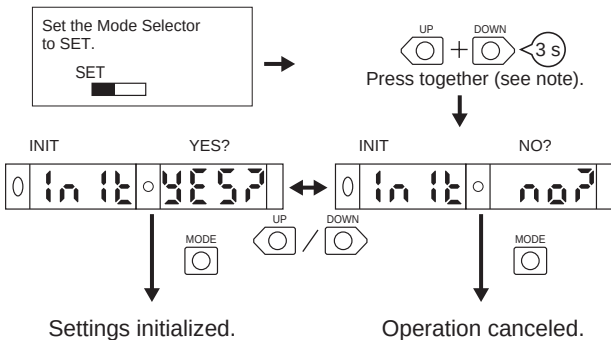


* If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Note: Press the DOWN key right after pressing the MODE key.

6-3. Initializing Settings

All settings can be returned to their original default settings.



Safety Precautions

Note: In addition to the following precautions, please read and observe the common precautions for the instructions included with the product.

Precautions for Correct Use

Amplifier Unit

Installation

• Operation after Turning Power ON

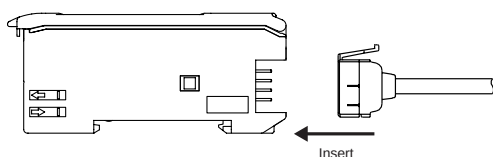
The Amplifier Unit is ready to operate within 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, be sure to turn ON the power supply to the Sensor first.

Mounting

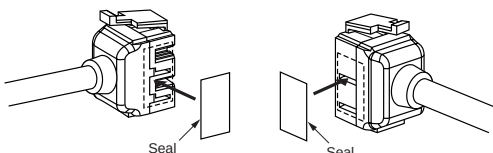
• Connecting and Disconnecting Connectors

Mounting Connectors

1. Insert the Master or Slave Connector into the Amplifier Unit until it clicks into place.



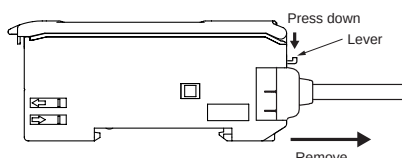
2. Attach the protector seals (provided as accessories) to the sides of master and slave connectors that are not connected.



Note: Attach the seals to the sides with grooves

Removing Connectors

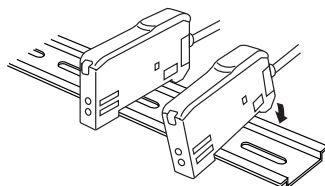
1. Slide the slave Amplifier Unit(s) for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit(s) has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



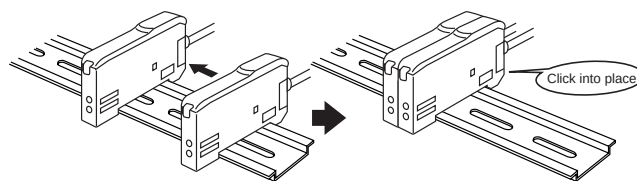
• Joining and Removing Amplifier Units

Joining Amplifier Units

1. Mount the Amplifier Units one at a time onto the DIN track.



2. Slide the Amplifier Units together, line up the clips, and press the Amplifier Units together until they click into place.



Separating Amplifier Units

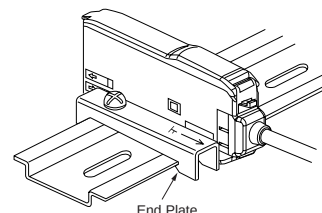
Slide Amplifier Units away from each other, and remove from the DIN track one at a time. (Do not attempt to remove Amplifier Units from the DIN track without separating them first.)

Note 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings/Characteristics*.

2. Always turn OFF the power supply before joining or separating Amplifier Units.

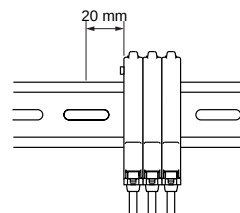
• Mounting the End Plate (PFP-M)

An End Plate should be used if there is a possibility of the Amplifier Unit moving, e.g., due to vibration. If a Mobile Console is going to be mounted, connect the End Plate in the direction shown in the following diagram.



• Mounting the Mobile Console Head

Leave a gap of at least 20 mm between the nearest Amplifier Unit and the Mobile Console head.

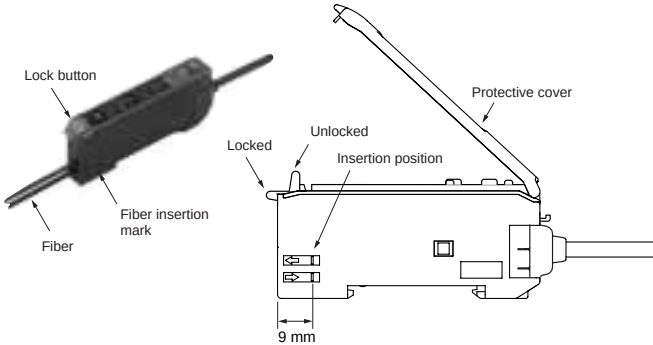


- **Fiber Connection**

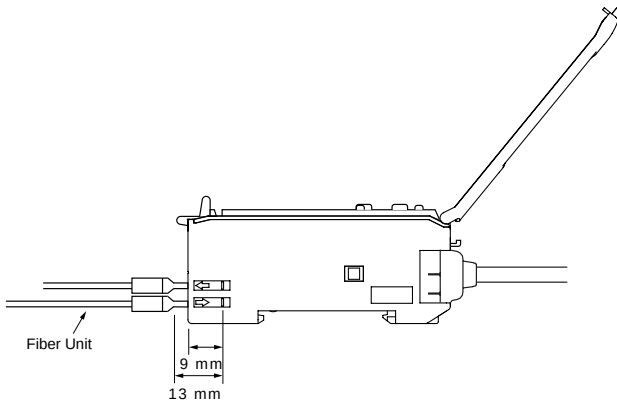
The E3X Amplifier Unit has a lock button for easy connection of the Fiber Unit. Connect or disconnect the fibers using the following procedures:

1. Connection

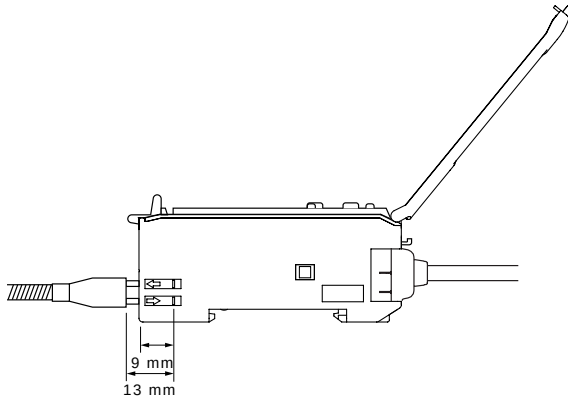
Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.



Fibers with E39-F9 Attachment

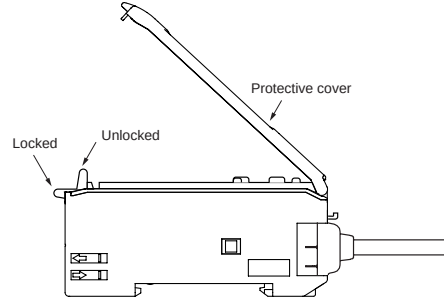


Fibers That Cannot Be Free-Cut (with Sleeves)



2. Disconnecting Fibers

Remove the protective cover and raise the lock button to pull out the fibers.



Note 1. To maintain the fiber properties, confirm that the lock is released before removing the fibers.

2. Be sure to lock or unlock the lock button within an ambient temperature range between -10°C and 40°C .

Adjustments

- **Mutual Interference Protection Function**

There may be some instability in the digital display values due to light from other sensors. If this occurs, decrease the sensitivity (i.e., decrease the power or increase the threshold) to perform stable detection.

- **EEPROM Writing Error**

If the data is not written to the EEPROM correctly due to a power failure or static-electric noise, initialize the settings with the keys on the Amplifier Unit. ERR/EEP will flash on the display when a writing error has occurred.

- **Optical Communications**

Several Amplifier Units can be slid together and used in groups. Do not, however, slide the Amplifier Units or attempt to remove any of the Amplifier Units during operation.

Other Precautions

- **Protective Cover**

Always keep the protective cover in place when using the Amplifier Unit.

- **Mobile Console**

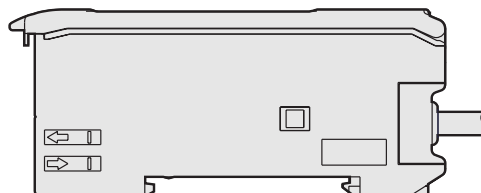
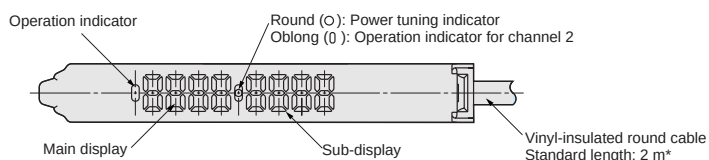
Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, cannot be used.

Dimensions

Amplifier Units

Amplifier Units with Cables

E3X-DA11-S
E3X-DA41-S
E3X-DAG11-S
E3X-DAG41-S
E3X-DAB11-S
E3X-DAB41-S
E3X-DA11RM-S
E3X-DA41RM-S
E3X-DA11TW-S
E3X-DA41TW-S

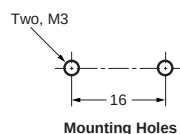
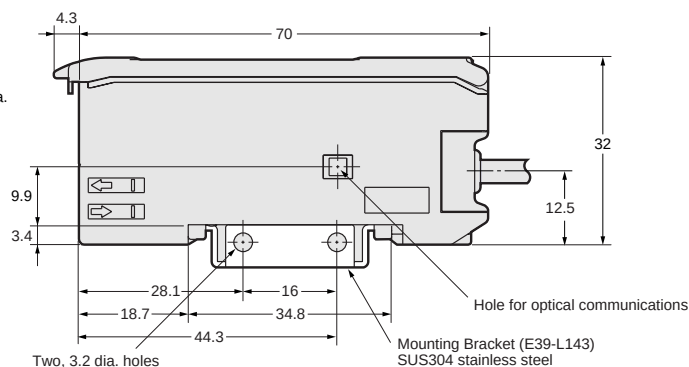
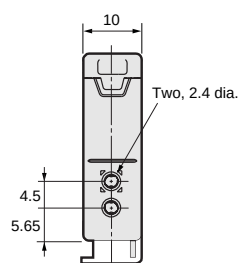
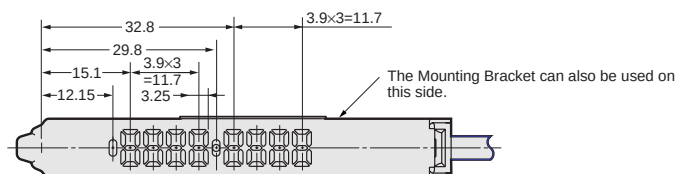


*Cable Specifications

E3X-DA11-S/DA41-S/DAG11-S/ DAG41-S/DAB11-S/DAB41-S	A 4-dia., 3-conductor (conductor cross-sectional area: 0.2 mm ² ; insulation diameter: 1.1 mm)
E3X-DA11TW-S/DA41TW-S/ DA11RM-S/DA41RM-S	A 4-dia., 4-conductor (conductor cross-sectional area: 0.2 mm ² ; insulation diameter: 1.1 mm)



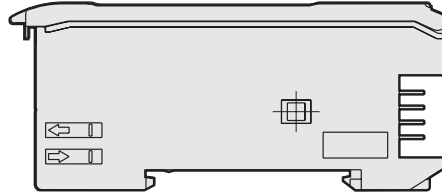
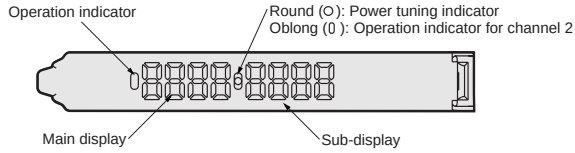
With Mounting Bracket Attached



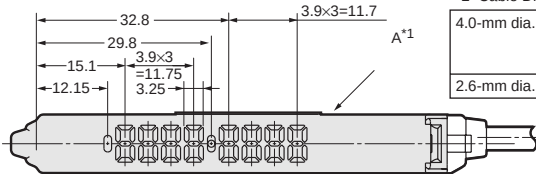
Amplifier Units with Connectors

E3X-DA6-S
E3X-DA8-S
E3X-DAG6-S
E3X-DAG8-S
E3X-DAB6-S
E3X-DAB8-S
E3X-DA6RM-S
E3X-DA8RM-S
E3X-DA6TW-S
E3X-DA8TW-S

E3X-DA-S

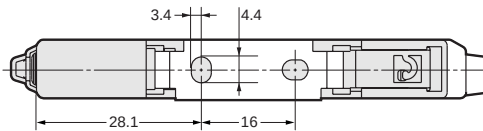
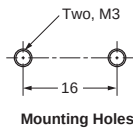
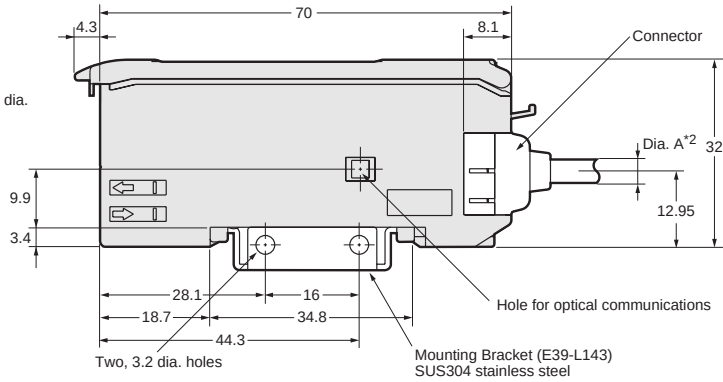
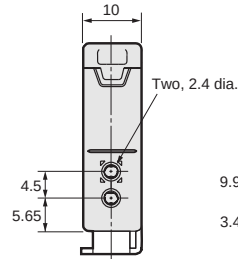


With Mounting Bracket Attached



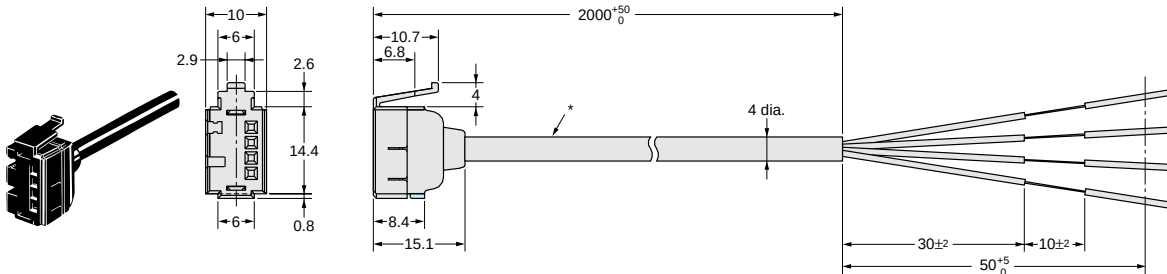
*1 The Mounting Bracket can also be used on this side.
*2 Cable Diameters

4.0-mm dia.	E3X-CN11 (3 conductors) E3X-CN21 (4 conductors) E3X-CN22 (2 conductors)
2.6-mm dia.	E3X-CN12 (1 conductor)



Amplifier Unit Connectors
Master Connectors

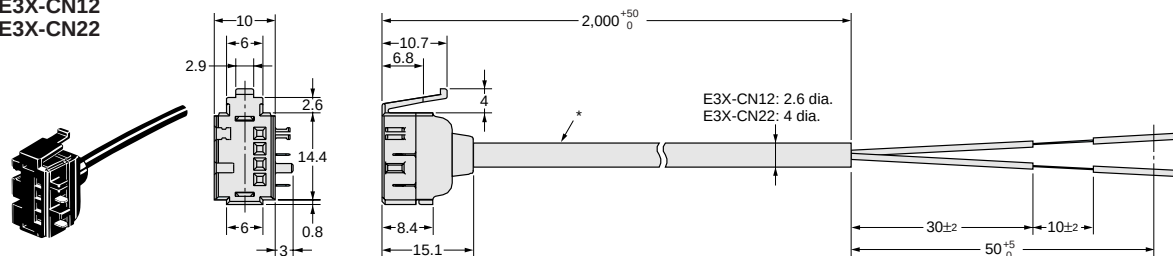
E3X-CN11
E3X-CN21



*E3X-CN11: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.
E3X-CN21: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Slave Connectors

E3X-CN12 E3X-CN22

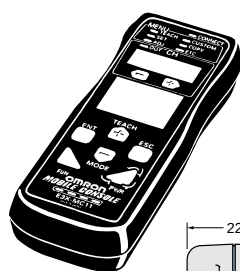


*E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

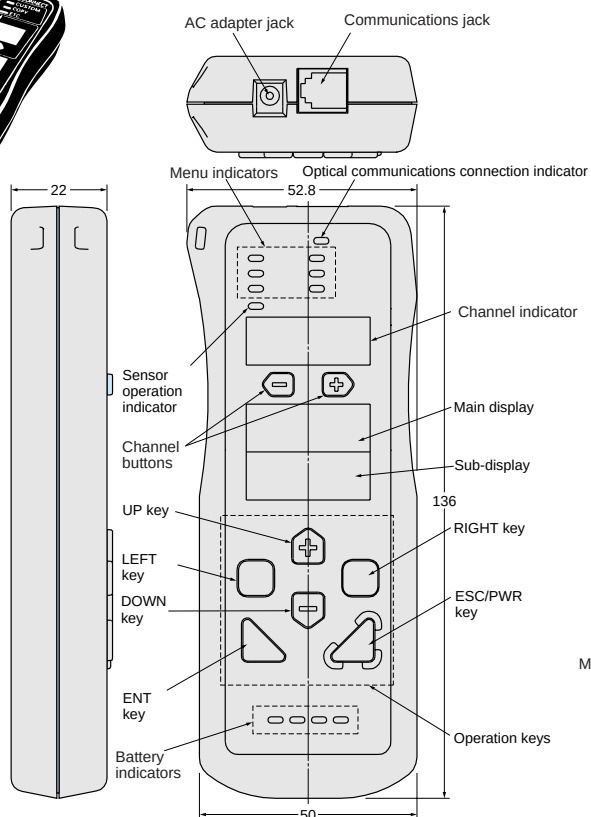
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Mobile Console

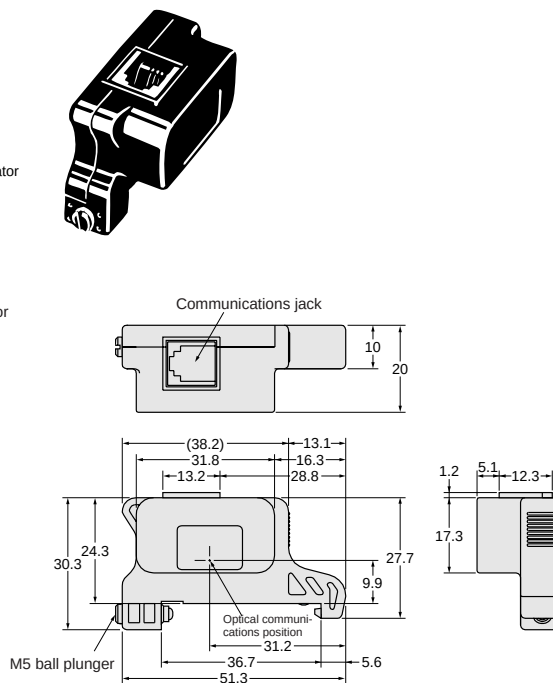
E3X-MC11-S



Mobile Console



Mobile Console Head



MEMO

Digital Fiber Amplifier

E3X-DA-N

*Truly ultimate fiber amplifier
in pursuit of "user friendliness"
and "high performance"*



UL991*

* UL-listed including UL991 tests/evaluations • Applicable standard: UL3121-1 • Standards for additional tests/evaluations for applications: UL991, SEMI S2-0200

Features

Reducing power line wiring meaning space is saved. New design for easier maintenance.

Industry First

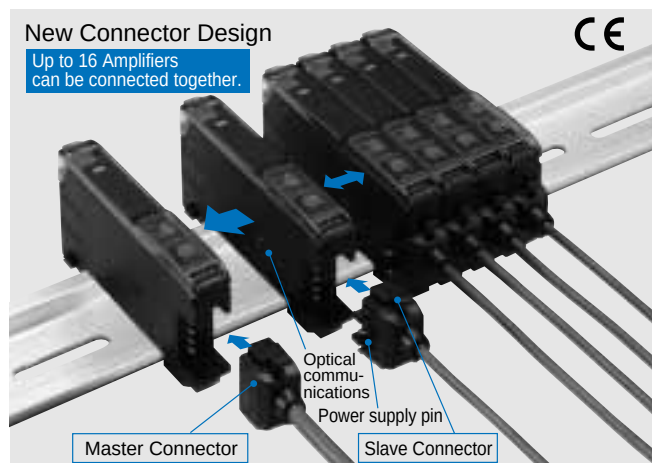
Patent pending

The connector type that uses the wire-saving connector supplies power to the single-conductor slave connectors via the three-conductor master connector. Hence, the following three has been made possible.

1. Wiring is much simpler.
2. Relay connectors are not required meaning that space is used more efficiently and costs are reduced.
3. Simple inventory control because of no differentiation between master and slave in the amplifier section.

New Connector Design

Up to 16 Amplifiers
can be connected together.



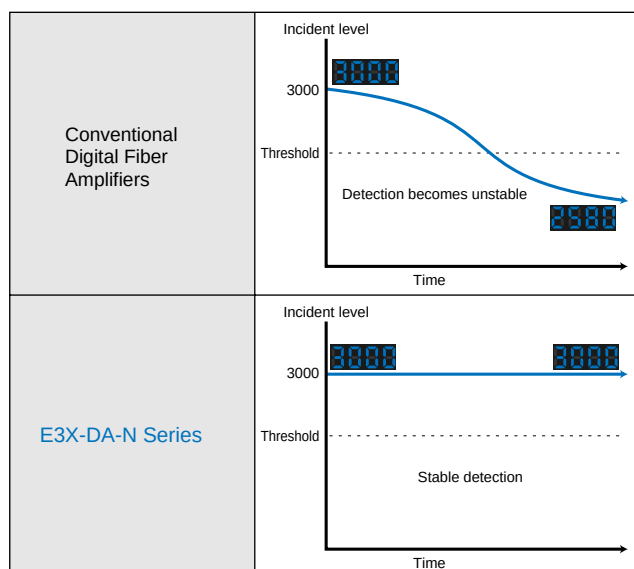
Super digital display by use of the Auto Power Control (APC) circuit

Industry First

The incident level of LEDs used in sensors is prone to deteriorate with time and as a result, detection becomes unstable.

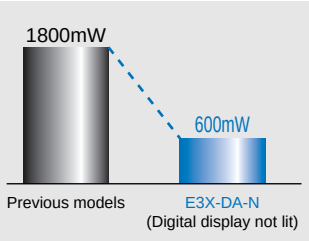
Using the APC (auto power control) circuit for the first time as the fiber sensor, the E3X-DA-N series has no digital value variations, realizing severe detection.

This makes the E3X-DA-N ideal for applications where a high degree of sensitivity is required, such as detecting crystal glass.



Power consumption reduced by 70%.

Power consumption has been reduced up to about 70% from 1800 mW to 600 mW. (If the digital display is off)



The digital display can be changed to full-OFF or Dark-ON during RUN.

Eco mode

Power consumption can be reduced by setting the display to Full-OFF/Dark-ON in applications where the digital display is rarely looked at during RUN.
(Can be set at the Mobile Console only)

Beeper-sized, new-generation Mobile Console unleashing the power of the ultimate fiber amplifier

Remote setting/adjustment function

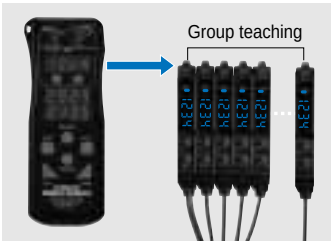
Setting/teaching/fine adjustment can be made at the fiber front-end.

The Mobile Console has enabled setting and teaching at the fiber front-end, which could only be made at the amplifier. You can perform major adjustments while looking at the work position, etc.



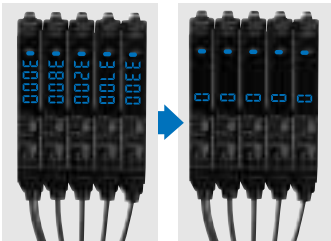
Simultaneous turning possible using group teaching.

While teaching had to be performed for each Amplifier separately, it can now be performed for several Amplifiers at once using the Mobile Console.



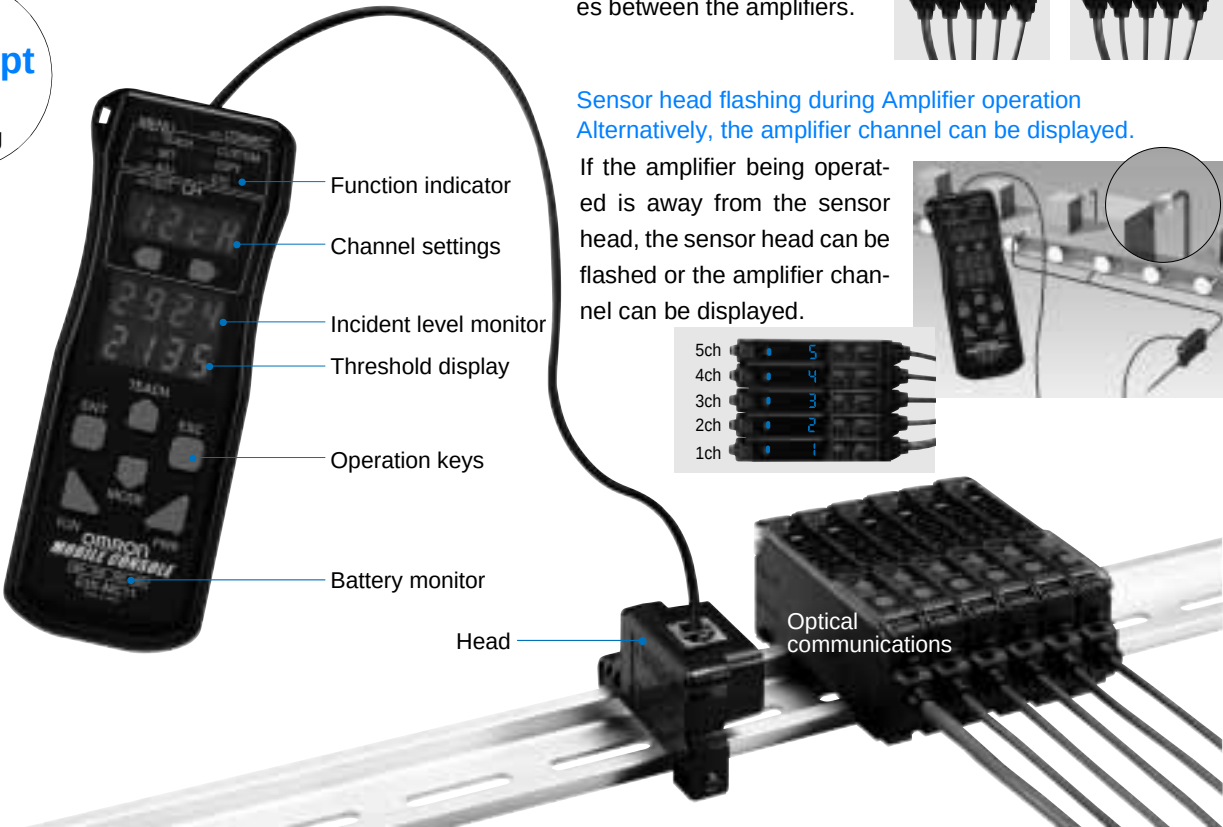
Differences in incident light avoided by group zero-reset.

The incident levels of several amplifiers can be batch-reset to zero by the group zero-reset. This feature is useful for reducing differences between the amplifiers.



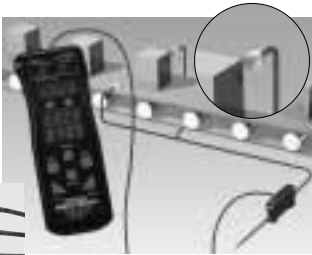
Incident level and threshold can be displayed simultaneously.

New Concept
Patent pending



Sensor head flashing during Amplifier operation
Alternatively, the amplifier channel can be displayed.

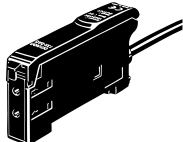
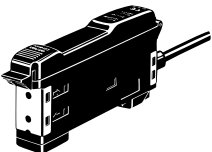
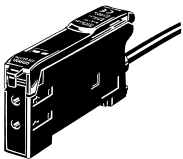
If the amplifier being operated is away from the sensor head, the sensor head can be flashed or the amplifier channel can be displayed.



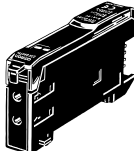
Ordering Information

amplifier units

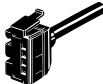
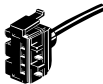
Prewired

Item	Shape	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-DA11-N	E3X-DA41-N
Monitor-output models		•ON/OFF output •Monitor output	E3X-DA21-N	E3X-DA51-N
Mark-detecting models (Blue LED)		ON/OFF output	E3X-DAB11-N	E3X-DAB41-N
Mark-detecting models (Green LED)			E3X-DAG11-N	E3X-DAG41-N
Infrared models			E3X-DAH11-N	E3X-DAH41-N
Differential output type			E3X-DA11D	---
Water-resistant models		ON/OFF output	E3X-DA11V	E3X-DA41V
Twin-output models			E3X-DA11TW	E3X-DA41TW

Connector type

Item	Shape	Applicable Connector (order separately)		Control output	Model	
					NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-DA6	E3X-DA8
		Slave	E3X-CN12			
Monitor-output models		Master	E3X-CN21	•ON/OFF output •Monitor-output	E3X-DA7	E3X-DA9
		Slave	E3X-CN22			
Mark-detecting models (Blue LED)		Master	E3X-CN11	ON/OFF output	E3X-DAB6	E3X-DAB8
		Slave	E3X-CN12			
Mark-detecting models (Green LED)		Master	E3X-CN11		E3X-DAG6	E3X-DAG8
		Slave	E3X-CN12			
Infrared models		Master	E3X-CN11		E3X-DAH6	E3X-DAH8
		Slave	E3X-CN12			
Differential output type		Master	E3X-CN11		E3X-DA6D	---
		Slave	E3X-CN12			
Water-resistant models (M8 Connector)		XS3F-M421-40□-A XS3F-M422-40□-A		ON/OFF output	E3X-DA14V	E3X-DA44V
Twin-output models		Master	E3X-CN21		E3X-DA6TW	E3X-DA8TW
		Slave	E3X-CN22			

amplifier units Connectors (Order Separately) Note: Stickers for Connectors are included as accessories.

Item	Shape	Cable length	No. of conductors	Model
Master connector		2 m	3	E3X-CN11
			4	E3X-CN21
Slave con- nector			1	E3X-CN12
			2	E3X-CN22

Sensor I/O Connectors (Order separately)

Size	Cable type	Shape	Cable length		Model
M8	Standard cable	Straight connector 	2 m	4 conductors	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped connector 	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A

Mobile Console (Order Separately)

Shape	Model	Remarks
	(Set form) E3X-MC11	Mobile Console with head, cable, and AC adapter provided as accessories. Power supply provided by chargeable battery
	E3X-MC11-C1	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

In general, amplifier units and connectors are sold separately.

Refer to the following tables for order placement.

amplifier units			Applicable Connector (order separately)	
Type	NPN	PNP	Master connector	Slave connector
Standard models	E3X-DA6	E3X-DA8	E3X-CN11	E3X-CN12
Mark-detect- ing models	E3X-DAB6	E3X-DAB8		
	E3X-DAG6	E3X-DAG8		
Infrared models	E3X-DAH6	E3X-DAH8	E3X-CN21	E3X-CN22
Differen- tial output	E3X-DA6D	---		
Monitor-out- put models	E3X-DA7	E3X-DA9		
Twin-output models	E3X-DA6TW	E3X-DA8TW		

When using 5 sets

amplifier units (5 Units)	+	1 Master Connector + 4 Slave Connectors

Rating/Performance

Amplifier units

Prewired

Item	Type		Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-resis- tant models	Twin-output models
	Model	NPN output	E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
		PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Light source (wave length)			Red LED (660 nm)		Blue LED (470 nm)	Green LED (525 nm)	Infrared LED (870 nm)	Red LED (660 nm)	
Power supply voltage			12 to 24 VDC ±10%, ripple (p-p) : 10% max.						
Power consumption			Normal: Power consumption 960 mW max. (power consumption 40 mA max. at supply voltage 24 V) Eco mode: Power consumption 720 mW max. (power consumption 30 mA max. at supply voltage 24 V) Digital display OFF: Power consumption 600 mW max. (power consumption 25 mA max. at supply voltage 24 V)						
Control output	ON/OFF output		Load current 50 mA (residual voltage NPN/PNP: 1 V max. each) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON, switch selectable						
	Monitor output		---	1 to 5 VDC, load 10 kΩ min.	---				
Protective circuits			Reverse polarity protection, output short-circuit protection, mutual interference prevention (possible for up to 10 amplifiers)						
Response time	Super-high-speed mode:		0.25 ms for operation and reset respectively						0.5 ms for operation and reset respectively
	Standard mode:		Operation/reset: 1 ms each						2 ms for operation and reset respectively
	Super-long-distance mode:		4 ms for operation and reset respectively						7 ms for operation and reset respectively
Sensitivity setting			Teaching or manual method						
Functions	Timer functions		OFF delay 0 to 200 ms (1 to 20: 1 ms increments, 20 to 200 ms: 5 ms increments), when the Mobile Control is used, select either OFF delay, ON delay or one shot.						
	Automatic power control (APC)		Fiber-optic current digital control		---			Fiber-optic current digital control	
	Zero reset		Yes (negative indication possible)						
	Initial reset		Yes (setting conditions initialized)						
	Monitor focus		---	Upper and lower limit values of output range can be set per digital value of 100	---				
Indicator lamp			Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital incident level percent display (red), incident level & threshold value double-bar display (green, red), 7-segment digital threshold value display (red)						
Display timing			Normal/peak hold/bottom hold selectable						
Display direction			Normal/reverse selectable						
Optical axis adjustment function			Yes (hyper flashing emission function)						
Ambient lighting			Incandescent lamp: 10,000 lux max. Sunlight 20,000 lux max.						

Model	Type	Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-res-istant models	Twin-output models
	NPN output	E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
Item	PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Ambient temperature		Operating: Groups of 1 to 3 amplifiers: -25 to +55°C, Groups of 4 to 11 amplifiers: -25 to +50°C, Groups of 12 to 16 amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation)						
Ambient humidity		Operating/Storage: 35% to 85% RH (with no condensation)						
Insulation resistance		20 M Ω min. at 500 VDC						
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute						
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions						
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions						
Protective structure		IEC 60529 IP50 (with Protective Cover attached)					IEC 60529 IP66 (with protective cover at-tached)	IEC 60529 IP50 (with protective cover attached)
Connection method		Prewired models (standard length: 2 m)						
Weight (Packed state)		Approx. 100 g					Approx. 110 g	Approx. 100 g
Mate-rial	Case	PBT (polybutylene terephthalate)						
	Cover	Polycarbonate						Polyethersul-fone
Accessories		Instruction manual						

Connector type

Specifications that differ from those of the prewired type

Model	Type	Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-res-istant models (See note.)	Twin-out-put models
	NPN output	E3X-DA6	E3X-DA7	E3X-DAB6	E3X-DAG6	E3X-DAH6	E3X-DA14V	E3X-DA6TW
Item	PNP output	E3X-DA8	E3X-DA9	E3X-DAB8	E3X-DAG8	E3X-DAH8	E3X-DA44V	E3X-DA8TW
Connection method		Connector type					M8 connector	Connector
Weight (Packed state)		Approx. 55 g					65 g	Approx. 55 g

* For waterproof type only, voltage resistance is 500 VAC 50/60 Hz 1 min

Amplifier unit Connectors

Item	Model	E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 m Ω max. (20 mVDC max., 100 mA max.) [By connection with amplifier unit and connection with adjacent connector (except conductor resistance of cable)]	
No. of insertions		50 times (By connection with amplifier unit and connection with adjacent connector)	
Material	Housing	PBT (polybutylene terephthalate)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (Packed state)		Approx. 55 g	Approx. 25 g

Mobile Console

Item	Model	E3X-MC11
Supply volt-age		Charged with AC adapter
Connection method		Connected via adapter
Weight (packed state)		Approx. 580 g (Console only: 120 g)
For details of the Mobile Console, refer to the instruction manual attached to the product.		

Digital Fiber Amplifier

* Differential output digital fiber amplifier (E3X-DA11D/E3X-DA6D)

Applicable fiber unit characteristic

(Through-beam model)

Fiber type	Sensitivity switching 11 steps can be set Re- sponse time	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)					Standard object (mm) *1 Minimum sensing object *2 (Opaque object) de- fault	
		HIGH			LOW			
		1	2	3-11	1	2		3-11
		270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570μs	0.5 or 1 ms		1 to 200 ms or 2 to 400 ms
E32-ET11R		240 (1680)	280 (1960)	370 (2590)	140(980)	180(1260)	240 (1680)	1 mm dia. (0.01 mm dia.) (0.3 mm dia.)*3 (0.2 mm dia.)
E32-ET21R		50	60	80	30	40	50	
E32-T16WR		580	690	910	350	450	580	
E32-T16PR		380	450	600	230	290	380	

*1. The sensing object is operating.

*2. Value applied when the response time is set to 3-11. The value can be detected if the temperature varies within the operating ambient temperature. (Value when the sensing object is operating)

*3. The digital value is 1000 and the value can be detected in each detection area.

Refer to the E3X-DA-N for the note of the fiber unit.

(Reflective model)

Sensitivity switching		Sensing distance (mm)*1					Standard object (mm) *2 Minimum sensing object *3 (Opaque object) de- fault	
		HIGH			LOW			
11 steps can be set		1	2	3-11	1	2		3-11
Fiber type	Re- sponse time	270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570μs	0.5 or 1 ms		1 to 200 ms or 2 to 400 ms
E32-ED11R		80	90	120	45	60	80	150 x 150 (0.01 mm dia.)
E32-ED21R		13	15	20	7	10	13	25 x 25 (0.01 mm dia.)

*1. Sensing distance indicates values for white paper.

*2. The sensing object is operating.

*3. Value applied when the response time is set to 3-11. The value can be detected if the temperature varies within the operating ambient temperature. (Value when the sensing object is operating)

Note: Refer to E3X-DA-N for the note of the fiber unit.

Differences from E3X-DA-N amplifier unit

Item		Differential output type (edge detection type)	
		Prewiring type	amplifier units with Connectors
NPN output		E3X-DA11D	E3X-DA6D
Power consumption		Power consumption 960 mW max. (at power supply voltage 24 V, power consumption 40 mA max.)	
Control output	ON/OFF output	Load current 50 mA (residual voltage NPN/PNP: 1 V max. each) Open collector output type L.ON (ON at edge detection)/D.ON (OFF at edge detection) switch selectable	
Detection mode		One-side edge detection mode/both-side edge detection mode	
Response time		One-side edge detection mode: 270/500 μ s/1/2/4/10/20/30/50/100/200 ms selectable Both-side edge detection mode: 570 μ s/1/2/4/10/20/30/50/100/200/400 ms selectable	
Functions	Timer function	OFF delay timer for L.ON ON delay timer for D.ON 0 to 5 s (1 to 20 ms: 1 ms increments, 20 to 20 ms: 5 ms increments, 200 ms to 1 s: 100 ms, 1 to 5 s: 1 s increments)	
	APC	Yes	
	Zero reset	Yes (negative indication)	
	Initial reset	Yes (setting conditions initialized)	
	Sensitivity switching	Yes (HIGH/LOW)	
	Teaching level	One-point teaching level 1 to 50% variable (1% increments)	
Indicator lamp		Operation indicator (orange), 7-segment incident level display (red), 7-segment digital edge detection level display (red)	

For the outline drawings and other details, refer to the instruction manuals attached to the products.

Output Circuit Diagram

NPN output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-DA11-N E3X-DAB11-N E3X-DAG11-N E3X-DAH11-N E3X-DA11V E3X-DA6 E3X-DAB6 E3X-DAG6 E3X-DAH6 E3X-DA14V	Light ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	L•ON (LIGHT ON)	Connector Pin Arrangement Note: Pin 2 is not used.
	Dark ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	D•ON (DARK ON)	
E3X-DA21-N E3X-DA7	Light ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	L•ON (LIGHT ON)	Note: Load resistance: 10Ωmin.
	Dark ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	D•ON (DARK ON)	
E3X-DA11TW E3X-DA6TW	Light ON	CH1/ Incident light CH2 No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	L•ON (LIGHT ON)	
	Dark ON	CH1/ Incident light CH2 No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate Release (Between brown and black)	D•ON (DARK ON)	

Note: With E3X-DA□TW models, only channel 1 is output when set for area sensing operation.
 L•ON The range between the CH1 and CH2 thresholds turns ON
 D•ON The range between the CH1 and CH2 thresholds turns OFF (CH2 is always OFF)

PNP output

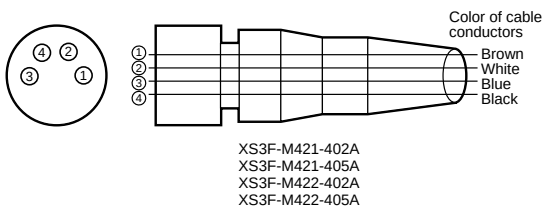
Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-DA41-N E3X-DAB41-N E3X-DAG41-N E3X-DAH41-N E3X-DA41V E3X-DA8 E3X-DAB8 E3X-DAG8 E3X-DAH8 E3X-DA44V	Light ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	L•ON (LIGHT ON)	Connector Pin Arrangement Note: Pin 2 is not used.
	Dark ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	D•ON (DARK ON)	
E3X-DA51-N E3X-DA9	Light ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	L•ON (LIGHT ON)	Note: Load resistance: 10kΩmin.
	Dark ON	Incident light No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	D•ON (DARK ON)	
E3X-DA41TW E3X-DA8TW	Light ON	CH1/ Incident light CH2 No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	L•ON (LIGHT ON)	
	Dark ON	CH1/ Incident light CH2 No incident light Operation Indicator (orange) ON OFF Output transistor ON OFF Load Operate (relay) Release (Between blue and black)	D•ON (DARK ON)	

Note: With E3X-DA□TW models, only channel 1 is output when set for area sensing operation.

L•ON The range between the CH1 and CH2 thresholds turns ON

D•ON The range between the CH1 and CH2 thresholds turns OFF (CH2 is always OFF)

Connectors (Sensor I/O Connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	Power supply (+V)
	White	②	-
	Blue	③	Power supply (0 V)
	Black	④	Output

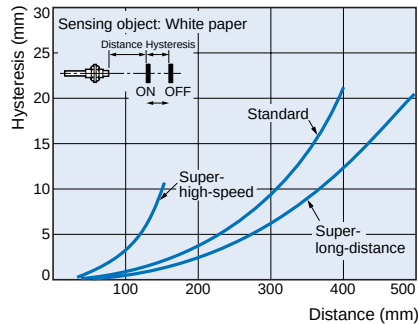
Note: Pin 2 is open.

Characteristic data (default)

Hysteresis vs. sensing distance

Reflective model

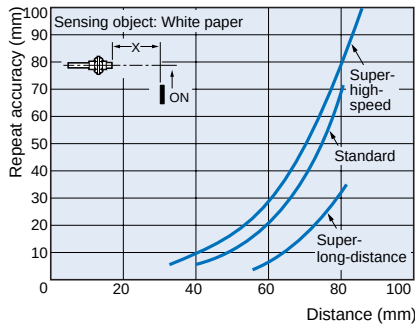
E32-D11L



Repeated accuracy vs. sensing distance

Reflective model

E32-DC200

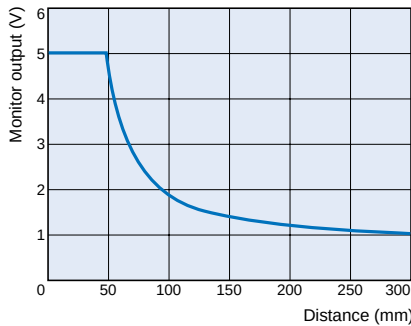


Monitor output vs. distance

(In standard mode)

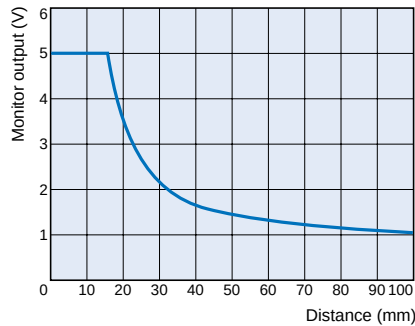
Through-beam

E32-TC200



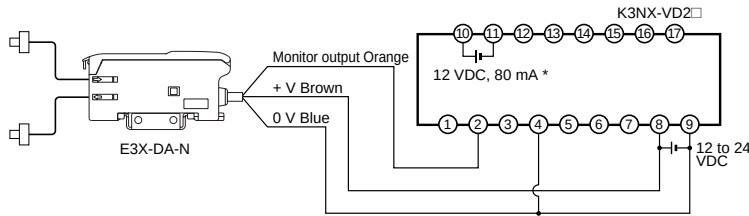
Reflective model

E32-DC200



Connection

Connection with linear sensor controller K3NX-VD2□



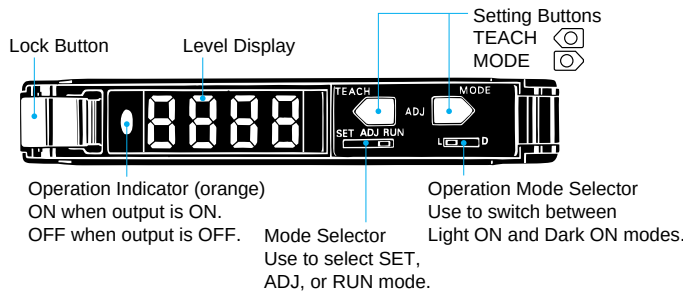
* Use this service power supply for the Sensor with reference to the power consumption of each Sensor.

- Note: 1. Various I/O Units are available for the K3NX. Select an appropriate output type depending on the application.
2. For details about the K3NX, refer to the K3NX Datasheet (N084) or the K3NX Operation Manual (N90).
3. This wiring is for the K3NX, with DC power supply specifications and the Monitor (Analog) Sensor with DC power supply specifications. Check respective power supply specifications before wiring them.

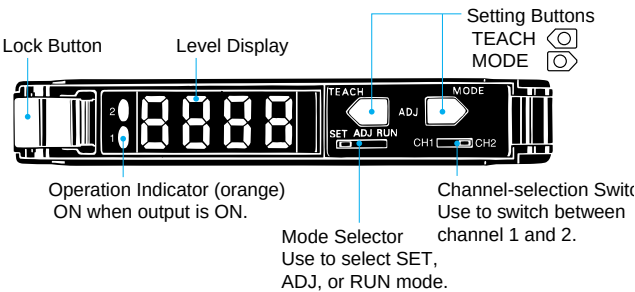
Nomenclature:

amplifier units

Standard, monitor-output, mark-detecting, infrared, and water-resistant models

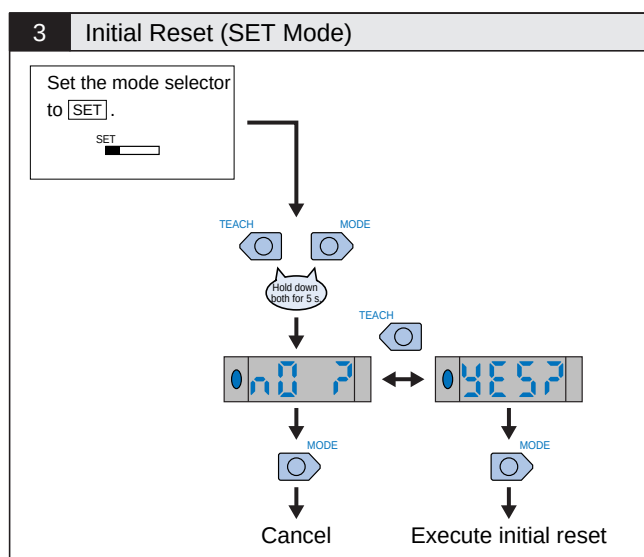
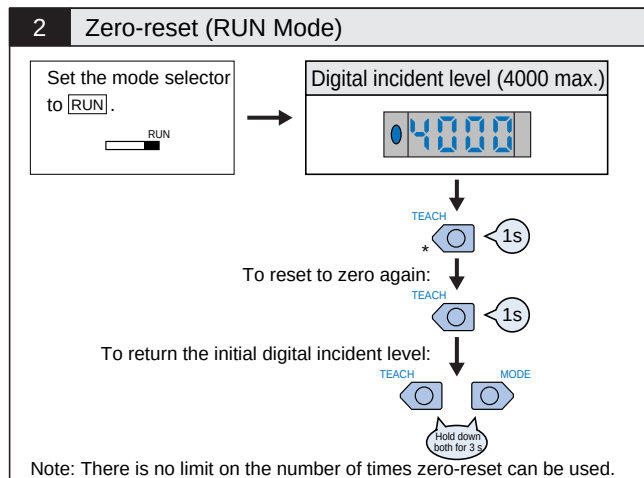
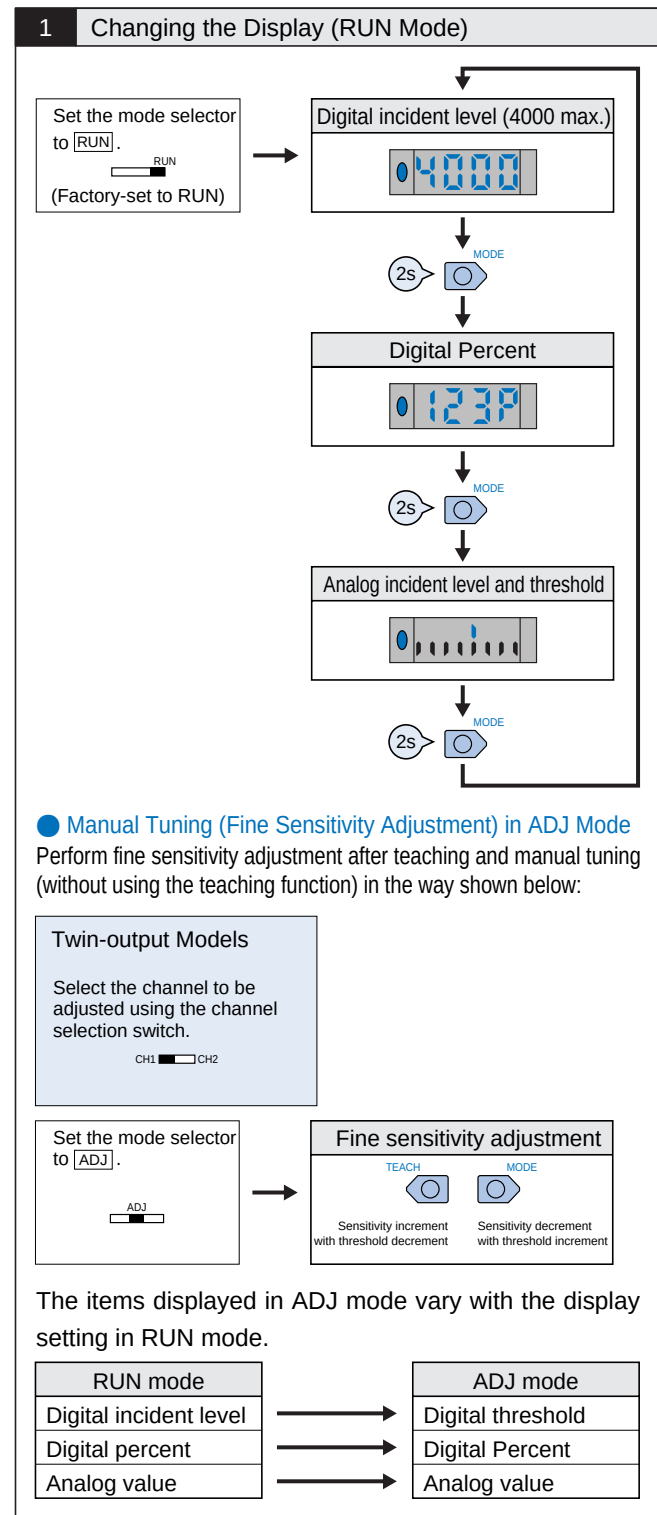


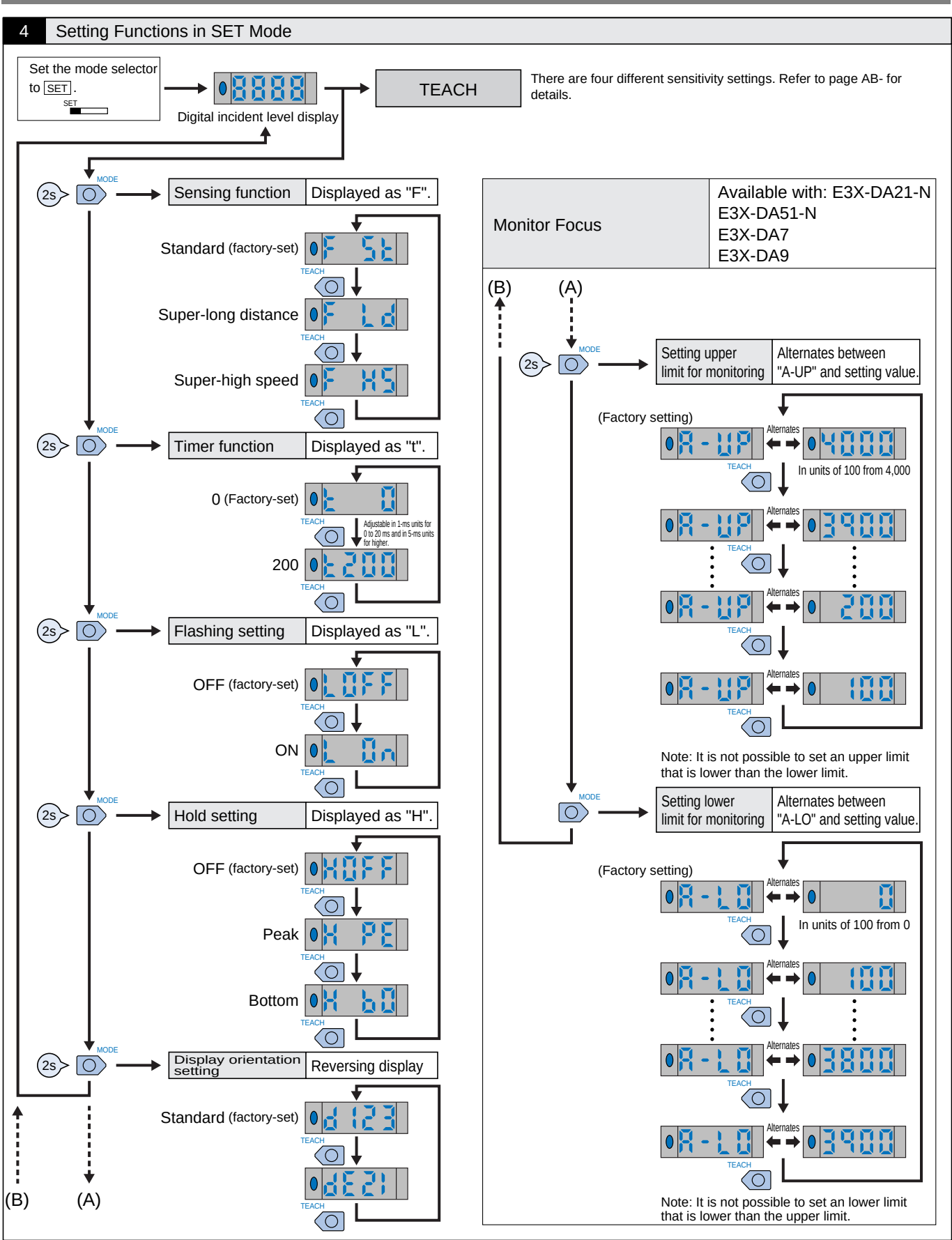
Twin-output models



Operation

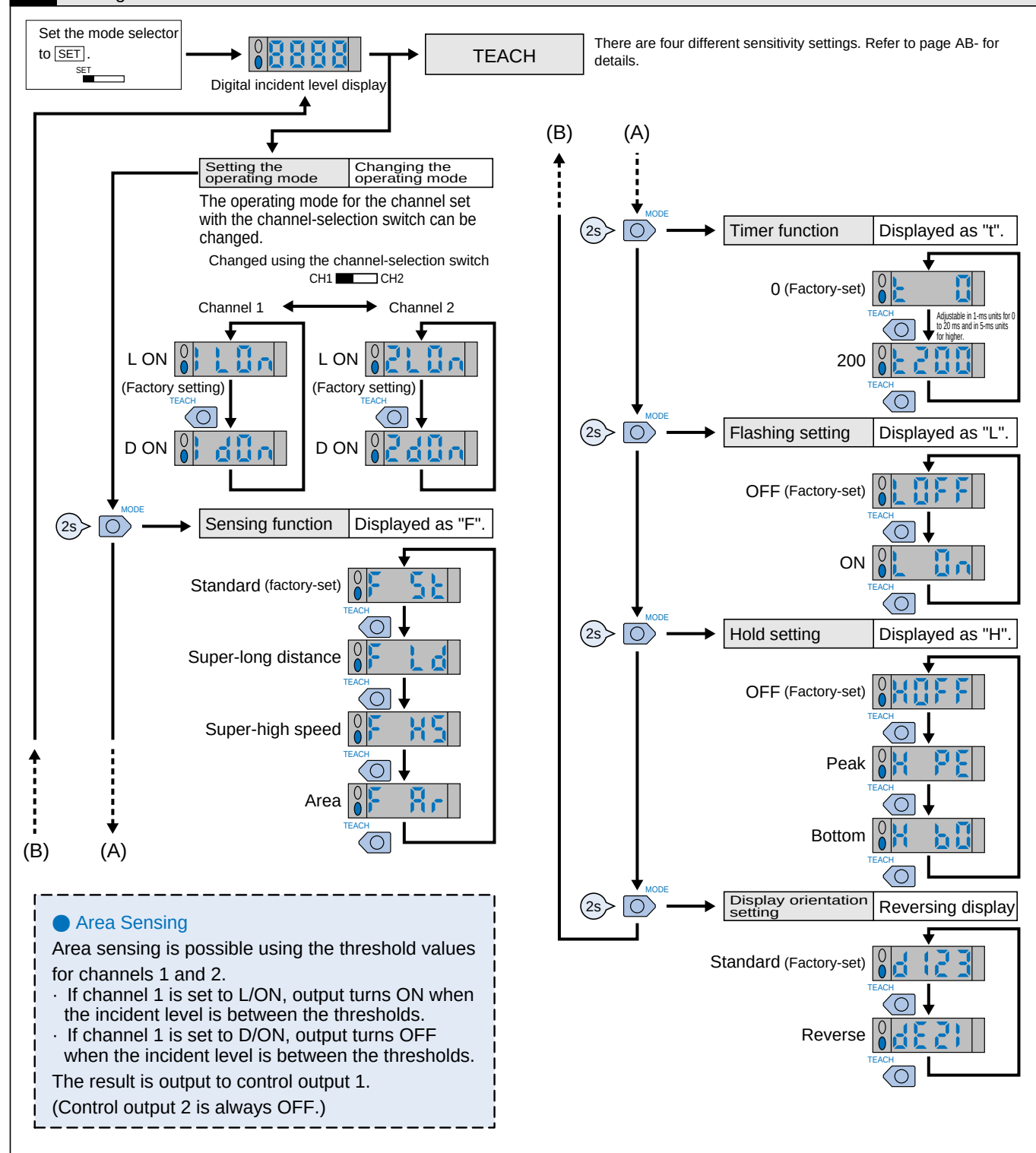
General





Twin-output models

4 Setting Functions in SET Mode



General

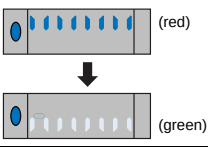
When teaching is performed (SET mode)

- The four types of teaching given below are available.
- Once setting is made, operation is performed in the preset status thereafter. When a teaching error occurs, the level indicators flash in red. Restart setting from the beginning.

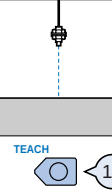
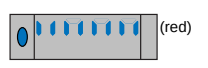
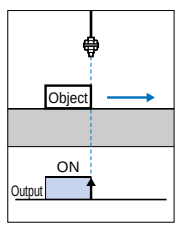
Twin-output models only Select the channel to be adjusted using the channel selection switch. CH1 ☐ CH2 ☐

Set the mode selector to SET. SET ☐

Maximum Sensitivity Setting

Proce- dure	Operation
1	Set the mode selector to SET. 
2	Press the TEACH button for 3 seconds min. 
3	Setting is completed when the red-lit level indicators turn to green. Then they return to the digital incident level display. 
4	Set to RUN mode. 

One-point without-object teaching

Proce- dure	Operation
1	Set the mode selector to SET. 
2	Press the SET button once (about 1 s). 
3	Setting is completed when the red level indicators are turned ON. They then return to the digital incident level display. 
4	Set to RUN mode. 
5	The threshold is automatically set with the object. 

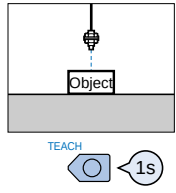
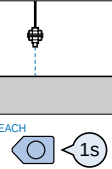
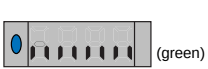
Note: If one-point teaching is not available because the difference in level is too fine, try two-point teaching.

Operation Mode Selector

Operating mode	Operation
Light ON L•ON	 (Factory-set)
Dark ON D•ON	

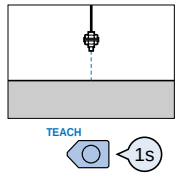
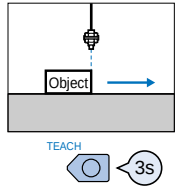
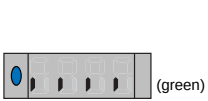
There is no operation mode selector for twin-output models.

Two-point With/Without-object Teaching

Proce- dure	Operation
1	Set the mode selector to SET. 
2	With the work present, press the SET button once (about 1 s). 
3	The level indicators are lit red. 
4	If no work is pending, press the SET button once (about 1 s). 
5	Setting is completed when the green indicators are turned ON. Then they return to the digital incident level display. 
6	Set to RUN mode. 

Note: With and without work may be in any order.

Pin-point teaching (for positioning)

Proce- dure	Operation
1	Set the mode selector to SET. 
2	If no work is pending, press the SET button once (about 1 s). 
3	The level indicators are lit red. 
4	Place the object in the desired position, and press the TEACH button for 3 seconds min. 
5	Setting is completed when the green indicators are turned ON. Then they return to the digital incident level display. (Red indicators start flashing if setting is not OK.) 
6	Set to RUN mode. 

Precautions

Correct Use

Amplifier units

Design

Power ON

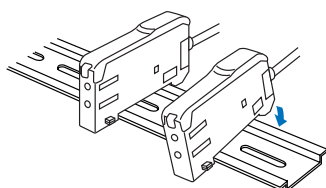
The sensor is ready to sense an object within 200 ms after turning the power ON. If the load and sensor are connected to different power supplies, always turn on the sensor power first.

Mounting

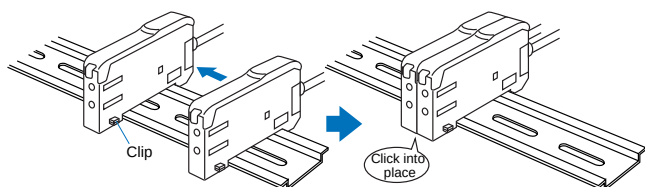
Connection/removing of amplifier units

(Connection)

1. Install the units one by one to the DIN rail.



2. Slide one unit toward the other, match the clips at the front ends, and then bring them together until they "click".



(Removing)

Slide one unit away from the other and remove them one by one. (Do not remove the connected units together from the DIN rail.)

Note: 1. When the amplifier units are connected to each other, the operable ambient temperature changes depending on the number of connected amplifier units. Check "Ratings/Performance".

2. Before connecting or removing the units, always switch power off.

Adjustment

Mutual interference prevention function

The digital display value may vary due to the light from the other sensor. In that case, low the sensitivity (raise the threshold) to stabilize detection.

EEPROM Write Error

If a write error occurs (operation indicator starts flashing) due to power-off, static electricity or other noise in the teaching mode, perform teaching again.

Optical communication

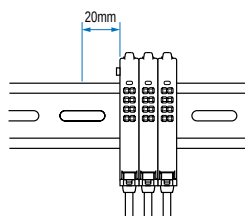
When connecting the amplifier units, assemble them in close contact. During operation, do not slide or dismantle the amplifier units.

Hysteresis adjustment

The Mobile Console allows hysteresis adjustment, but note that the unit may not operate properly if the hysteresis setting is lower than the factory value.

Fitting of Mobile Console head

When fitting the Mobile Console head, a 20 mm or more clearance is needed on the left side.



Use of Mobile Console

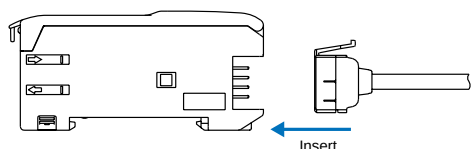
For the twin output type (E3X-DA□□TW), up to 16 channels (eight E3X-DA□□TW units) can be set from the Mobile Console E3X-MC11. (Note that the operation mode and area detection cannot be set.)

Amplifier Unit Connectors

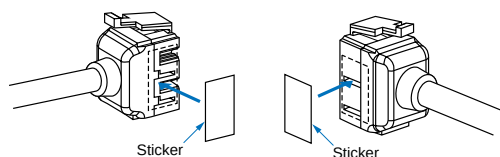
Installation

Connector installation

1. Insert the Master or Slave Connector into the amplifier unit until it clicks into place.



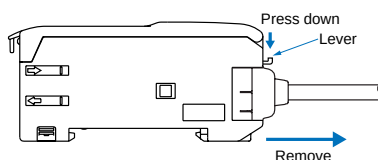
2. Link amplifier units to each other after the master and slave Connectors have been inserted.
3. Apply the supplied seal to the non-connecting surface of the master/slave connector.



Note: Apply seal to the grooved side.

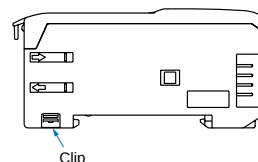
Removing Connectors

1. Slide the slave amplifier unit (s) on which the connector must be removed from the rest of the group.
2. After the amplifier unit (s) has been separated, press down the lever on the connector and remove it. (Do not attempt to remove connectors without separating them from other amplifier units first.)



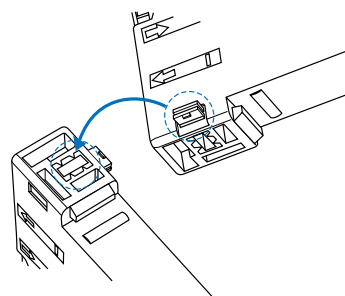
Mounting End Plate (PFP-M)

Depending on the installation, an amplifier unit may move during operation. In this case, use an end plate. Before installing an end plate, remove the clip from the master amplifier unit using a nipper or similar tool.

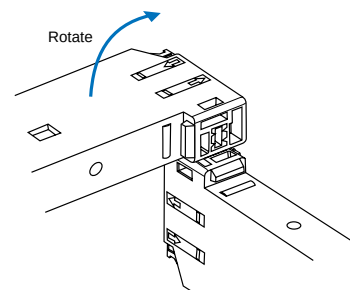


The sensor bottom is also equipped with a clip removing mechanism.

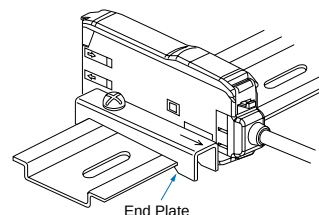
1. Insert the clip to be removed into the slit underneath the clip on another amplifier unit.



2. Remove the clip by rotating the amplifier unit.



When fitting the Mobile Console, set the end plate in the guide as shown in the following figure.



Tensile stress for connectors (including cables)

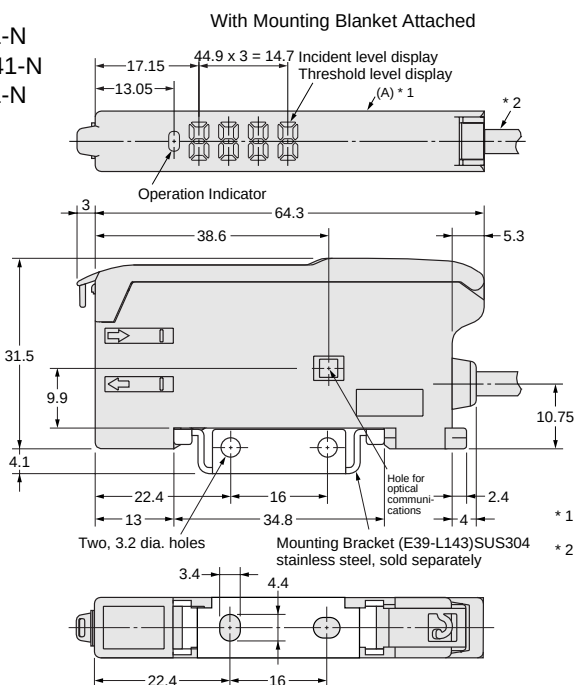
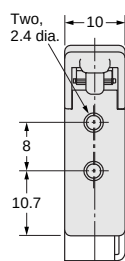
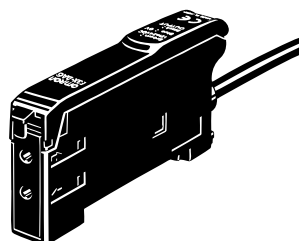
E3X-CN11, E3X-CN21, E3X-CN22: 30 N max.
E3X-CN12: 12N max.

Dimensions (Unit: mm)

Amplifier Units

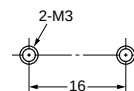
prewired

E3X-DA11-N E3X-DAG11-N E3X-DA21-N
E3X-DAH11-N E3X-DAB11-N E3X-DAB41-N
E3X-DA41-N E3X-DAG41-N E3X-DA51-N
E3X-DAH41-N E3X-DA11D



CAD file E3X_05

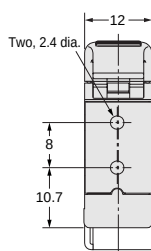
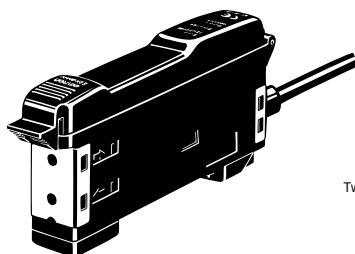
Mounting Holes



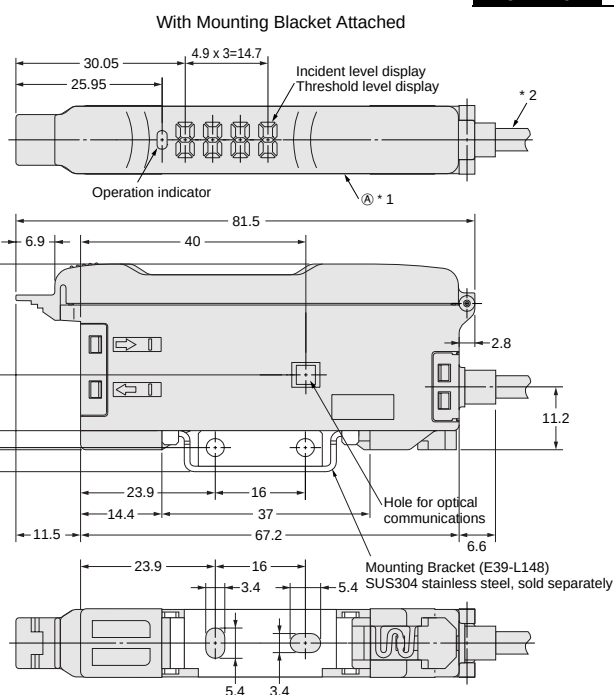
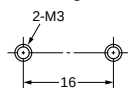
- * 1. The Mounting Bracket can also be used on side A.
- * 2. E3X-DA11-N/DA41-N/DAB11-N: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.45 mm²; insulation diameter: 1.1 mm) is used. E3X-DA21-N/DA51-N: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Amplifier units with Cables, Water-resistant Models

E3X-DA11V
E3X-DA41V



Mounting Holes



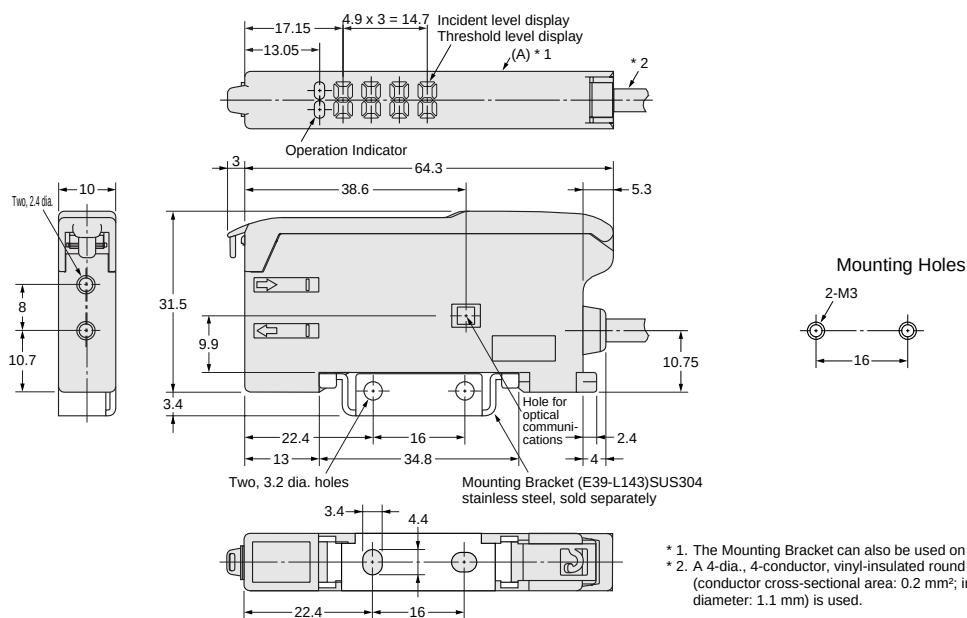
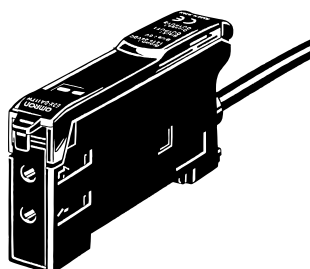
CAD file E3X_10

- * 1. The mounting Bracket can also be used on side A.
- * 2. 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

E3X-DA11TW
E3X-DA41TW

With Mounting Blanket Attached

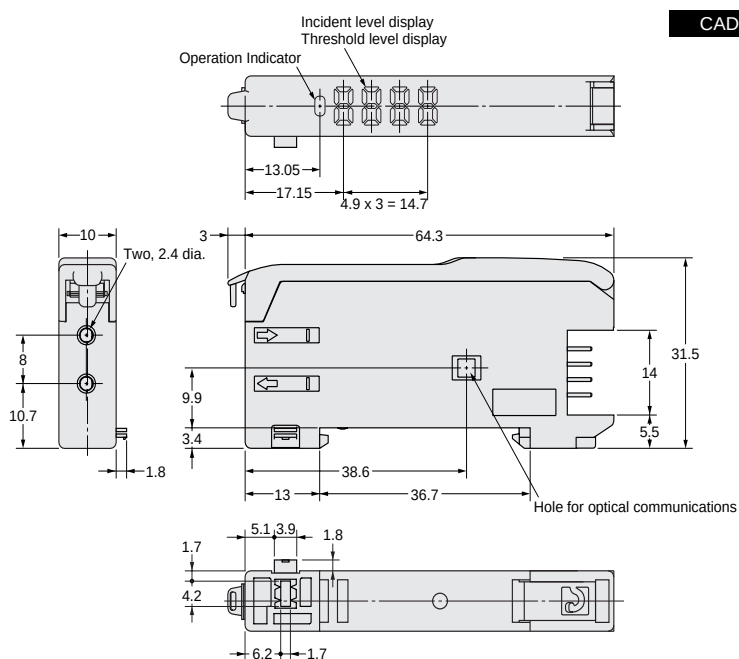
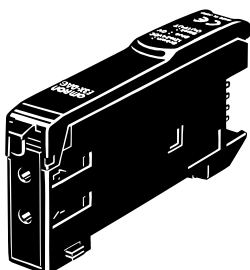
CAD file	E3X 05



- * 1. The Mounting Bracket can also be used on side A.
- * 2. A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Connector type

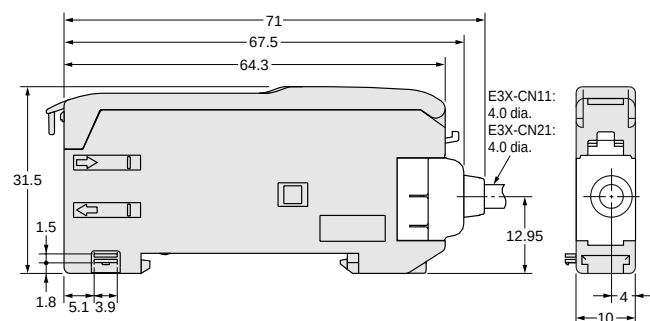
E3X-DA6	E3X-DAG6
E3X-DA7	E3X-DAH6
E3X-DA8	E3X-DAB8
E3X-DA9	E3X-DAG8
E3X-DAB6	E3X-DAH8
E3X-DA6D	



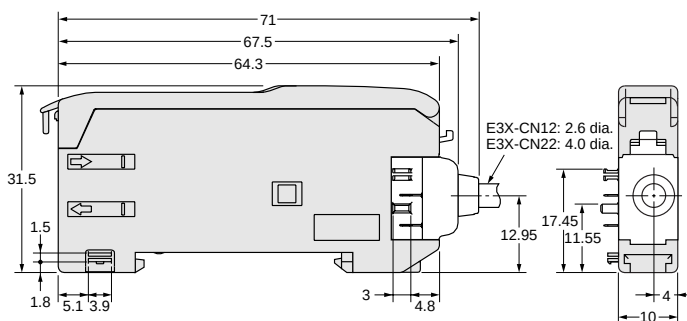
CAD file	E3X 07

CAD file	E3X_08

Dimensions with Master Connector Connected



Dimensions with Slave Connector Connected



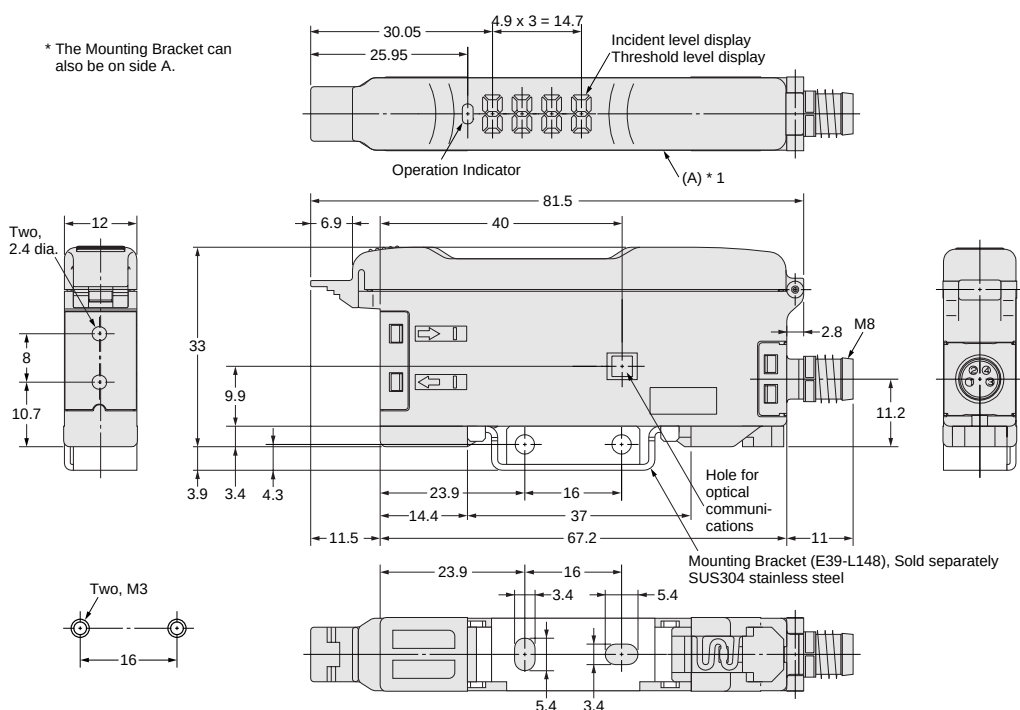
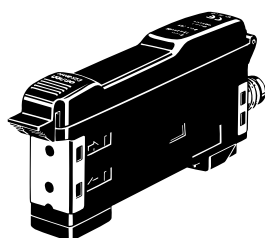
Amplifier Units M8 Connectors, Water-resistant Models

E3X-DA14V
E3X-DA44V

With Mounting Bracket Attached

CAD file E3X_11

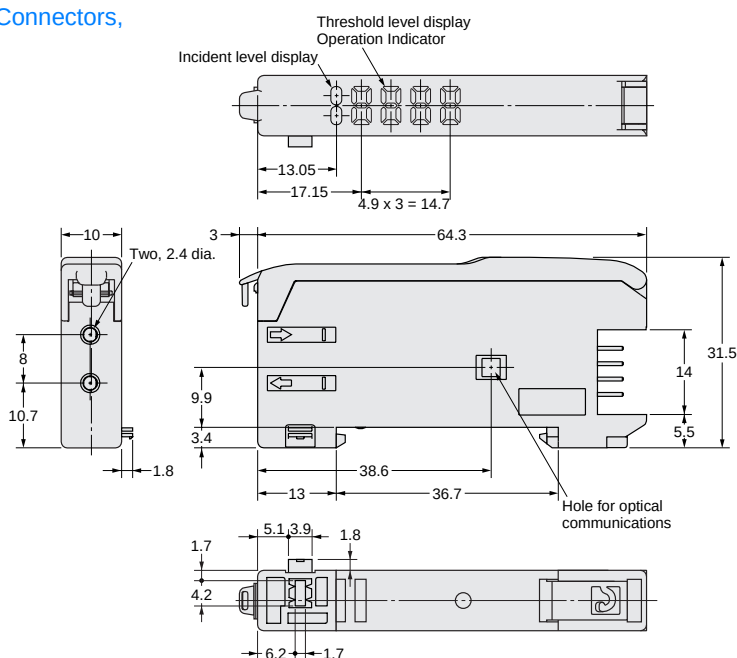
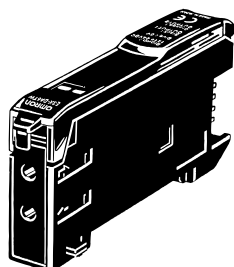
* The Mounting Bracket can also be on side A.



Amplifier units with Standard Connectors, Twin-output Models

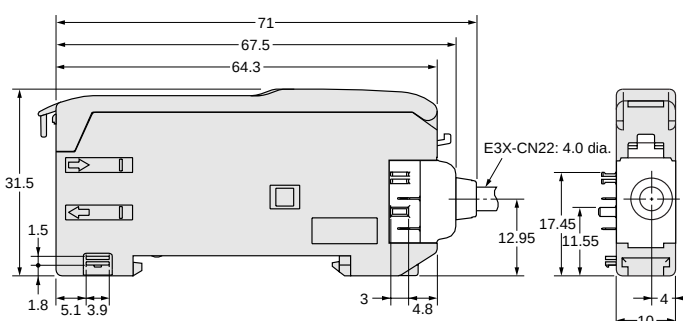
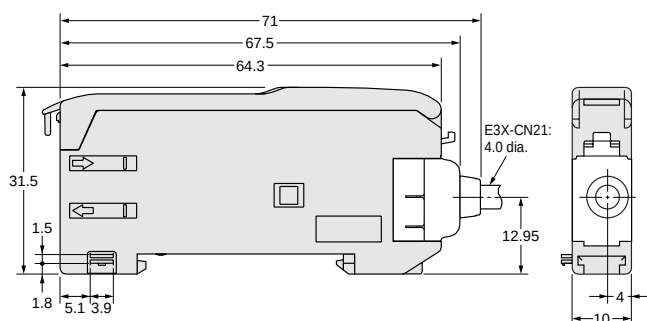
E3X-DA6TW
E3X-DA8TW

CAD file E3X_06



Dimensions with Master Connector Connected

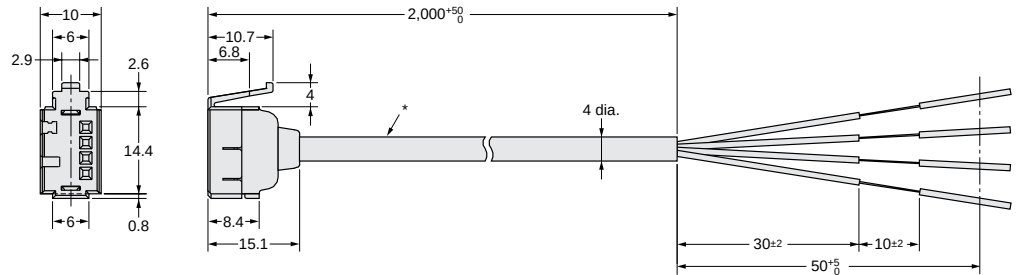
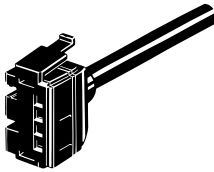
Dimensions with Slave Connector Connected



Amplifier Unit Connectors

Master connector

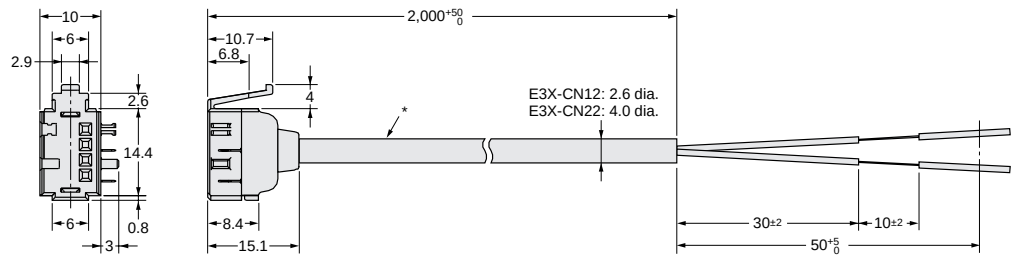
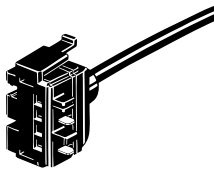
E3X-CN11
E3X-CN21



* E3X-CN11: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.
E3X-CN21: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Slave connector

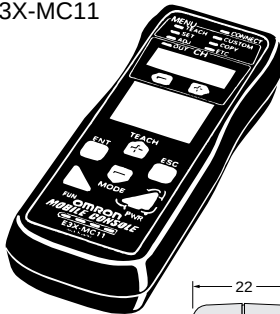
E3X-CN12
E3X-CN22



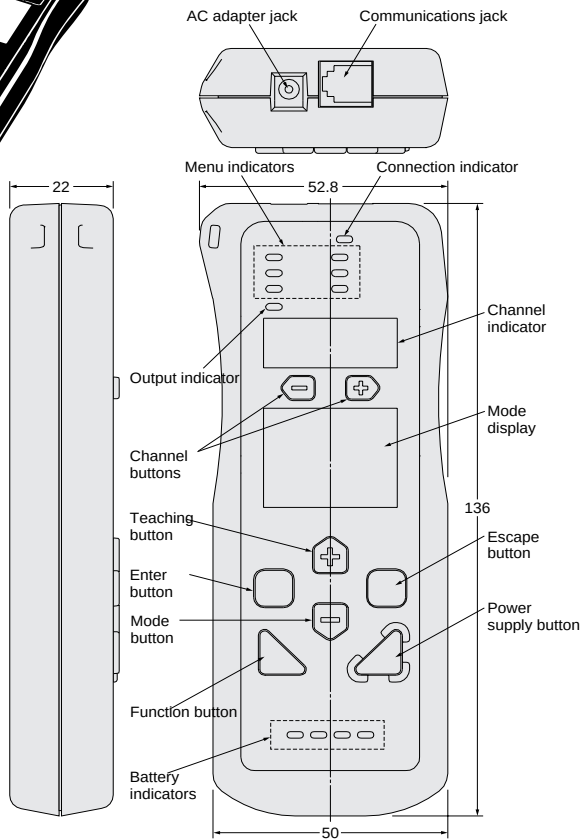
* E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Mobile Console

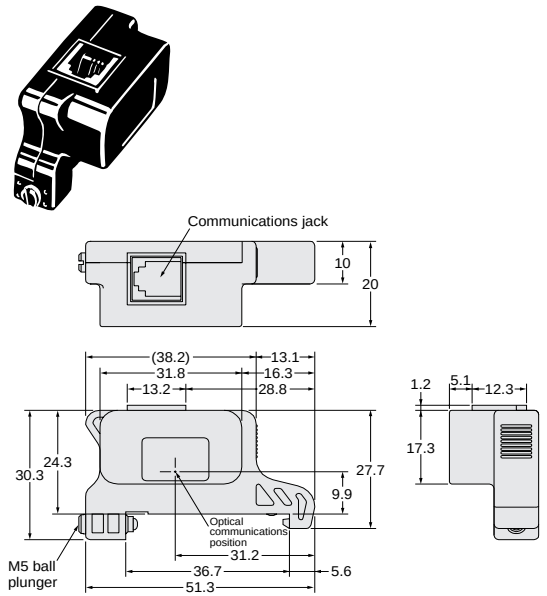
E3X-MC11



Mobile Console



Mobile Console head



2-Channel Fiber Sensors

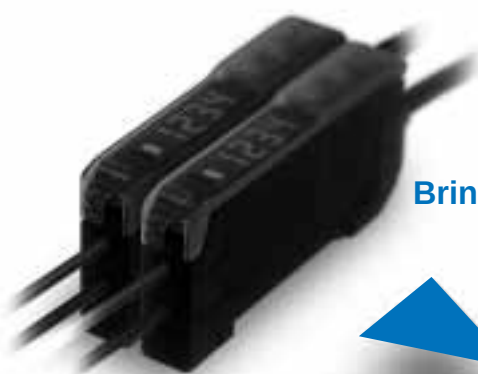
E3X-MDA

- The thinnest profile in the industry, with only 5 mm per channel.
- AND/OR control output.
- Flexible control from the Mobile Console.
- The industry's first power tuning function in a digital amplifier
- Stable long term performance due to Omron's APC function.
- Two large easy to read displays

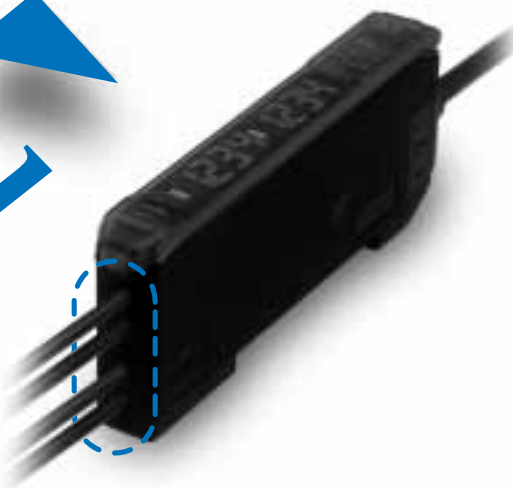
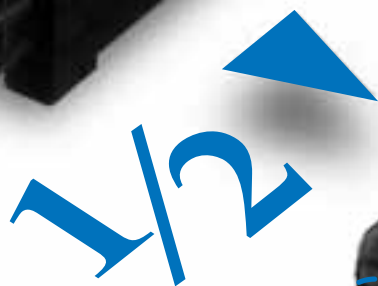
*The remarkable new 2-channel amplifiers.
The Ultimate space saver!! Only 5mm for one channel*



Features

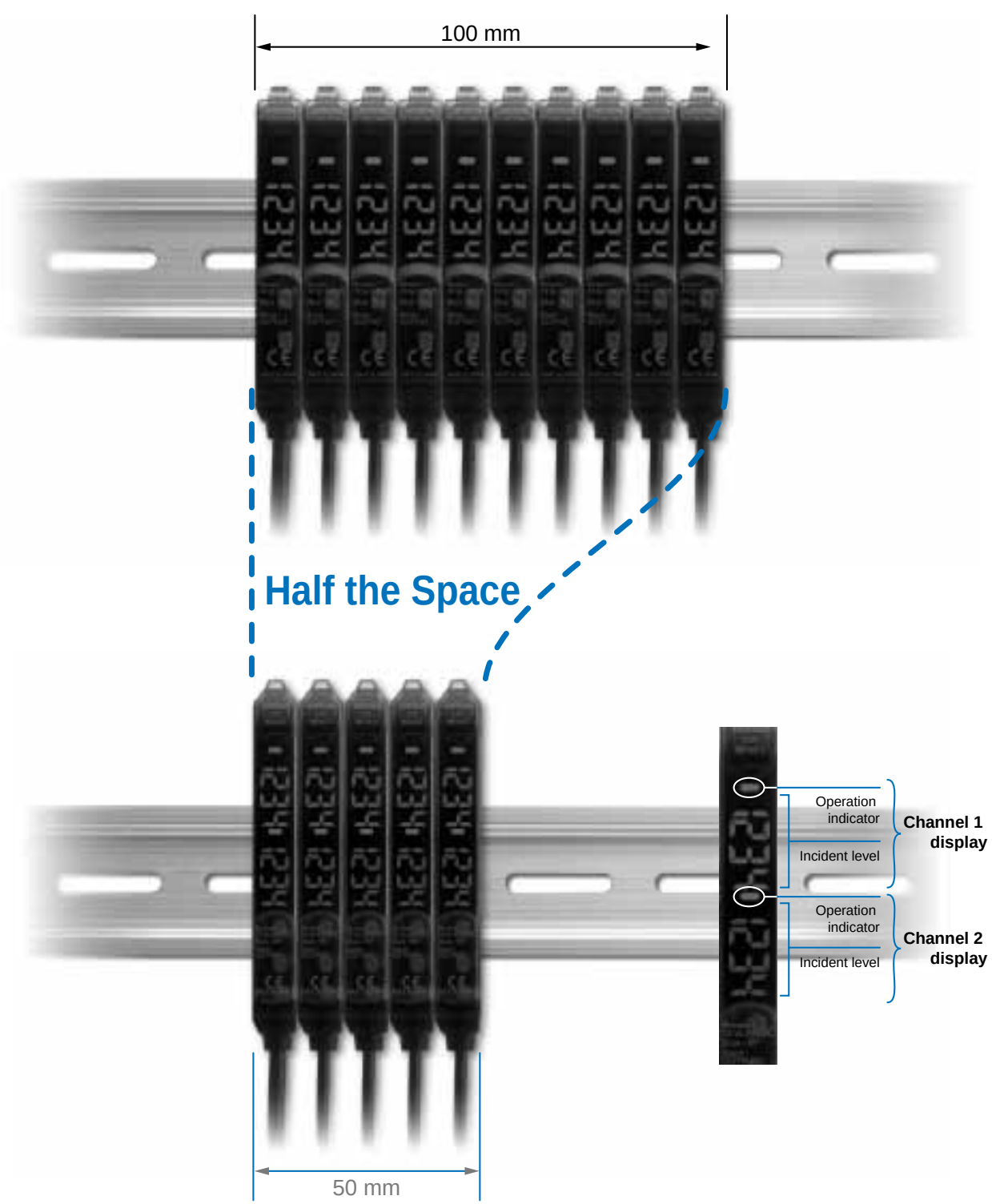


Bringing a new dimension to sensing...



...the 2-channel amplifier has arrived.

Having problems gang-mounting Fiber Sensor Amplifier Units in tight spaces?



Slimmest in the industry — 5 mm per channel. Patent pending

Two Amplifiers squeezed into a body of width 10 mm.
Remarkable space saving of approx. 50%.
Power saving of approx. 40%.
(Savings per channel compared with existing products.)

Checking alignment and mounting of LCD substrates



10 mm

2 ch { Emitting
Receiving
1 ch { Emitting
Receiving



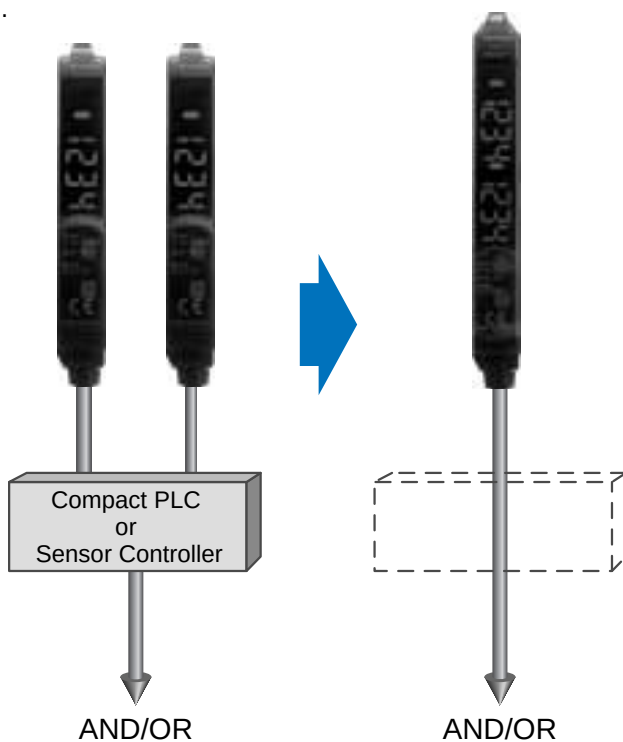
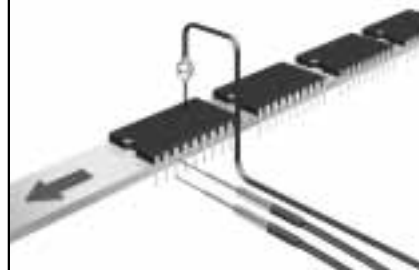
Equipped with AND/OR control output. Patent pending

Two types of control output possible with one Sensor (AND/OR).
Compact PLCs and Sensor Controllers no longer required.

Detection and front/back discrimination of parts



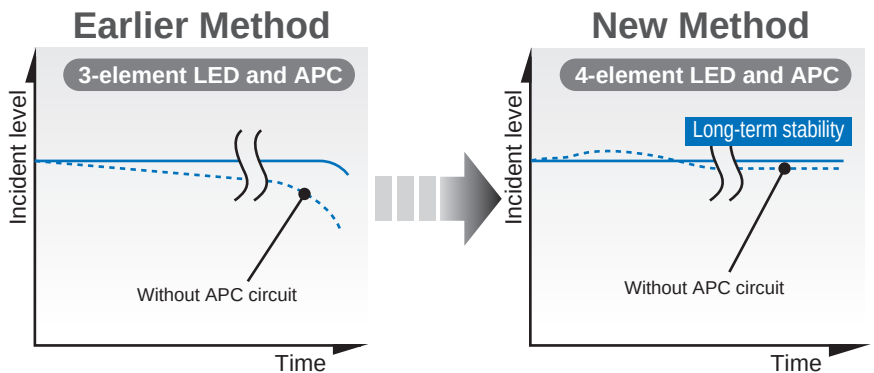
Detection of bends in electronic component leads



Stable, long-term performance with OMRON's APC function

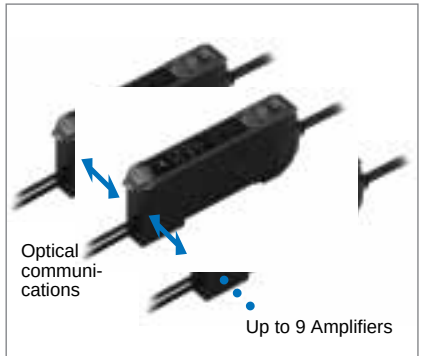
OMRON provides the industry's most stable long-term detection Highest Level of Stability
by using new 4-element LEDs and an APC (Auto Power Control) circuit.

In addition to our unique APC circuit used in the E3X-DA-N Amplifiers to compensate for the deterioration of the LED, the E3X-DA-S uses 4-element LEDs to counteract the deterioration of the light-emitting elements over time and achieve the industry's most stable long-term detection performance. Furthermore, the circuit is designed with excess light capacity, so the Sensors can be used with high stability regardless of whether the APC circuit is ON or OFF.



Optical communications prevents mutual interference.

With optical communications, up to 9 Amplifiers (18 channels) can be mounted together.



Flexible control with Mobile Console.

The Mobile Console, which can also be used with the E3X-DA-S, allows handheld operation of the Fiber Head even when it is separated from the Amplifier.



Ordering Information

Amplifier Units

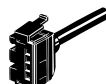
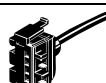
Amplifier Units with Cables

Item	Appearance	Functions	Model	
			NPN output	PNP output
2-channel models		AND/OR output	E3X-MDA11	E3X-MDA41

Amplifier Units with Connectors

Item	Appearance	Functions	Model	
			NPN output	PNP output
2-channel models		AND/OR output	E3X-MDA6	E3X-MDA8

Amplifier Unit Connectors (Order Separately)

Item	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	3	E3X-CN11
			4	E3X-CN21
Slave Connector			1	E3X-CN12
			2	E3X-CN22

Combining Amplifier Units and Connectors

Amplifier Units and Connectors are sold separately. Refer to the following tables when placing an order.

Amplifier Unit			Applicable Connector (Order Separately)	
Model	NPN output	PNP output	Master Connector	Slave Connector
2-channel models	E3X-MDA6	E3X-MDA8	E3X-CN21 (4-wire)	E3X-CN22 (2-wire)

When Using 5 Amplifier Units

Amplifier Units (5 Units)	+	1 Master Connector + 4 Slave Connectors

Mobile Console (Order Separately)

Appearance	Model	Remarks
	E3X-MC11-S (model number of set)	Mobile Console with Head, Cable, and AC adapter provided as accessories
	E3X-MC11-C1-S	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

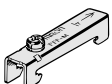
Note: Use the E3X-MC11-S Mobile Console for the E3X-DA-S/MDA-series Amplifier Units. Other Mobile Consoles cannot be used.

Accessories (Order Separately)

Mounting Bracket

Appearance	Model	Quantity
	E39-L143	1

End Plate

Appearance	Model	Quantity
	PFP-M	1

Specifications

Ratings/Characteristics

Amplifier Units

Model Item		Type	2-channel models	
		NPN output	E3X-MDA11	E3X-MDA6
		PNP output	E3X-MDA41	E3X-MDA8
Light source (wavelength)			Red LED (650 nm)	
Supply voltage			12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Power consumption			1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC)	
Control output			Load power supply voltage: 26.4 VDC; open collector; load current: 50 mA max.; residual voltage: 1 V max.	
Circuit protection			Reverse polarity for power supply connection, output short-circuit	
Response time	Super- high- speed mode	NPN	130 μs*1 for operation and reset respectively	
		PNP		
	Standard mode		1 ms for operation and reset respectively	
	High-resolution mode		4 ms for operation and reset respectively	
Sensitivity setting			Teaching or manual method	
Functions	Power tuning		Light emission power and reception gain, digital control method	
	Timer function		Select from OFF-delay, ON-delay, or one-shot timer. 1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)	
	Automatic power control (APC)		High-speed control method for emission current	
	Zero-reset		Display can be reset to zero when required (negative values can be displayed).	
	Initial reset		Settings can be returned to defaults as required.	
	Mutual interference prevention		Possible for up to 9 Units (18 channels)*2, *3	
	I/O settings		Output setting (Select from channel 2 output, AND, OR, leading edge sync, falling edge sync, or differential output)	
Display			Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)	
Digital display			Select from the following: Incident level for channel 1 + incident level for channel 2, Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel	
Display orientation			Switching between normal/reversed display is possible.	
Ambient illumination (receiver side)			Incandescent lamp:10,000 lux max. Sunlight:20,000 lux max.	

Model Item	Type	2-channel models	
	NPN output	E3X-MDA11	E3X-MDA6
	PNP output	E3X-MDA41	E3X-MDA8
Ambient temperature		Operating: Groups of 1 to 2 Amplifiers: -25°C to 55°C Groups of 3 to 10 Amplifiers: -25°C to 50°C Groups of 11 to 16 Amplifiers: -25°C to 45°C (with no icing or condensation) Storage: -30°C to 70°C (with no icing or condensation)	
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)	
Insulation resistance		20 MΩ min. (at 500 VDC)	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance (destruction)		10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions	
Shock resistance (destruction)		500 m/s ² , for 3 times each in X, Y and Z directions	
Enclosure rating		IEC 60529 IP50 (with Protective Cover attached)	
Connection method		Prewired cable	Standard connector
Weight (packed state)		Approx. 100 g	Approx. 55 g
Materials	Case	Polybutylene terephthalate (PBT)	
	Cover	Polycarbonate (PC)	
Accessories		Instruction sheet	

*1: When differential output is selected for the output setting, the second channel output is 200 μs for operation and reset respectively.

*2: Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.

*3: Mutual interference prevention can be used for up to 5 Units (10 channels) if power tuning is enabled.

Amplifier Unit Connectors

Item		E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)	
No. of insertions (destruction)		50 times (The figure for the number of insertions is for connection to the Amplifier Unit and the adjacent Connector.)	
Materials	Housing	Polybutylene terephthalate (PBT)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (packed state)		Approx. 55 g	Approx. 25 g

Mobile Console

Item	E3X-MC11-S
Supply voltage	Charged with AC adapter
Connection method	Connected via adapter
Weight (packed state)	Approx. 580 g (Console only: 120 g)
Refer to <i>Operation Manual</i> provided with the Mobile Console for details.	

Output Circuits

NPN Output

Model	Mode se-lector	Timing chart	Mode se-lector	Output circuit
E3X-MDA11 E3X-MDA6	LIGHT ON (L/ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Light ON	
	DARK ON (D/ ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between brown and black)	Dark ON	

Note: 1. Time Charts for Timer Settings (T: Set Time)

ON delay	OFF delay	One-shot

2. Control Output (AND, OR, Sync) and Time Chart for Timer Settings (T: Set Time)

CH1 ON CH1 OFF CH2 ON CH2 OFF OUT (AND) ON OUT (AND) OFF OUT (OR) ON OUT (OR) OFF OUT (sync) ON OUT (sync) OFF	CH1 ON CH1 OFF CH2 ON CH2 OFF ON delay ON ON delay OFF OFF delay ON OFF delay OFF One-shot ON One-shot OFF

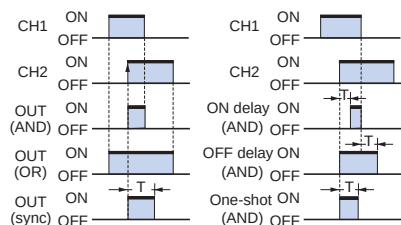
PNP Output

Model	Mode se-lector	Timing chart	State of output transistor	Output circuit
E3X-MDA41 E3X-MDA8	LIGHT ON (L/ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Light ON	
	DARK ON (D/ ON)	CH1/ Incident light CH2 No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Release (Between blue and black)	Dark ON	

Note: 1. Time Charts for Timer Settings (T: Set Time)

ON delay	OFF delay	One-shot

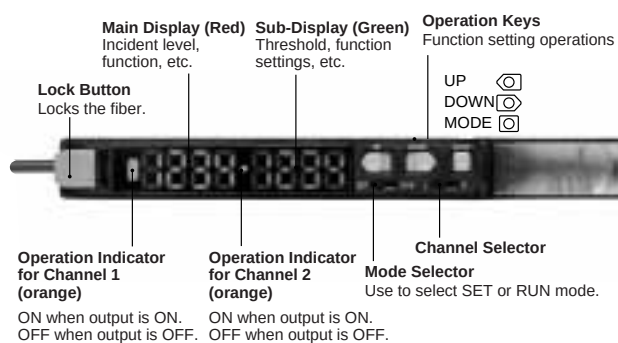
2. Control Output (AND, OR, Sync) and Time Chart for Timer Settings (T: Set Time)



Nomenclature

Amplifier Units

E3X-MDA□



Adjustment Methods

1. Setting the Operation Mode

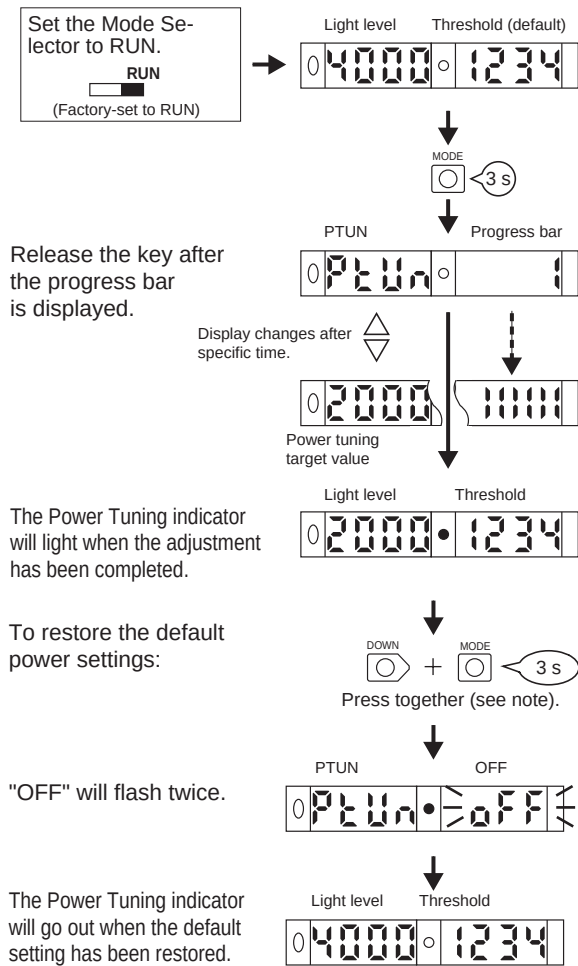
The operation mode is set in SET mode. Refer to *page A-373 5. Setting Functions in SET Mode*.

Set the Channel Selector to the desired channel before making any adjustments or settings. This is true for all adjustments and settings.

2. Adjusting the Power (RUN Mode)

The current incident light level can be adjusted to near the power tuning target value (default: 2,000).

Confirm that the MODE key setting is PTUN (power tuning). The default setting is PTUN. Refer to *page A-373 5. Setting Functions in SET Mode*



* Setting Errors

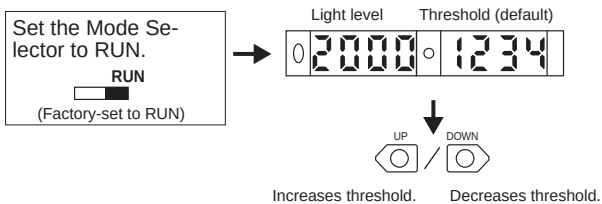
An error has occurred if one of the following displays appears after the progress bar is displayed.

Display	Error	Action
Flashes twice 0 PTUN 0 over PTUN OVER	Over Error The incident light level is too low for the power tuning target value.	The power will not be tuned. The power can be increased up to approximately 5 times the incident light value.
Flashes twice 0 PTUN 0 botm PTUN BOTM	Bottom Error The incident light level is too high for the power tuning target value.	The power will be tuned to the minimum level. The power can be decreased down to approximately 1/25th the incident light value.

Note: Press the DOWN key right after pressing the MODE key.

3. Setting Thresholds Manually (RUN Mode)

A threshold can be set manually. A threshold value can also be fine-tuned using manual setting after teaching.



* Even if the display method for display switching is changed, the threshold will appear on the sub-display when the key is pressed.

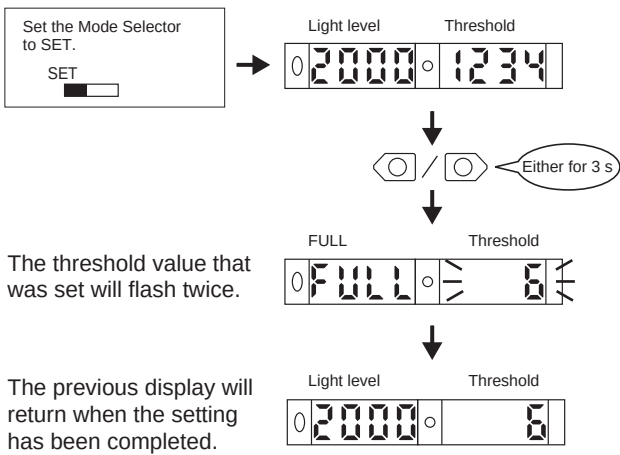
4. Teaching the Threshold Value (SET Mode)

* There are four methods that can be used for teaching, as described below. Use the method most suitable for the application.

* An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. Repeat the operation from the beginning.

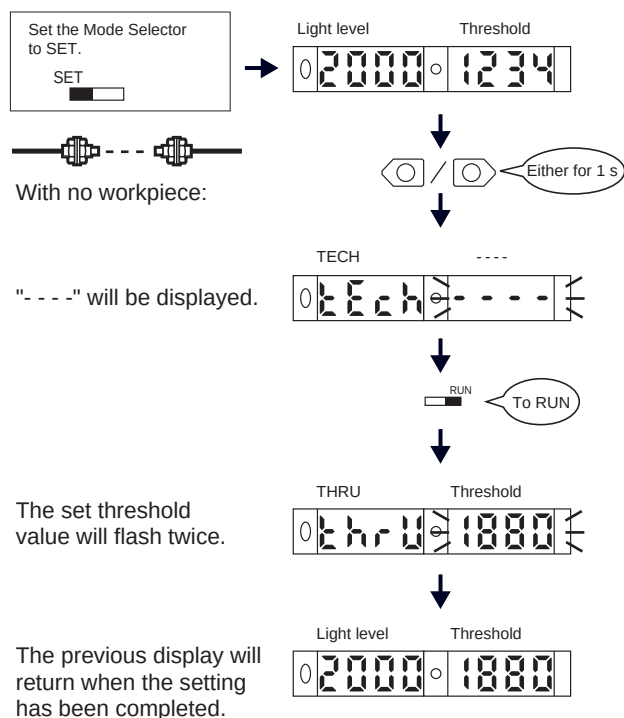
4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set at the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



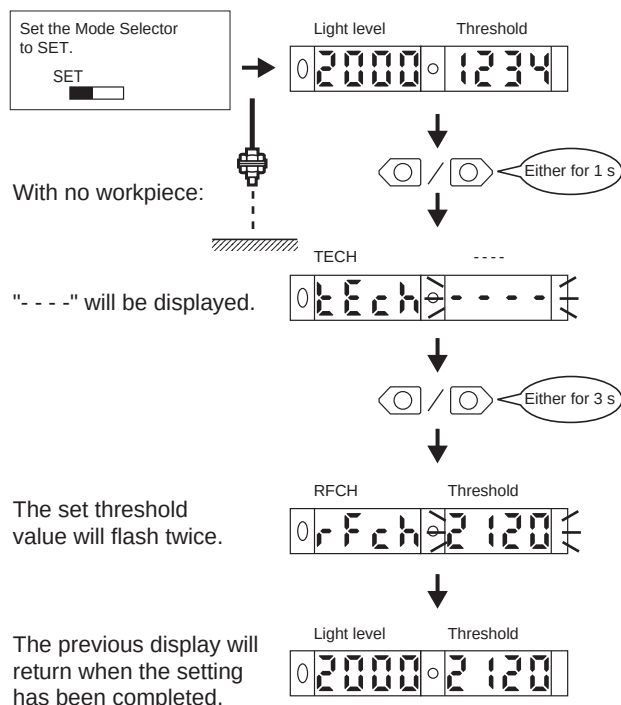
4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold value. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



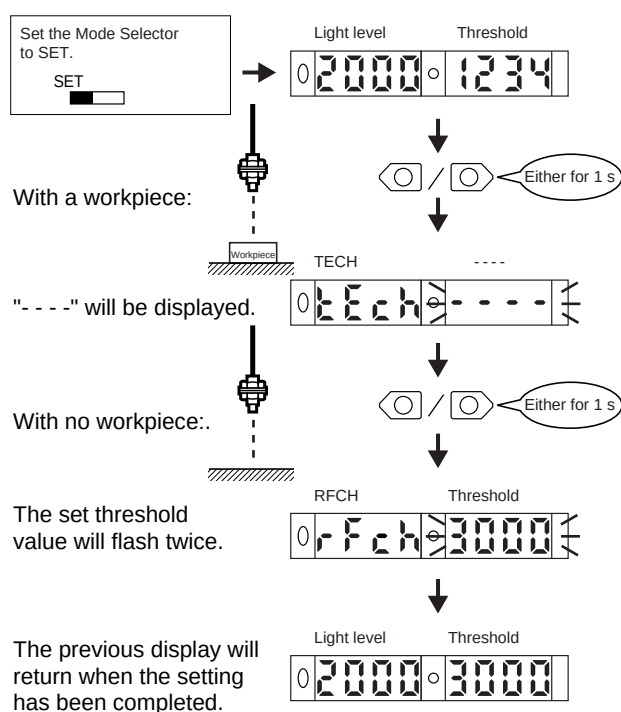
4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold value. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



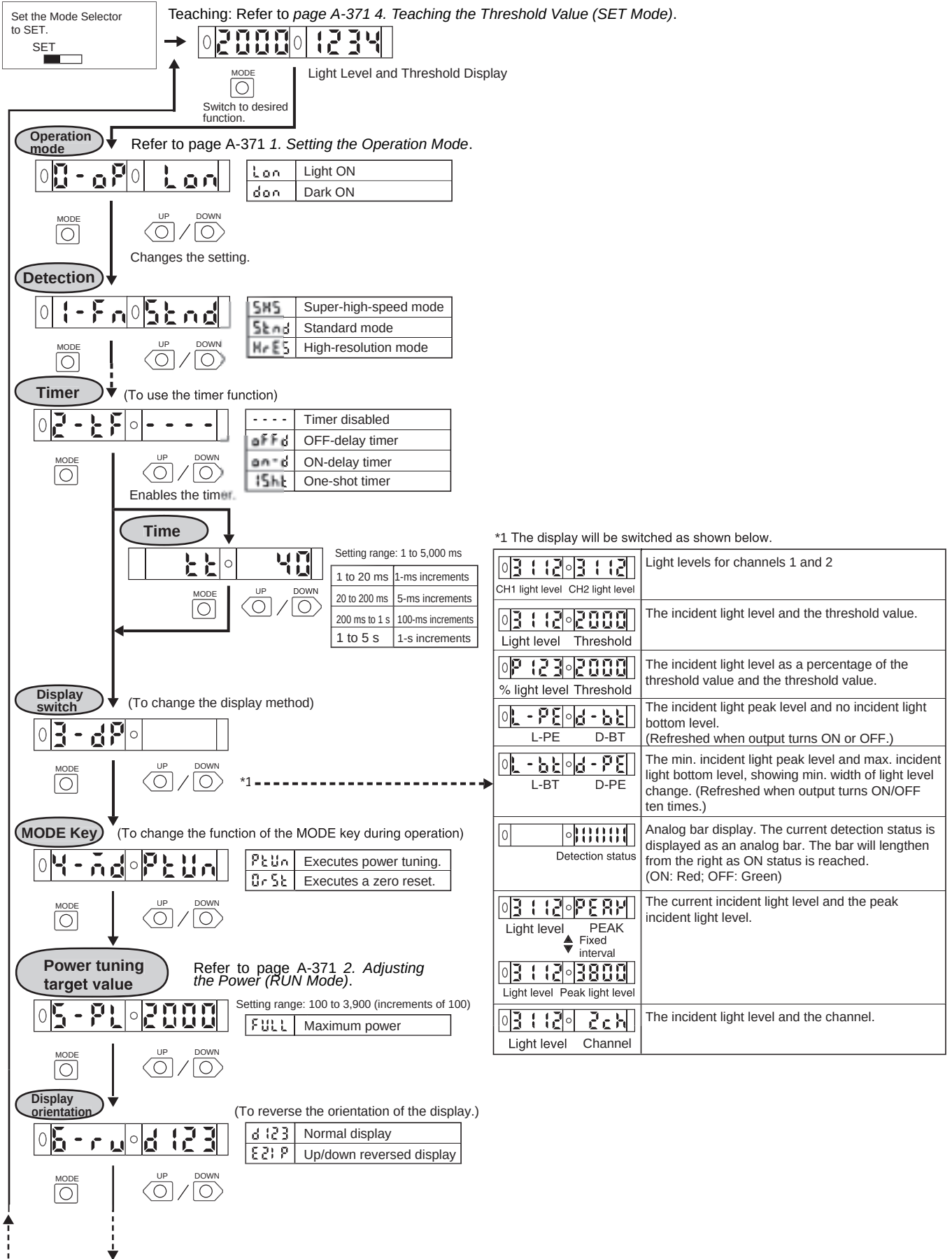
4-4. Teaching With and Without a Workpiece

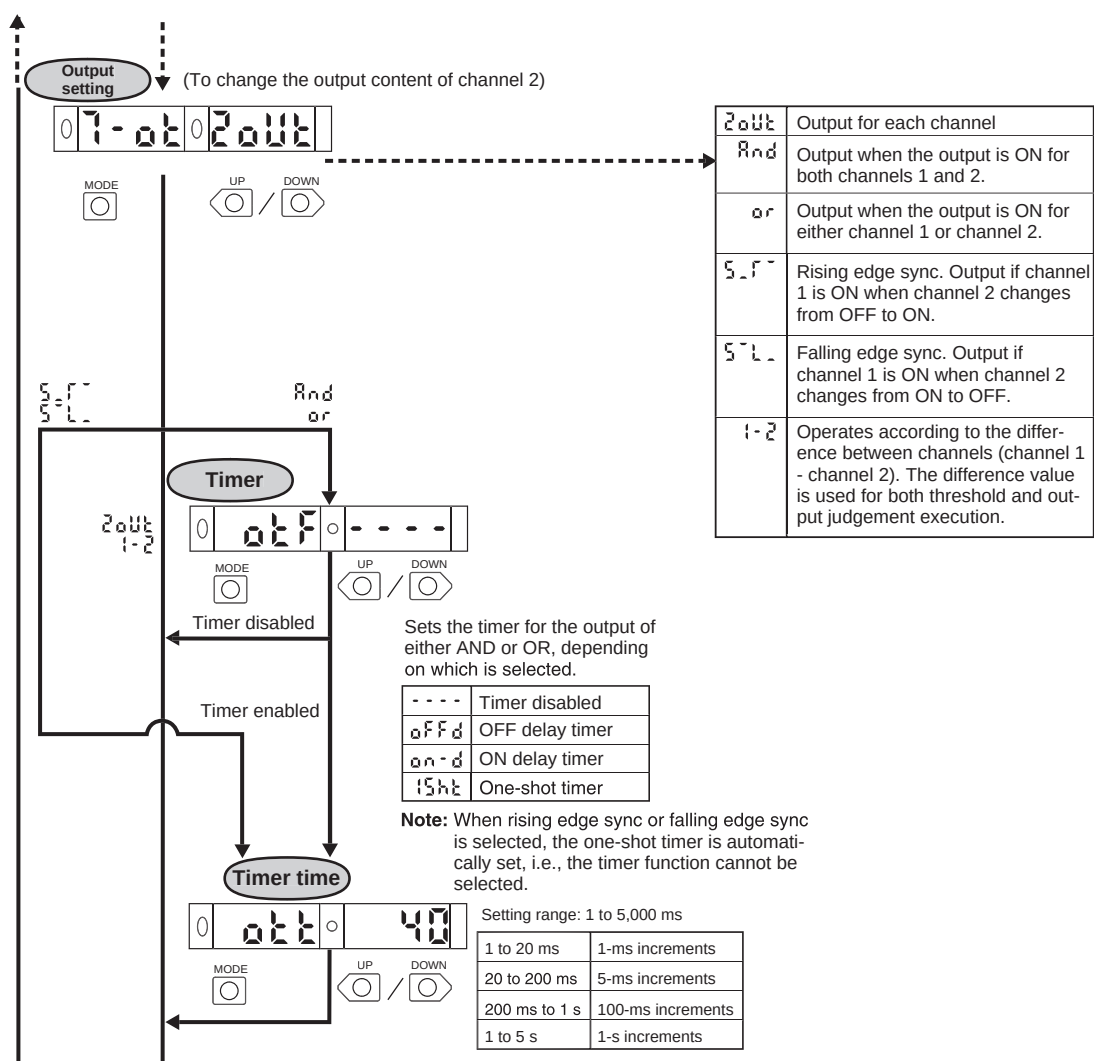
Teaching can be performed twice, once with and once without a workpiece, and the value between the two measured value can be set as the threshold.



5. Setting Functions in SET Mode

*The default settings are shown in the transition boxes between functions.



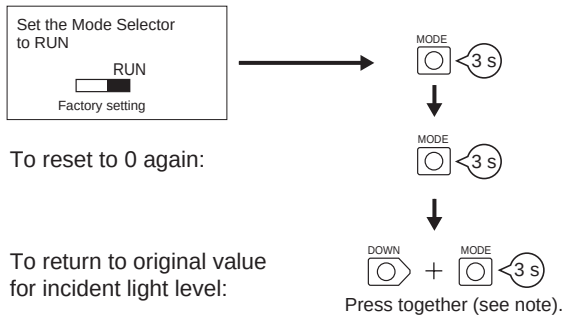


6. Convenient Functions

6-1. Zeroing the Digital Display

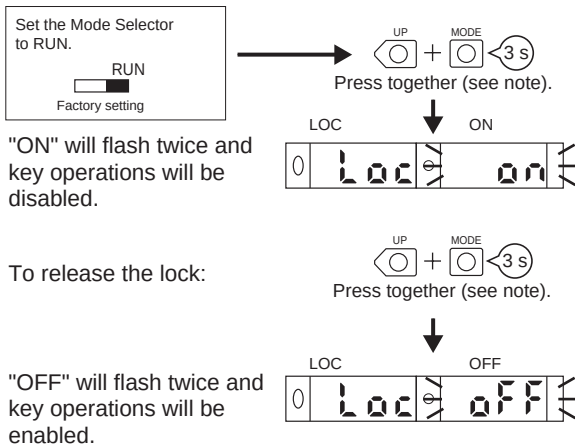
The incident light level on the digital display can be set to 0.

* Change the function to 0rst (zero reset) with the MODE key. The default setting is PTUN.



6-2. Locking the Keys

All key operations can be disabled.

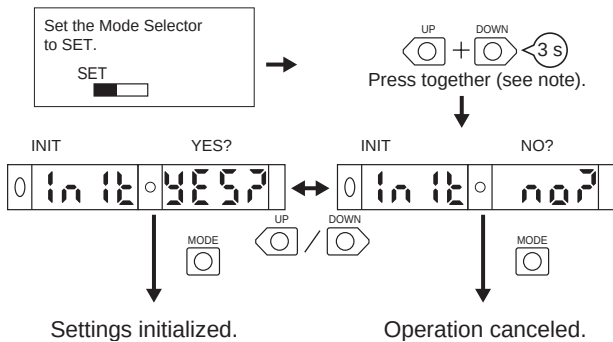


* If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Note: Press the DOWN or UP key right after pressing the MODE key.

6-3. Initializing Settings

All settings can be returned to their original default settings.



Safety Precautions

Note: In addition to the following precautions, please read and observe the common precautions for the instructions included with the product.

Precautions for Correct Use

Amplifier Unit

Installation

- Operation after Turning Power ON

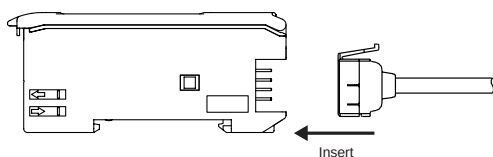
The Amplifier Unit is ready to operate within 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, be sure to turn ON the power supply to the Sensor first.

Mounting

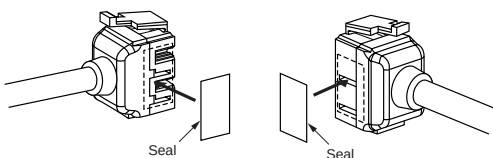
- Connecting and Disconnecting Connectors

Mounting Connectors

1. Insert the Master or Slave Connector into the Amplifier Unit until it clicks into place.



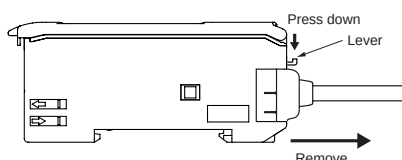
2. Attach the protector seals (provided as accessories) to the sides of master and slave connectors that are not connected.



Note: Attach the seals to the sides with grooves

Removing Connectors

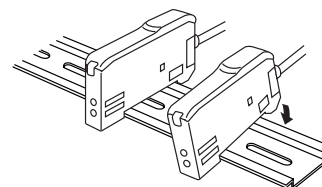
1. Slide the slave Amplifier Unit(s) for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit(s) has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



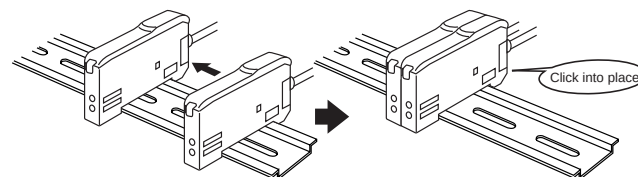
- Joining and Removing Amplifier Units

Joining Amplifier Units

1. Mount the Amplifier Units one at a time onto the DIN track.



2. Slide the Amplifier Units together, line up the clips, and press the Amplifier Units together until they click into place.



Separating Amplifier Units

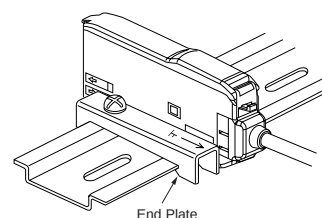
Slide Amplifier Units away from each other, and remove from the DIN track one at a time. (Do not attempt to remove Amplifier Units from the DIN track without separating them first.)

Note 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings/Characteristics*.

2. Always turn OFF the power supply before joining or separating Amplifier Units.

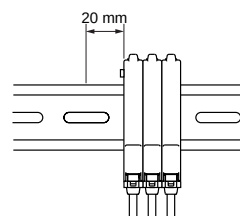
- Mounting the End Plate (PFP-M)

An End Plate should be used if there is a possibility of the Amplifier Unit moving, e.g., due to vibration. If a Mobile Console is going to be mounted, connect the End Plate in the direction shown in the following diagram.



- Mounting the Mobile Console Head

Leave a gap of at least 20 mm between the nearest Amplifier Unit and the Mobile Console head.

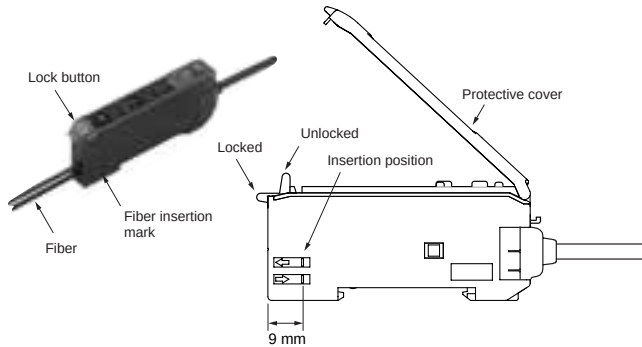


- **Fiber Connection**

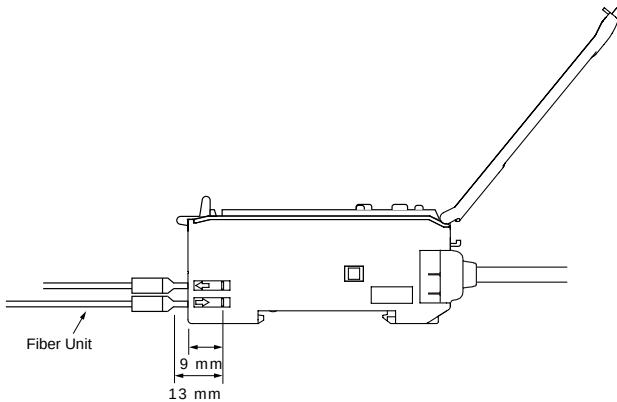
The E3X Amplifier Unit has a lock button for easy connection of the Fiber Unit. Connect or disconnect the fibers using the following procedures:

1. Connection

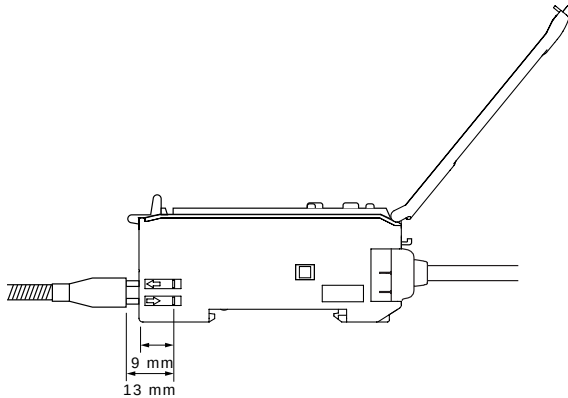
Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.



Fibers with E39-F9 Attachment

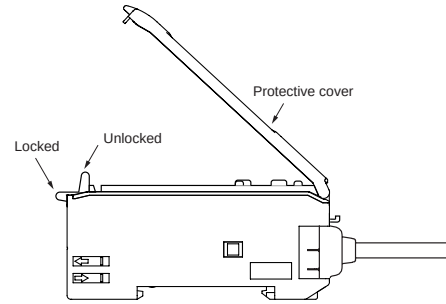


Fibers That Cannot Be Free-Cut (with Sleeves)



2. Disconnecting Fibers

Remove the protective cover and raise the lock button to pull out the fibers.



Note 1. To maintain the fiber properties, confirm that the lock is released before removing the fibers.

2. Be sure to lock or unlock the lock button within an ambient temperature range between -10°C and 40°C .

Adjustments

- **Mutual Interference Protection Function**

There may be some instability in the digital display values due to light from other sensors. If this occurs, decrease the sensitivity (i.e., decrease the power or increase the threshold) to perform stable detection.

- **EEPROM Writing Error**

If the data is not written to the EEPROM correctly due to a power failure or static-electric noise, initialize the settings with the keys on the Amplifier Unit. ERR/EEP will flash on the display when a writing error has occurred.

- **Optical Communications**

Several Amplifier Units can be slid together and used in groups. Do not, however, slide the Amplifier Units or attempt to remove any of the Amplifier Units during operation.

Other Precautions

- **Protective Cover**

Always keep the protective cover in place when using the Amplifier Unit.

- **Mobile Console**

Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series and the E3X-MDA series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, cannot be used.

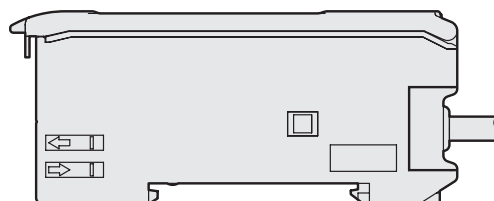
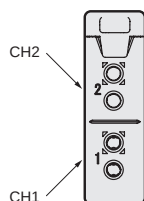
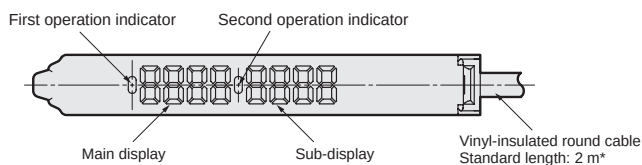
Dimensions

Amplifier Units

Amplifier Units with Cables

E3X-MDA11

E3X-MDA41

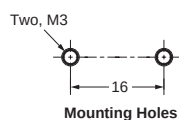
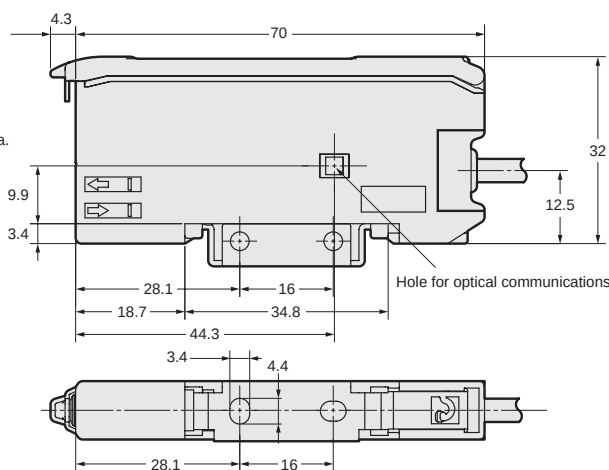
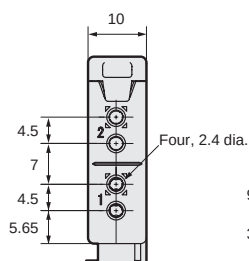
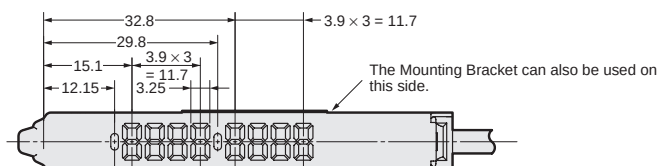


*Cable Specifications

E3X-MDA11 MDA41	A 4-dia., 2-conductor (conductor cross-sectional area: 0.2 mm ² ; insulation diameter: 1.1 mm)

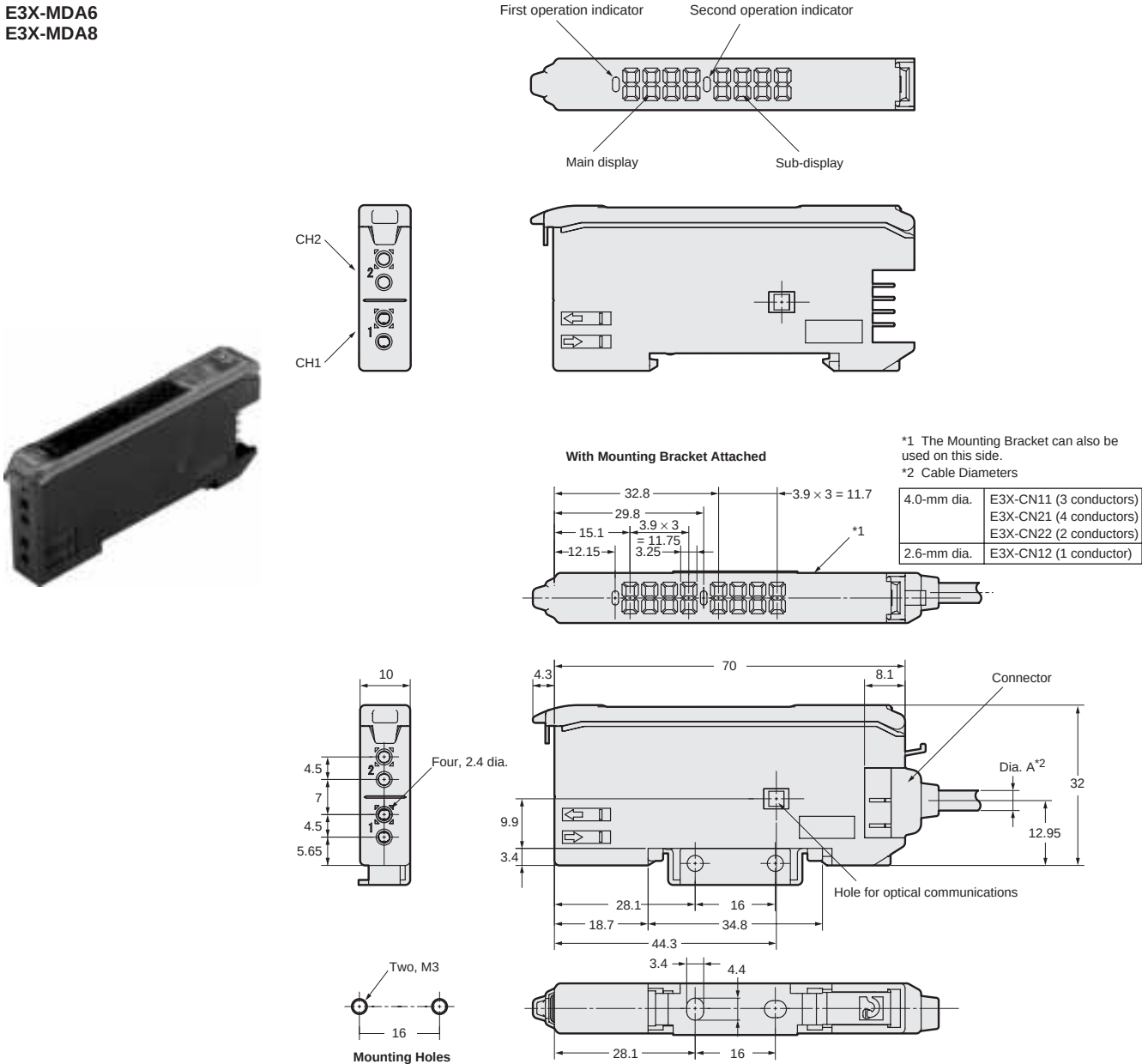


With Mounting Bracket Attached



Amplifier Units with Connectors

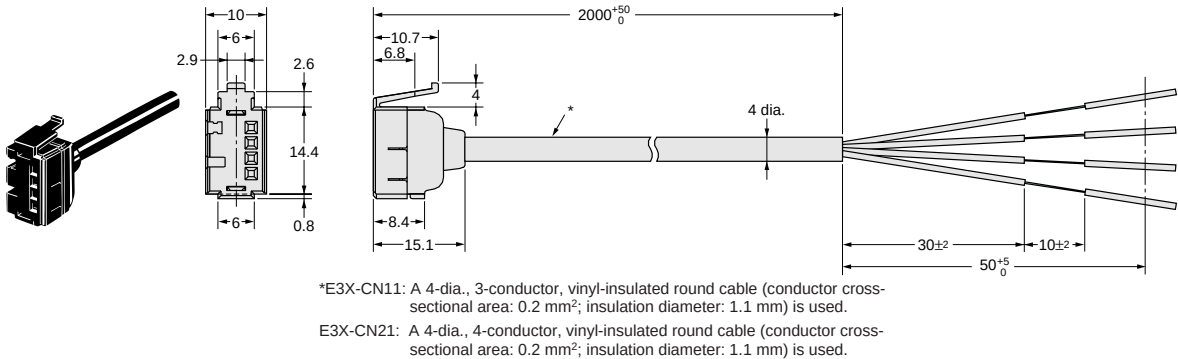
E3X-MDA6
E3X-MDA8



Amplifier Unit Connectors

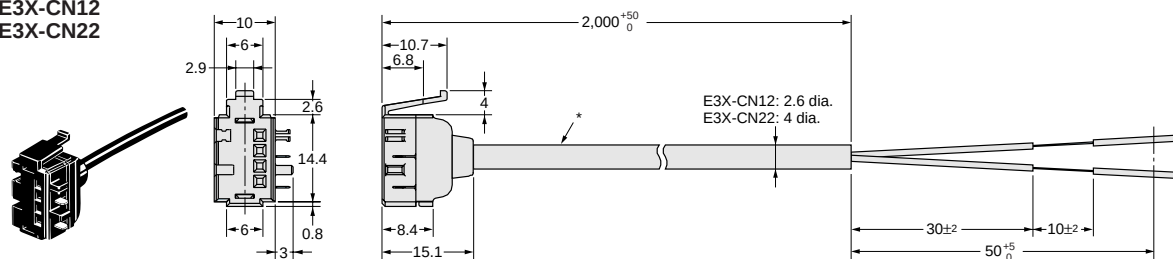
Master Connectors

E3X-CN11
E3X-CN21



Slave Connectors

E3X-CN12 E3X-CN22

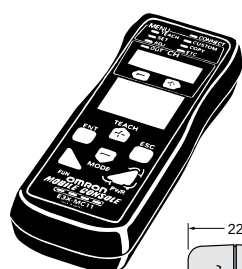


*E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

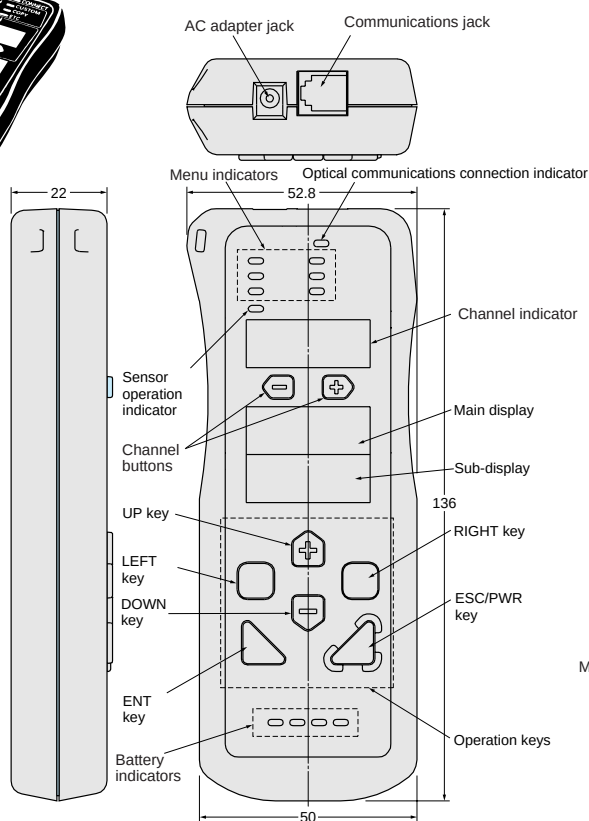
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Mobile Console

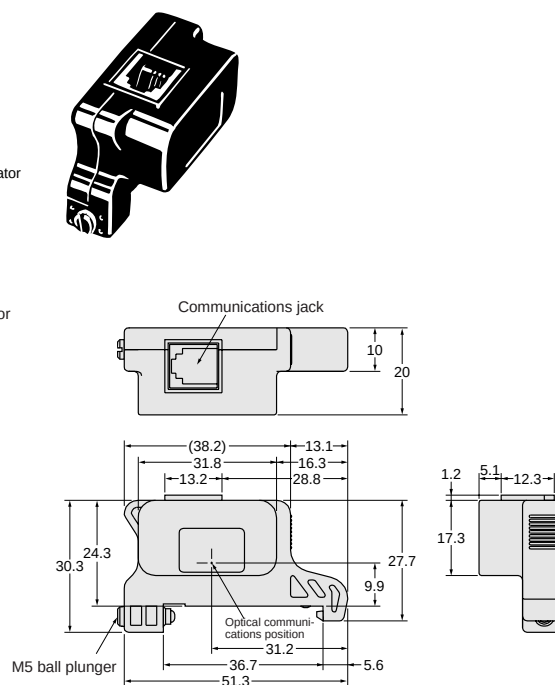
E3X-MC11-S



Mobile Console



Mobile Console Head



MEMO

Super Manual Fiber Amplifier

E3X-NA

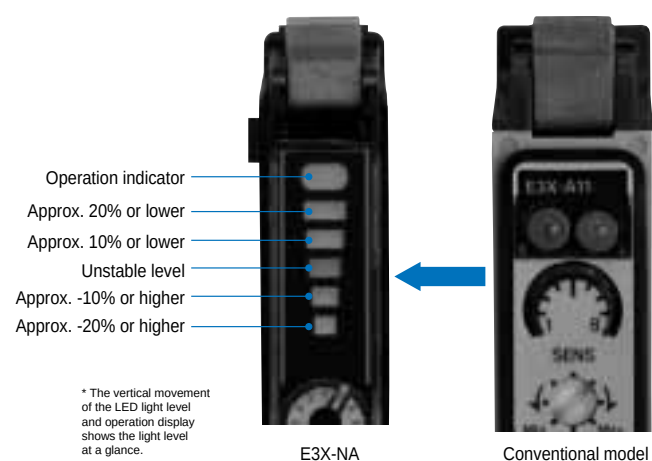
Adjuster type standard that is the culmination of true ease and simplicity

CE

Features

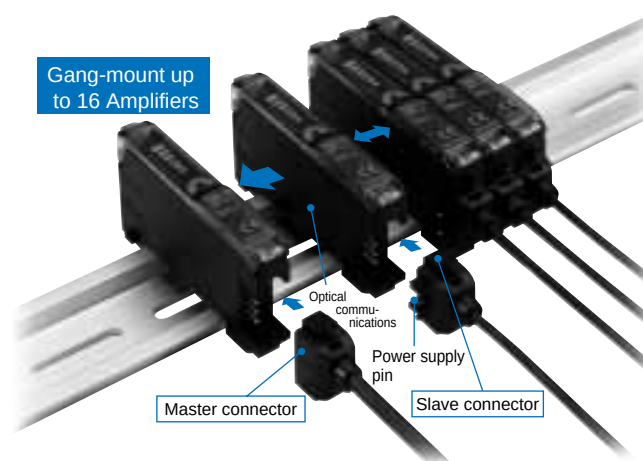
Instinctive LED bar displays of light levels

The previous manual type used the stability and incident level indicators to display the light level change, which was difficult to understand at a glance. The E3X-NA uses the LED bars to display the light level, ensuring the light level change at a glance.



Same "Wire-saving" Connector as E3X-DA-N

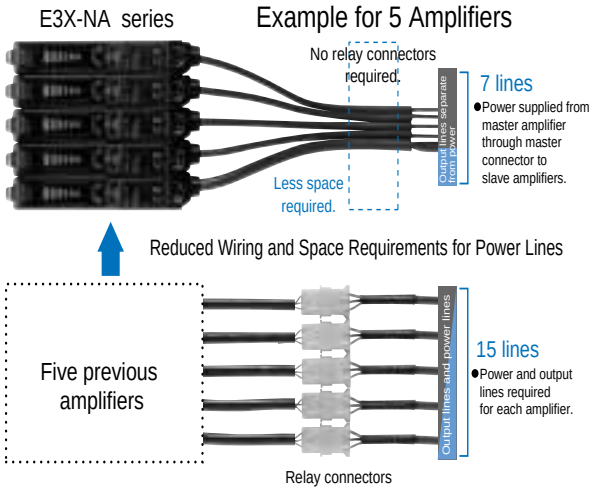
OMRON's original wiring-saving connector, which was inherited from the digital fiber amplifier E3X-DA-N, allows connection of up to 16 units.



Features

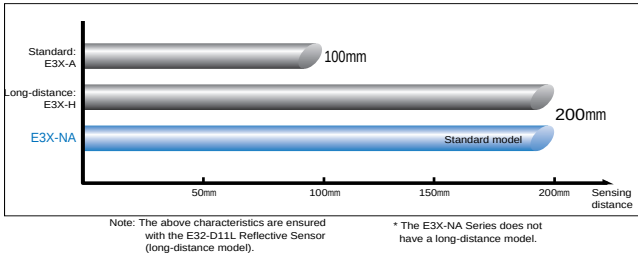
Reduced wiring and space requirements for power lines

Example for 5 Amplifiers E3X-NA Series



Same Sensing Distance as Previous Long-distance Models

200 mm Reflective Models



Approximately Seven Times the Detection Accuracy

Applied Fiber: E32-T16P (screen fiber) set at 100 mm. E3X-A1 1 (previous model) Minimum detection object: 2.0 mm dia. E3X-NA 0.3 mm dia.

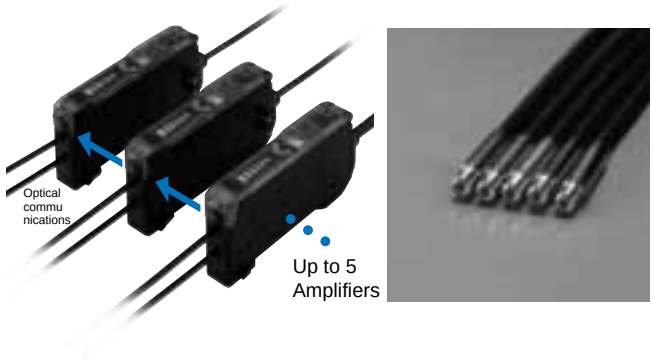
Applied Fiber: E32-T16 (screen fiber) set at 100 mm.

Minimum detection object: E3X-A11 (previous model) 2.0 mm dia. $\rightarrow$ E3X-NA 0.3 mm dia. (7 times improvement)

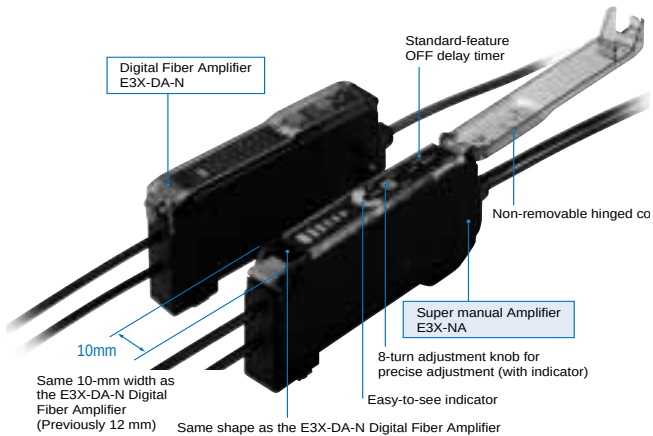
Addition of high-speed type and waterproof type to the series

Optical Communications to Prevent Mutual Interference

Optical communication between amplifiers prevents mutual interference. Up to 5 fiber heads can be installed closely, except E3X-NA□F.



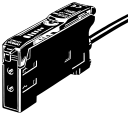
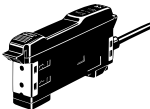
Dimensions and Designs Inherited from the E3X-DA-N Digital Fiber Amplifier



Ordering Information

Amplifier Units

Pre-wired

Item	Shape	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-NA11	E3X-NA41
High-speed detection			E3X-NA11F	E3X-NA41F
Mark-detecting models			E3X-NAG11	E3X-NAG41
Water-resistant models			E3X-NA11V	E3X-NA41V

Connector type

Item	Shape	Applicable Connector (order separately)		Control output	Model	
					NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-NA6	E3X-NA8
		Slave	E3X-CN12			
Water-resistant models (M8 Connector)		XS3F-M421-40□-A XS3F-M422-40□-A			E3X-NA14V	E3X-NA44V

Amplifier Units Connectors (Order Separately) Note: Stickers for Connectors are included as accessories.

Item	Shape	Cable length	No. of conductors	Model
Master connector		2 m	3	E3X-CN11
Slave connector			1	E3X-CN12

Precautions for ordering the connector type

Refer to the following tables when placing an order. Basically, Amplifier Units and connectors are sold separately.

Please place an order after referring to the combination given below.

Amplifier Units			+	Applicable Connector (order separately)	
Type	NPN	PNP		Master connector	Slave connector
Standard	E3X-NA6	E3X-NA8		E3X-CN11 (3 wires)	E3X-CN12 (1 wire)

When Using 5 Amplifier Units

Amplifier Units (5 Units)	+	1 Master Connector + 4 Slave Connectors

Sensor I/O Connectors (Order separately)

Size	Cable type	Shape	Cable length	Model
M8	Standard cable	Straight 	2 m	XS3F-M421-402-A
			5 m	XS3F-M421-405-A
		L-shaped 	2 m	XS3F-M422-402-A
			5 m	XS3F-M422-405-A

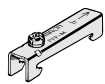
Note: Refer to page NB-6 for details.

Accessories (Order Separately)

Mounting Brackets

Shape	Applicable type	Model	Quantity
	E3X-NA□ E3X-NA□F E3X-NAG□	E39-L143	1
	E3X-NA□V	E39-L148	

End Plate

Shape	Model	Quantity
	PFP-M	1

Rating/performance

Amplifier Units

Item	Model	Type	Pre-wired				Connector type	
			Standard models	High-speed de- tection models	Mark-detecting models	Water-resistant models	Standard models	Water-resistant mod- els (M8 Connector)
	NPN output	E3X-NA11	E3X-NA11F	E3X-NAG11	E3X-NA11V	E3X-NA6	E3X-NA14V	
PNP output	E3X-NA41	E3X-NA41F	E3X-NAG41	E3X-NA41V	E3X-NA8	E3X-NA44V		
Light source (wave length)		Red LED (680 nm)		Green LED (520 nm)	Red LED (680 nm)			
Power supply volt- age		12 to 24 VDC ±10%, ripple (p-p): 10% max.						
Current consumption		35 mA max.	35 mA max. (at power supply voltage 24 VDC)	35 mA max.				
Control output		Load current 50 mA (residual voltage 1 V max. each) Open collector output type (depends on the NPN/PNP out- put format) Light-ON/Dark-ON switch selectable						
Response time		Operation or re- set: 200 μs max. *	Operating: 20 μs max. Reset: 30 μs max.	200 μs max. for operation and reset respectively (See note.)				
Sensitivity adjust- ment		8-turn endless adjuster (with indicator)						
Protective circuits		Reverse polarity protection, out- put short-circuit protection, mutu- al interference prevention (opti- cally synchro- nized)	Reverse polarity protection, out- put short-circuit protection	Reverse polarity protection, output short-circuit protection, mutual interfer- ence prevention (optically synchronized)				
Timer function		OFF-delay timer: 40 ms (fixed)						
Ambient illuminance		Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.						
Ambient temperature		Operating: Groups of 1 to 3 Amplifiers: -25 to +55°C, Groups of 4 to 11 Amplifiers: -25 to +50°C, Groups of 12 to 16 Amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation)						
Ambient humidity		Operating/Storage: 35% to 85% RH (with no condensation)						
Insulation resistance		20 M Ω min. at 500 VDC						
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute					500 VAC at 50/60 Hz for 1 minute	
Vibration resistance		10 to 55 Hz with a 1.5 mm double amplitude for 2 hrs each in X, Y and Z directions						
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions						
Protective structure		IEC 60529 IP50 (with Protective Cover attached)			IEC 60529 IP66 (with Protective Cover attached)	IEC 60529 IP50 (with Protective Cover attached)	IEC 60529 IP66 (with Protective Cover attached)	
Connection method		Pre-wired models (standard length: 2 m)				Connector type	M8 connector	
Weight (Packed state)		Approx. 100 g			Approx. 110 g	Approx. 55 g	65 g	
Material	Case	PBT (polybutylene terephthalate)						
	Cover	Polycarbonate			Polyethersul- fone (PES)	Polycarbonate	Polyethersul- fone (PES)	
Accessories		Instruction manual						

* If 8 or more Units are installed side-by-side, the response time will be 350 μ s max.

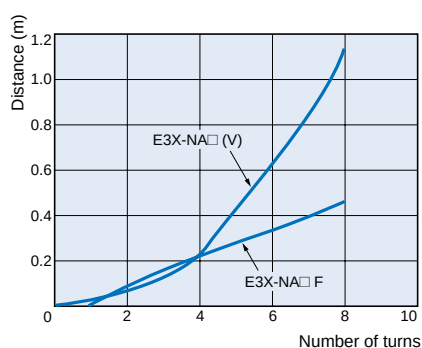
Amplifier Unit Connectors

Item		Model	E3X-CN11	E3X-CN12
Rated current			2.5 A	
Rated voltage			50 V	
Contact resistance			20 mΩ max. (20 mVDC max., 100 mA max.) [By connection with amplifier unit and connection with adjacent connector (except conductor resistance of cable)]	
No. of insertions			50 times (By connection with amplifier unit and connection with adjacent connector)	
Material	Housing		PBT (polybutylene terephthalate)	
	Contacts		Phosphor bronze/gold-plated nickel	
Weight (Packed state)			Approx. 55 g	Approx. 25 g

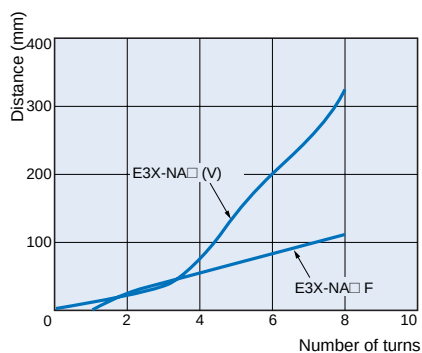
Characteristic data (typical)

Number of Turns of Sensitivity Adjuster vs. Sensing Distance

E32-T11L

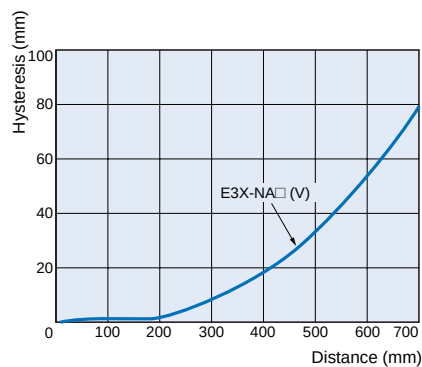


E32-D11L

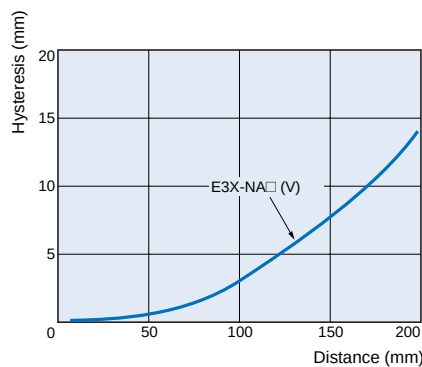


Sensing Distance vs. Hysteresis

E32-T11L



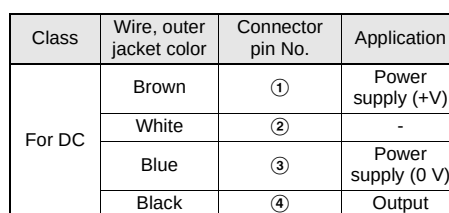
E32-D11L



NPN output

PNP output

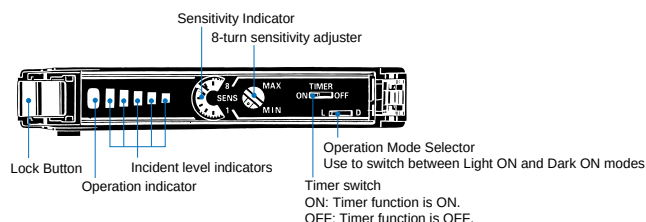
Connectors (Sensor I/O connectors)



Note: Pin 2 is not used.

Nomenclature:

Amplifier Units



Operation

Indicator status

In addition to the operation indicator (orange), E3X-NA has indicators that denote the incident level (4 green and 1 red indicators). Use them for optical axis adjustment and maintenance.

Indicator status (L/ON)	Operation indicator (L/ON)	Incident level
Operation indicator Incident level indicators Not lit Lit (See note)	Not lit	Approx. 80% to 90% of operating level
	Not lit	Approx. 80% to 90% of operating level
	Not lit or lit	Approx. 90% to 110% of operating level
	Lit	Approx. 110% to 120% of operating level
	Lit	Approx. 120% min. of operating level

Note: The rightmost indicator is turned ON at the "0 incident level".

Precautions

Correct Use

Amplifier Units

Design

Communications Hole

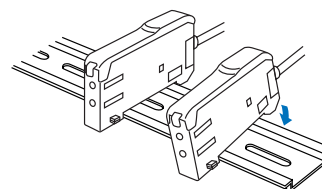
The window provided in the side face of the unit is a communication window for prevention of mutual interference when it is connected with the other unit. Note that the optional Mobile Console E3X-MC11 cannot be used. When the incident level of the sensor is excessive, mutual interference prevention may not be activated. At that time, make adjustment with the sensitivity adjuster. When the unit is used with the E3X-DA-N series, mutual interference prevention is not activated.

Mounting

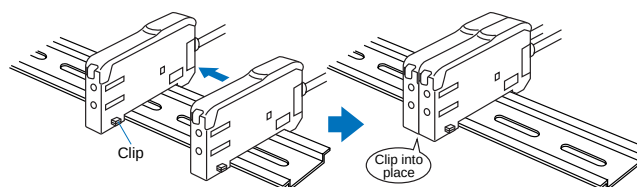
Connection/removing of amplifier units

(Connection)

1. Install the Amplifier Units one at a time onto the DIN track.



2. Slide the Amplifier Units together, line up the clips, and press the Amplifier Units together until they click into place.



(Removing)

Slide one unit away from the other and remove them one by one. (Do not remove the connected units together from the DIN rail.)

Note: 1. When the amplifier units are interconnected, the operating ambient temperature changes depending on the number of connected amplifier units. Check "Ratings/Performance".
2. Before connecting or removing the units, always switch power off.

Operating Environment

Ambient Conditions

Always remove dust, dirt, etc. from the optical communication window, which may disable communication.

Miscellaneous

Protective Cover

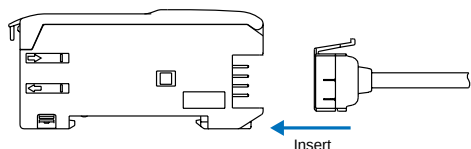
Be sure to set the Protective Cover before use.

Amplifier Unit Connectors

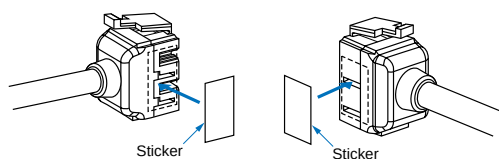
Installation

Installation Connectors

1. Insert the Master or Slave Connector into the Amplifier Unit until it clicks into place.



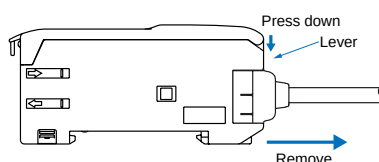
2. Join Amplifier Units together as required after all the Master and Slave Connectors have been inserted.
3. Apply the supplied seal to the non-connection surface of the master/slave connector.



Note: Apply the seal to the grooved side.

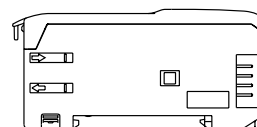
Removing Connectors

1. Slide the slave Amplifier Unit for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



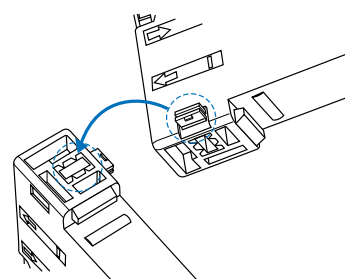
Mounting End Plate (PFP-M)

Depending on the installation type, an Amplifier Unit may move during operation. In this case, use an End Plate. Before installing an End Plate, remove the clip from the master Amplifier Unit using a nipper or similar tool.

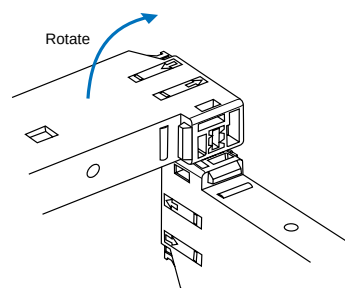


The sensor bottom is also equipped with the clip removing mechanism.

1. Insert the clip to be removed into the slit underneath the clip on another Amplifier Unit.



2. Remove the clip by rotating the Amplifier Unit.



Pull Strengths for Connectors (Including Cables)

E3X-CN11: 30 N max. E3X-CN12: 12 N max.

Dimensions (Unit: mm)

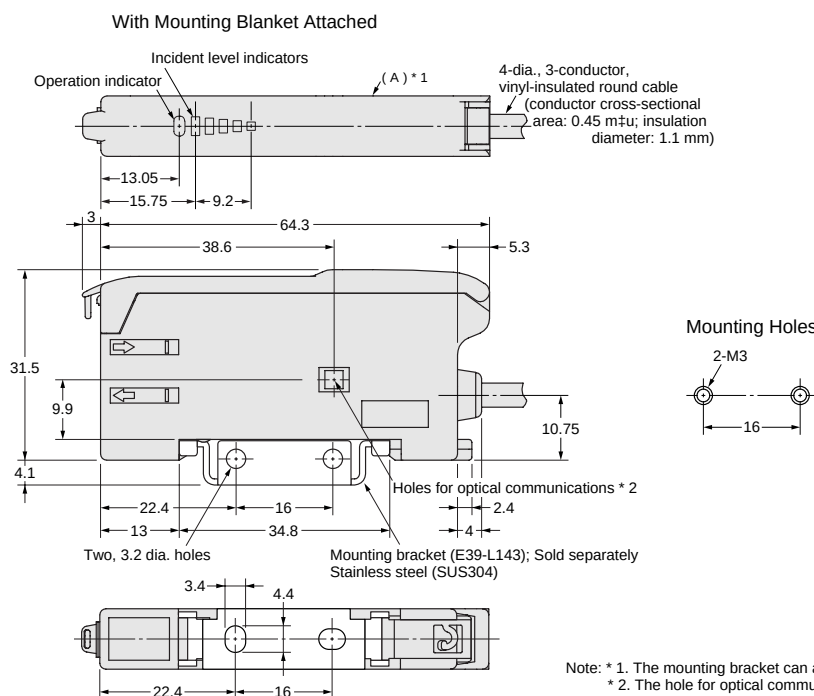
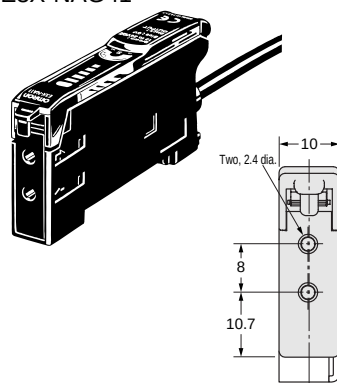
Amplifier Units

Pre-wired

E3X-NA11
E3X-NA11F
E3X-NA41
E3X-NA41F
E3X-NAG11
E3X-NAG41

CAD file

E3X_05

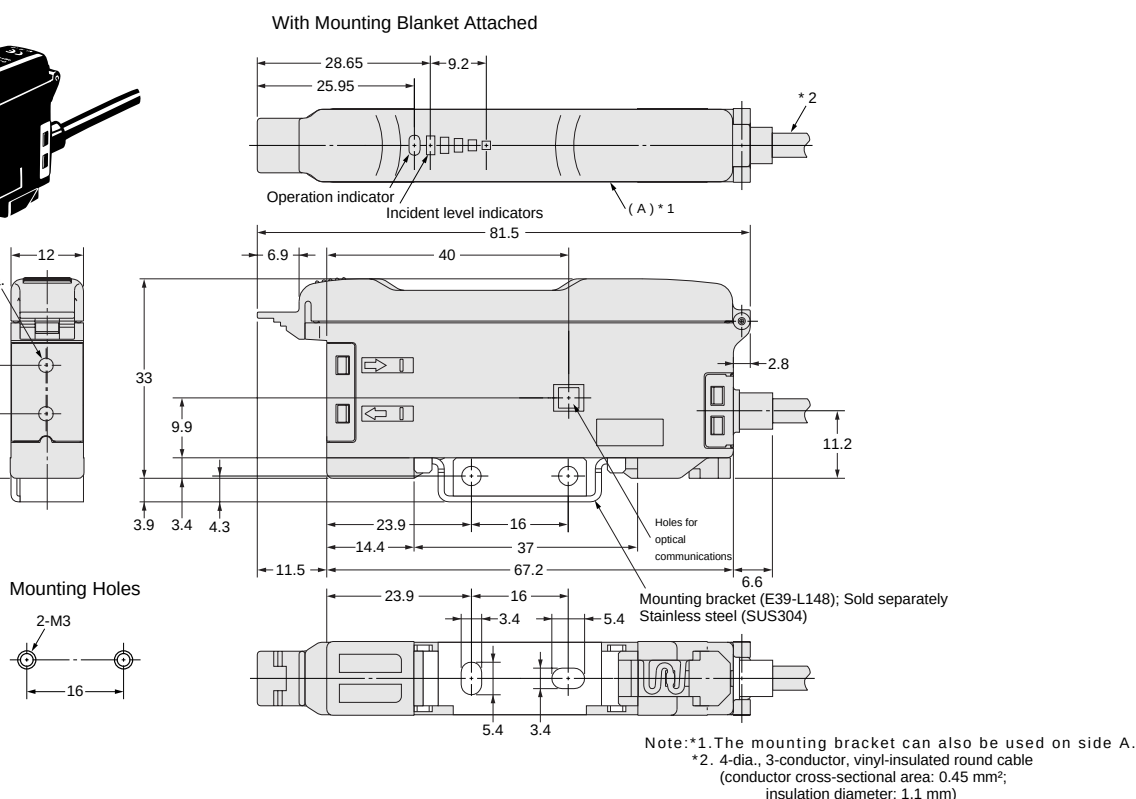
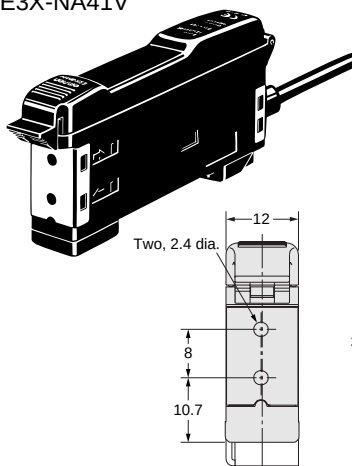


Amplifier Units with cables, Water-resistant Models

E3X-NA11V
E3X-NA41V

CAD file

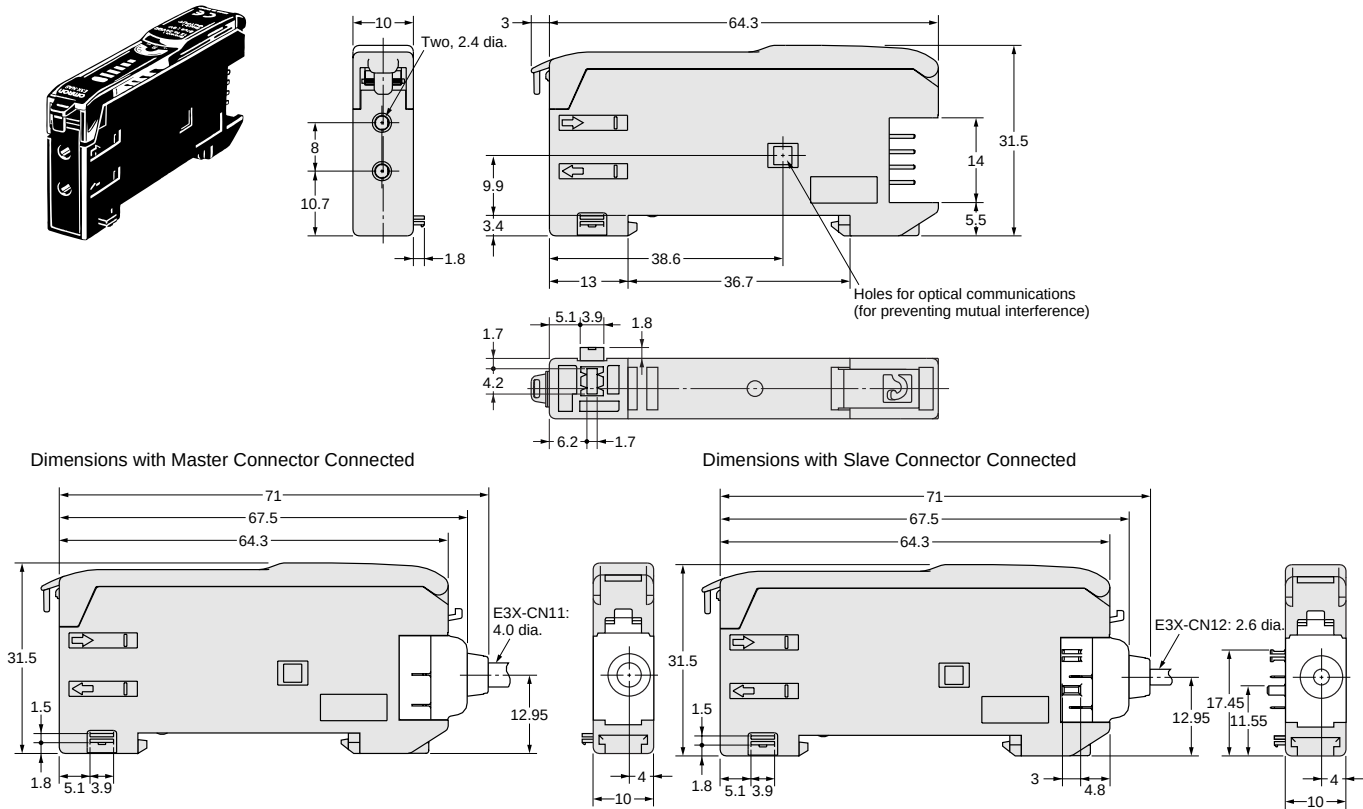
E3X_10



Connector type

E3X-NA6
E3X-NA8

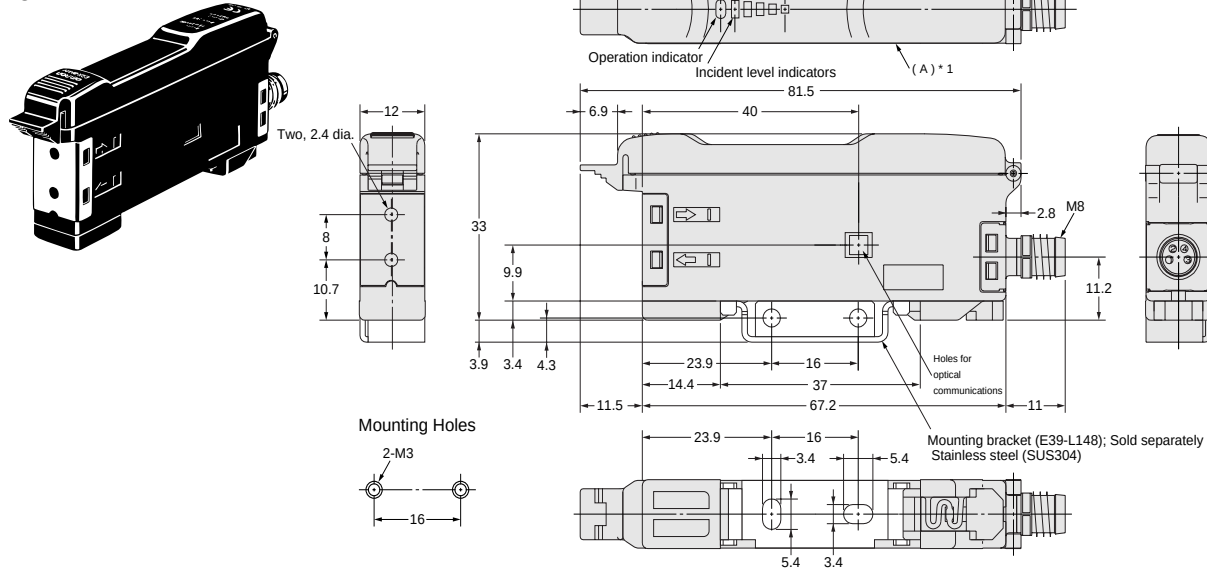
CAD file E3X_06



Amplifier Units M8 Connectors,
Water-resistant Models

E3X-NA14V
E3X-NA44V

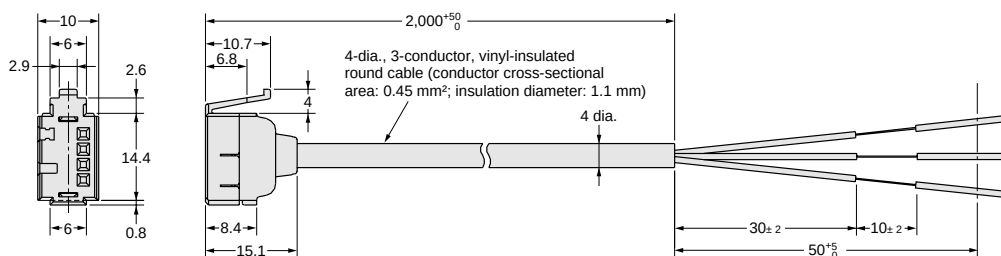
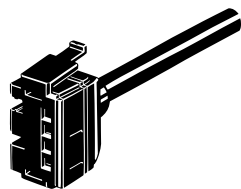
CAD file E3X_11



Amplifier Unit Connectors

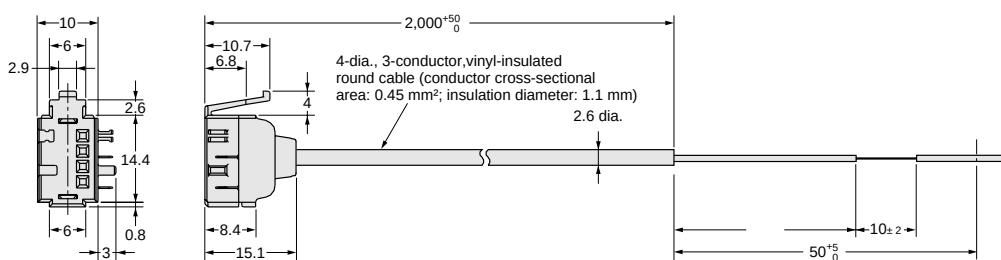
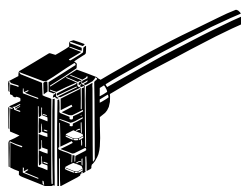
Master connector

E3X-CN11



Slave connector

E3X-CN12



Accessories (Order Separately)

Mounting Brackets

A-216

Communication unit for fiber amplifier

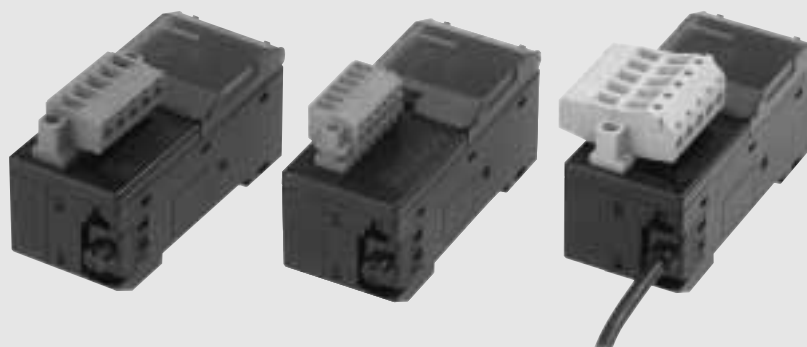
E3X-DRT21/SRT21/CIF11

Three communication units unveiled

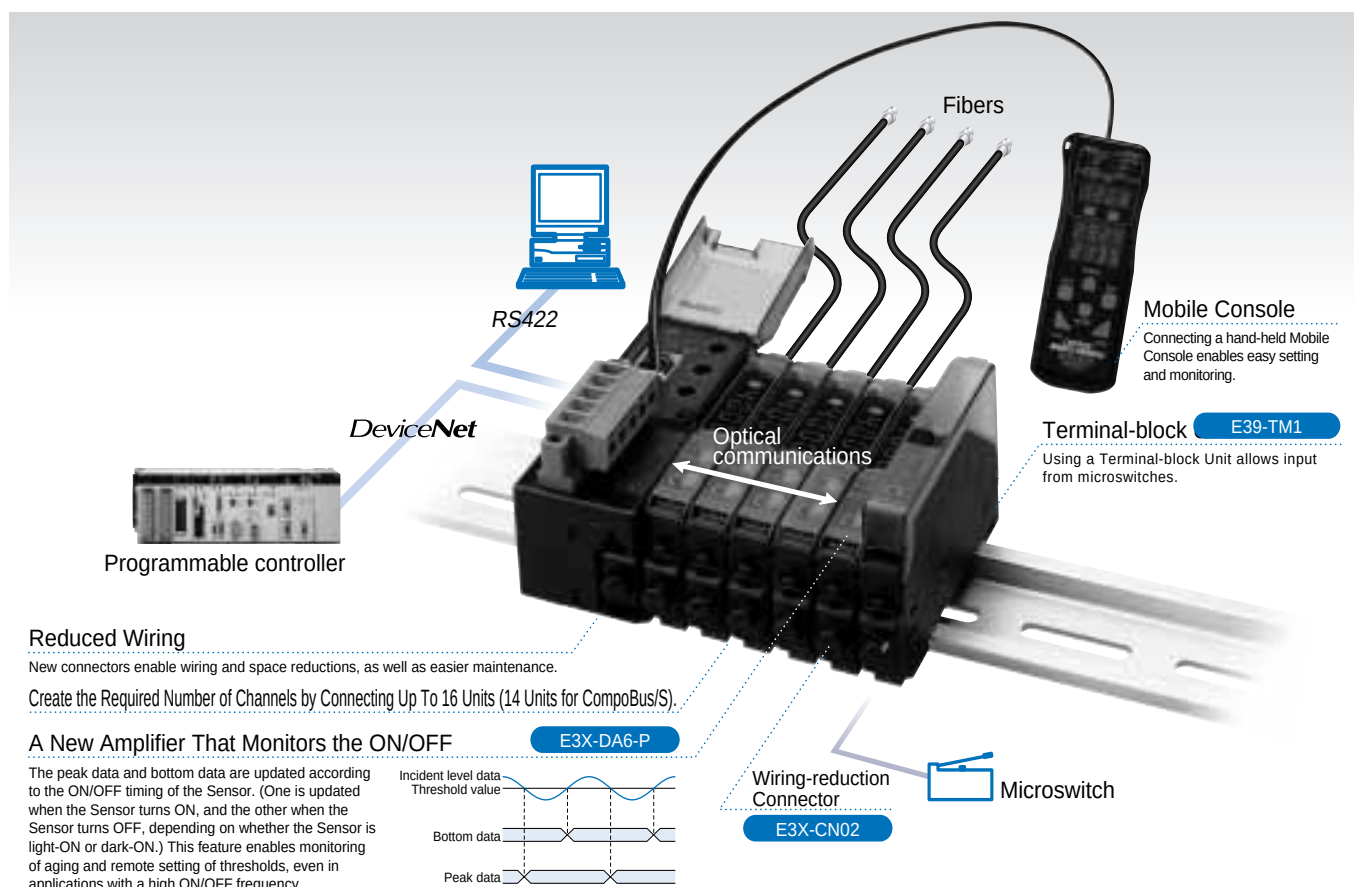
E3X-DRT21 for
DeviceNet

E3X-SRT21 for
CompoBus/S

E3X-CIF11 for
RS422



Features



Ordering Information

Communication unit

Communication system	Model
For DeviceNet	E3X-DRT21
For CompoBus/S	E3X-SRT21
For RS422	E3X-CIF11

Terminal block unit

Communication system	Model
General	E39-TM1

Fiber amplifier (with incident level monitoring function)

Communication system	Model
General	E3X-DA6-P

Amplifier Unit Connectors

Communication system	Model
---	E3X-CN02

* Please order the fiber amplifier and wiring-saving connector as a set.

Rating/performance

Communication unit

Item	Model	E3X-DRT21	E3X-SRT21	E3X-CIF11
Communication system		DeviceNet	CompoBus/S	RS422
Connectable fiber amplifier *1		*2E3X-DA6, E3X-DA8, E3X-DAB6, E3X-DAB8, E3X-DAG6, E3X-DAG8 E3X-DA6TW, E3X-DA8TW, E3X-DA6-P, E39-TM1		
Number of connectable fiber amplifiers		16 max.	14 max.	16 max.
Supply voltage		11 to 25 VDC	14 to 26.4 VDC	11.4 to 26.4 VDC (12 VDC -5% to 24 VDC +10%)
Internal current consumption *3		70 mA max.	30 mA max.	40 mA max.
Ambient temperature		Operating: -20°C to 55°C, storage: -30°C to 70°C (with no icing or condensation)		
Ambient humidity		35% to 85%RH (with no condensation)		
Weight (Packed state)		Approx. 150 g		Approx. 200 g

*1. Connection is not supported for Amplifiers Units cables (e.g., E3X-DA11-N) and water-resistant Amplifiers Units (e.g., E3X-DA11V).

*2. Can be connected with only the product of the following lot number or later.

Lot No. 01Z01 Manufactured on December 01, 2001.

↑ ↑ ↑ The year of manufacture is denoted as the two digits of the year.
Indicates the month of manufacture. October, November and December are denoted by X, Y and Z, respectively.
Indicates the day of manufacture.

*3. Does not include the current supplied to the fiber amplifier.

Terminal block unit

Item	Model	E39-TM1
Supply voltage *1		12 to 24 VDC $\pm 10\%$, ripple (p-p) : 10% max.
Power supply for sensor		11 to 23 VDC (supply voltage -1 V)
Current consumption		40 mA max. + used sensor's current consumption (total max. 100 mA)
Response speed		1.2 ms max.
Number of input points		1 point
Input signal		NPN/PNP no-voltage input (contact and non-contact), switchable
Input operation form		N.O/N.C. switch selection
Indicator lamp		Input signal display (orange)
Ambient temperature *2		Operating: Groups of 1 to 3 units: -25 to +55°C (with no icing or condensation) Groups of 4 to 8 units: -25 to +45°C (with no icing or condensation) Groups of 9 to 16 units: -25 to +40°C (with no icing or condensation) Storage: -30°C to 70°C

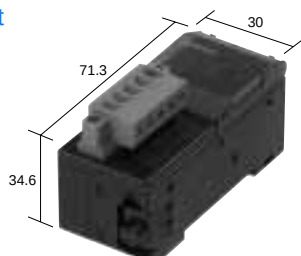
*1. Power to the E39-TM1 is supplied from the communication unit (option). Use the connector E3X-CN02 (option).

*2. When 4 or more units are connected, the total current consumption of each unit should be 75 mA max. For use with the E3X-DA-N series, connect the E39-TM1 at the end. At this time, the upper limit of the ambient temperature of the E3X-DA-N series should be -5°C of the rating.

Dimensions (Unit: mm)

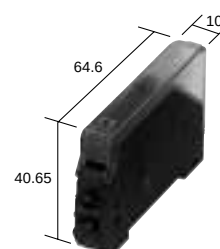
Communication unit

E3X-DRT21
E3X-SRT21
E3X-CIF11



Terminal block unit

E39-TM1



For the operating instructions and other details, read the user's manual. (Catalog No.: SCEA-800)

Photoelectric Laser Sensors with Separate Digital Amplifiers

E3C-LDA

- All three beam types provide ample long-distance detection of 1,000 mm.
- Industry-first variable focal point and optical axis alignment mechanisms. Optimize for workpieces and improve inspection quality.
- Drive the laser with an Amplifier the same size as a Digital Fiber Amplifier

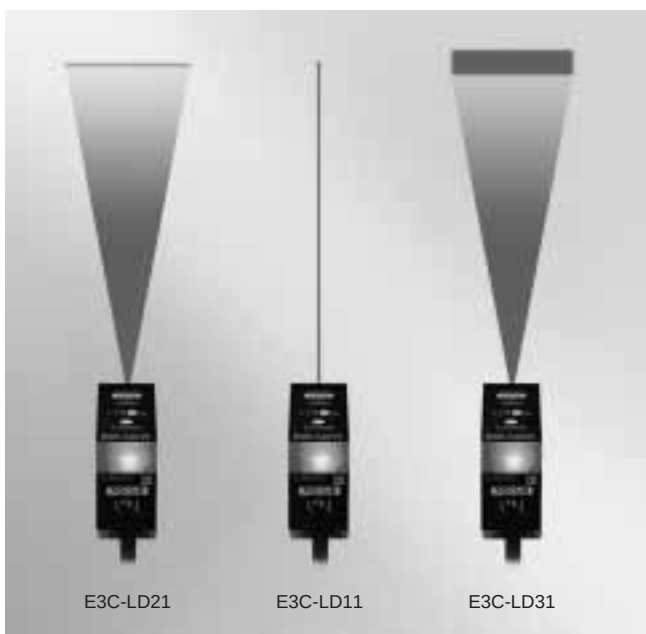
Take a look how precise and easy to set up a sensor can be!



Features

Three optical beam shapes to choose from!

With just one sensor head (spot size, E3C-LD11) and two clip-on units the E3C-LDA series effectively offers three different beam shapes - spot, line or area beam. The E3C-LD31 unit provides the area beam, while the E3C-LD21 provides the line beam. This feature really extends the application possibilities of the sensor.



Spot size shape

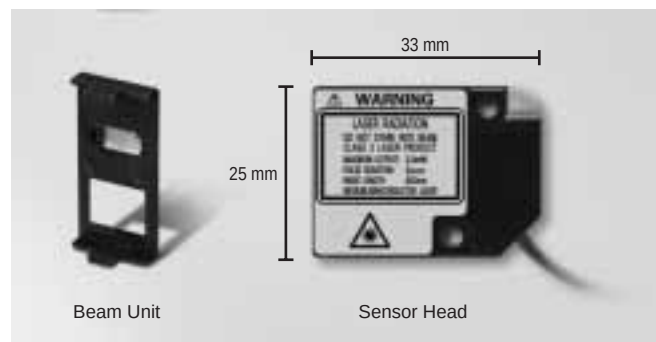
Ideal for detecting minute items like IC-pins and for very precise positioning.

Line beam shape

Ideal for detecting objects that are not fixed or for inspecting the completeness of parts. Typically application is edge control inspection

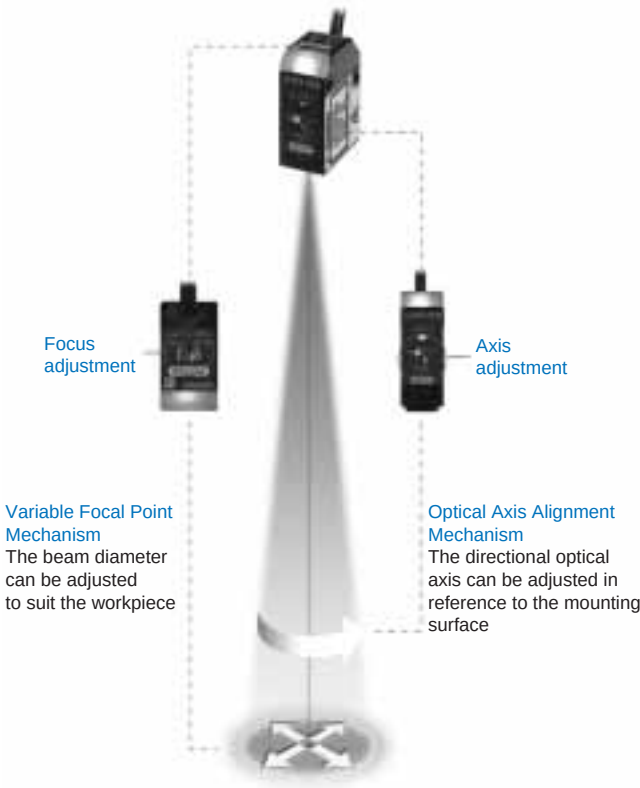
Area beam shape

Ideal for printed mark detection or for basic object detection in the paper and wood industry.



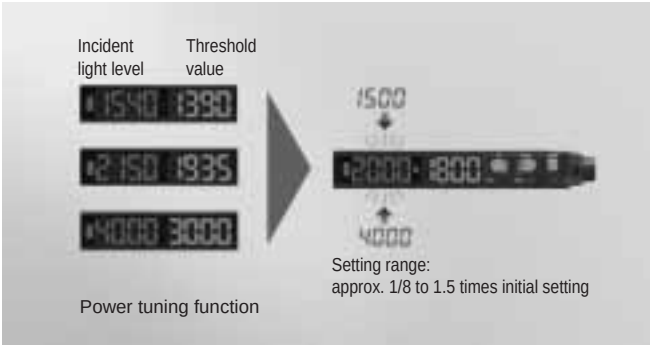
Adjustable settings for easy mounting and installation

The E3C-LDA is currently the only photoelectric sensor whose local point and axis can be easily adjusted to provide optimum sensing capability. By varying the focal point mechanism (patent pending) you can adjust the beam diameter to suit the work-piece. This in turn improves the reliability of detection. Varying the axis alignment mechanism (patent pending) enables you to adjust the direction of the beam fan to the mounting surface. this feature is perfect for accurate, long-distance positioning applications.



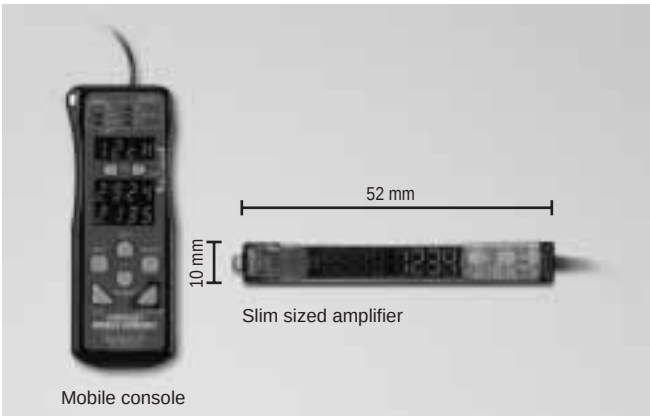
Power tuning function

OMRON's patented power tuning function provides optimal light level settings for all connected sensors. There is no need to select a mode. With just one touch you can adjust the light level settings of all connected amplifiers to the same level. This feature saves you time and money by eliminating labour-intensive adjustments.



Flexible control

An OMRON mobile console (E3X-MC11-S) can be used for operating the sensor head when a considerable distance separates the sensor head and amplifier. All parameters and settings can be set up via this mobile console.



Note: OMRON's fibre-optic series E3X-DA-S and E3X-MDA can also be combined and controlled by this mobile console.

Ordering Information

Sensor Heads

Sensing method	Focus	Model number	Remarks
Diffuse reflective	Spot	E3C-LD11	Mounting a Beam Unit (sold separately) allows the use of line and area beams.
	Line	E3C-LD21	This model number is for the set consisting of the E39-P11 mounted to the E3C-LD11.
	Area	E3C-LD31	This model number is for the set consisting of the E39-P21 mounted to the E3C-LD11.

Amplifier Units

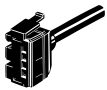
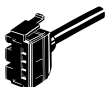
Amplifier Units with Cables

Item		Appearance	Functions	Model	
				NPN output	PNP output
Advanced models	Twin-output models		Area output, self-diagnosis, differential operation	E3C-LDA11	E3C-LDA41
	External-input models		Remote setting, counter, differential operation	E3C-LDA21	E3C-LDA51

Amplifier Units with Connectors

Item		Appearance	Functions	Model	
				NPN output	PNP output
Advanced models	Twin-output models		Area output, self-diagnosis, differential operation	E3C-LDA6	E3C-LDA8
	External-input models		Remote setting, counter, differential operation	E3C-LDA7	E3C-LDA9

Amplifier Unit Connectors (Order Separately)

Item	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	4	E3X-CN21
Slave Connector			2	E3X-CN22

Accessories (Order Separately)

Beam Unit

Applicable Sensor Head	Appearance	Focus	Model number
E3C-LD11		Line	E39-P11
		Area	E39-P21

Mobile Console (Order Separately)

Appearance	Model	Remarks
	E3X-MC11-S (model number of set)	Mobile Console with Head, Cable, and AC adapter provided as accessories
	E3X-MC11-C1-S	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

Note: Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles cannot be used.

Specifications

Ratings/Characteristics

Sensor Heads

Item	E3C-LD11	E3C-LD21	E3C-LD31
Light source (emission wavelength)	Red semiconductor laser diode (650 nm), 2 mW max. (JIS standard: Class 2, FDA standard: Class II)		
Sensing distance (See note 1.)	High-resolution mode: 30 to 1,000 mm Standard mode: 30 to 700 mm Super-high-speed mode: 30 to 250 mm		
Focus (See note 2.)	0.8 mm max. (at distances up to 300 mm)	33 mm (at 150 mm)	33 × 15 mm (at 150 mm)
Functions	Variable focal point mechanism (focus adjustment), optical axis adjustment mechanism (axis adjustment)		
Indicators	LDON indicator: Green; Operation indicator: Orange		
Ambient illumination (receiver side)	3,000 lx (incandescent lamp)		
Ambient temperature	Operating: -10°C to 55°C; Storage: -25°C to 70°C (with no icing or condensation)		
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)		
Vibration resistance (destruction)	10 to 150 Hz with double amplitude of 0.7 mm, in X, Y, and Z directions for 80 min each		
Degree of protection	IEC 60529: IP40		
Materials	Case and cover: ABS Front surface filter: Acrylic resin		
Weight (packed)	Approx. 85 g		

Note: 1. Values are sensed for white paper.

2. The beam radius is the value for the middle measurement distance and indicates a typical value for the middle sensing distance. The radius is defined by light intensity of $1/e^2$ (13.5%) of the central light intensity.

Light will extend beyond the main beam and may be affected by conditions surrounding the object being measured.

Amplifier Units

Model		Type	Advanced, twin-output models		Advanced, external-input models	
		NPN output	E3C-LDA11	E3C-LDA6	E3C-LDA21	E3C-LDA7
Item		PNP output	E3C-LDA41	E3C-LDA8	E3C-LDA51	E3C-LDA9
Supply voltage			12 to 24 VDC ±10%, ripple (p-p) 10% max.			
Power consumption			1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC)			
Control output			Load power supply voltage: 26.4 VDC max.; NPN/PNP (depends on model) open collector Load current: 50 mA max.; residual voltage: 1 V max.			
Response time	Super-high-speed mode		100 μs for operation and reset		80 μs for operation and reset	
	Standard mode		1 ms for operation and reset			
	High-resolution mode		4 ms for operation and reset			
Functions		Power tuning, differential detection, timer, zero-reset, initial reset, mutual interference prevention (See note 1.), preset counter (See note 2.), reversed display				
		I/O settings	Output setting (Select from channel 2 output, area output, or self-diagnosis.)		External input setting (Select from teaching, power tuning, zero reset, light OFF, or counter reset.)	
Display			Operation indicator for channel 1 (orange), operation indicator for channel 2 (orange)		Operation indicator (orange), Power Tuning indicator (orange)	
Digital display			Select from the following: Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel		Select from same displays as given at the left or a counter display.	
Ambient illumination (receiver side)			Incandescent lamp:10,000 lux max. Sunlight:20,000 lux max.			
Ambient temperature			Operating:Groups of 1 to 2 Amplifiers: -25°C to 55°C Groups of 3 to 11 Amplifiers: -25°C to 50°C Groups of 12 to 16 Amplifiers: -25°C to 45°C (with no icing or condensation) Storage: -30°C to 70°C (with no icing or condensation)			
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)			
Degree of protection			---			
Connection method			Prewired cable	Separate connector	Prewired cable	Separate connector
Weight (packed state)			Approx. 100 g	Approx. 55 g	Approx. 100 g	Approx. 55 g
Materials	Case		Polybutylene terephthalate (PBT)			
	Cover		Polycarbonate			

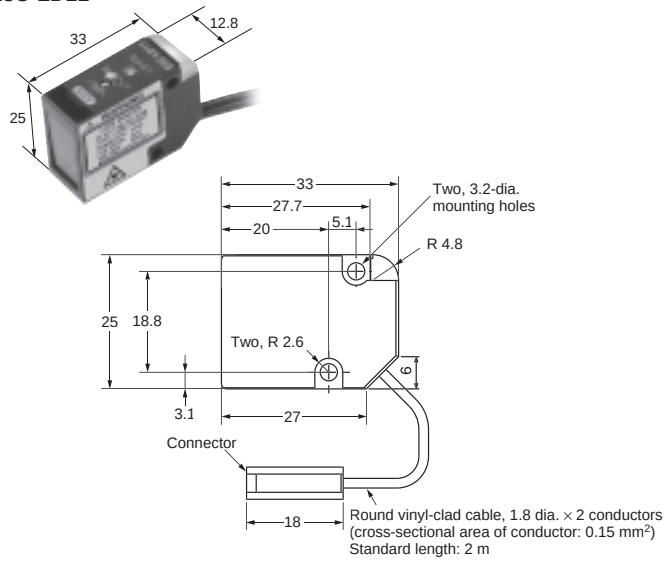
*1. Communications are disabled if super-high-speed mode is selected, and the mutual interference prevention function and the communications function for the Mobile Console will not function.

*2. The preset counter is available only with advanced, external-input models.

Dimensions (mm)

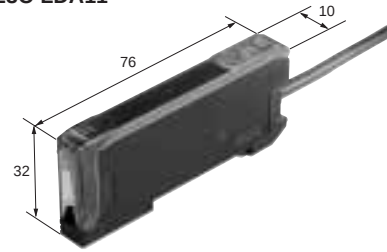
Sensor Head

E3C-LD11



Amplifier Unit

E3C-LDA11



MEMO

Distance setting laser photoelectric sensor

F3C-AL

Even in a reflective background such as SUS, a stable detection of work of any color is possible by simple distance adjustment.

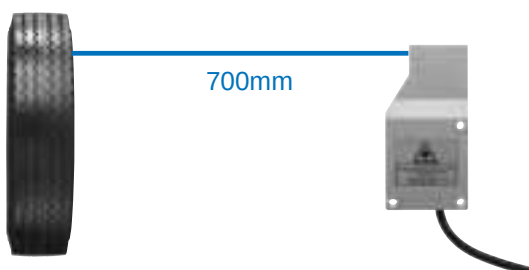


CE

Features

Clear red spot ensures easy setting.

With its wide setting range 170 to 700 mm, F3C-AL is compatible with standard conveyors. In the setting distance of 700 mm, the distance can be set easily with a 1.5x4 mm red spot.



Secure detection of shiny surface

Ensures stable detection of a 45-degree shiny surface. Detection of pouches, laminated packages or like minimizes setup change time.



Unaffected by a shiny background.

Insensitive to shiny objects in the background, the Sensor can be installed in any place.

Small Black/White error:

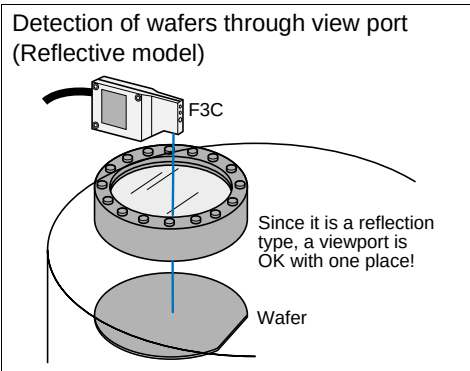
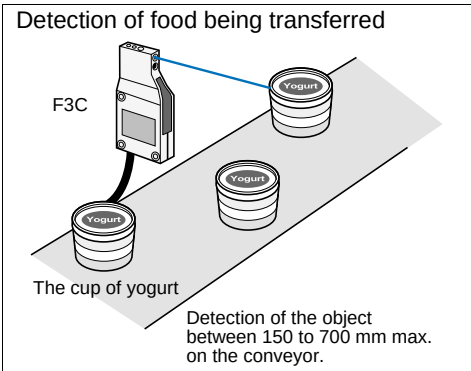
2% (Setting distance 300 mm),
8% max. (Setting distance 500 mm)

A little black/white error saves adjustment time during setup change.

Full hysteresis detection range 0.5% max. (for white paper)

6-turn adjuster ensures ease of adjustment.

Application



Ordering Information

Sensors

Red light

Shape	Connection method	Sensing/Setting range	Operating mode	Model	
				NPN output	PNP output
	Pre-wired with M12-connector	120 170 700 mm Setting range Sensing distance 120 to 700 mm	Light-ON/Dark-ON cable connection selectable	F3C-AL14-M1J	F3C-AL44-M1J

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity
	E39-L40	1

Sensor I/O Connectors

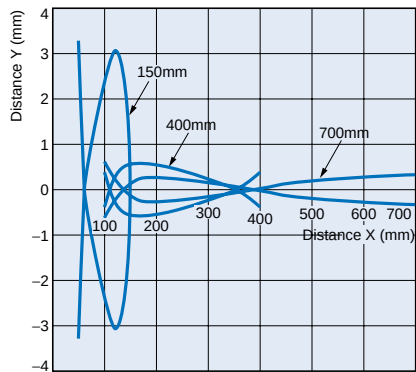
Cable specifications	Shape	Cable type		Model
Standard cable	Straight type	2 m	4 conductors	XS2F-D421-D80-A
		5 m		XS2F-D421-G80-A
	L type	2 m		XS2F-D422-D80-A
		5 m		XS2F-D422-G80-A
Robot cable (for vibration resistance)	Straight type	2 m		XS2F-D421-D80-R
		5 m		XS2F-D421-G80-R
	L type	2 m		XS2F-D422-D80-R
		5 m		XS2F-D422-G80-R

Rating/Performance

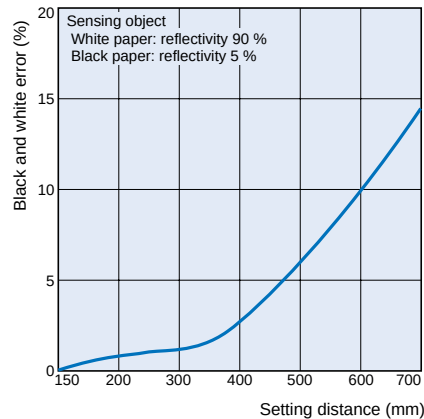
Item	Model	F3C-AL14-M1J	F3C-AL44-M1J
Sensing		120 to 700 mm (White paper 100 x 100 mm) (Setting distance 700 mm)	
Setting distance range		170 to 700 mm (White paper, 90% remission, 100 x 100 mm) 170 to 560 mm (White paper, 6% remission, 100 x 100 mm)	
Black-/white-error		20% max. (of setting distance, 90%/6% remission)	
Spot Diameter		1.5 x 4 mm (Setting distance 700 mm)	
Light source		Pulsed red light semiconductor laser Class II: < 1mWeff. / 670 nm / 5% duty cycle (Impulse time 60 µs, Period time: 1.2 ms)	
Power supply voltage		10 to 30 VDC [ripple (p-p) 10% included]	
Current consumption		30 mA max.	
Control output		Load supply voltage 30 VDC max., load current 150 mA max. (residual voltage: 2 V max.) NPN open collector output type, Light-ON/Dark-ON cable connection selectable	Load supply voltage 30 VDC max., load current 150 mA max. (residual voltage: 2 V max.) PNP open collector output type, Light-ON/Dark-ON cable connection selectable
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention	
Response time		Operation and reset: 10 ms max.	
Sensitivity adjustment		6-turn adjuster	
Ambient illuminance		Incandescent lamp/Sunlight: 5,000 lux max.	
Ambient temperature		Operating: 0°C to 50°C, Storage: -25°C to 60°C (with no icing or condensation)	
Ambient humidity		Operating/Storage: 35% to 85%RH (with no condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Vibration resistance		10 to 55 Hz double amplitude 1.5 mm or 300 m/s ² for 2 h in each of X, Y, Z directions	
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP40	
Connection method		M12 connector joint type (standard cable length 200 mm) / 4 x 0.34 mm ² (PVC)	
Weight (packed state)		Approx. 80 g	
Material	Case	ABS	
	Lens	Acrylics (PMMA)	
Accessories		Adjusting screwdriver, Laser warning label, instruction manual	

Characteristic data (typical)

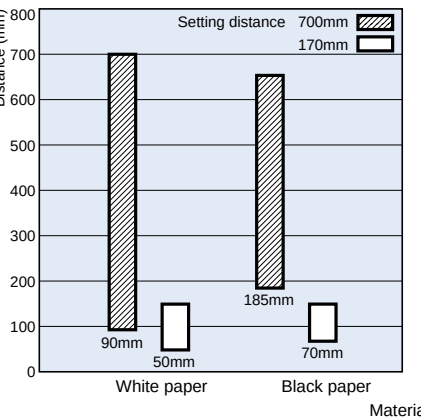
Parallel operating range



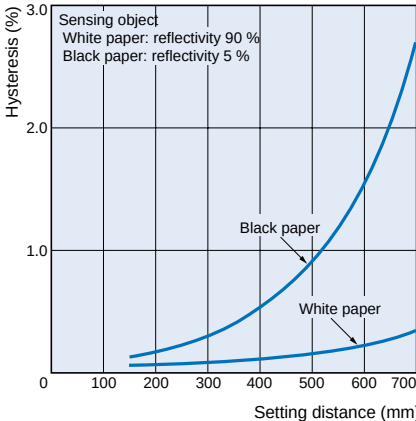
Black/White error



Short distance characteristic chart



Hysteresis



Output Circuit Diagram

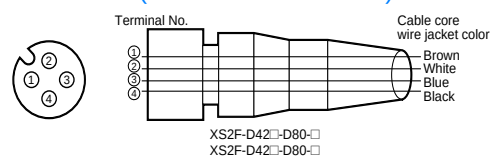
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection	Output circuit
F3C-AL14-M1J	Light ON	Incident Interrupted Light indicator (red) ON Output transistor ON Load (Relay) Operate Reset (Between 1 and 4)	Connect ② to ① or disconnect ②.	Connector Pin Arrangement
	Dark ON	Incident Interrupted Light indicator (red) OFF Output transistor OFF Load (Relay) Operate Reset (Between 1 and 4)	Connect ② to ③.	Connector Pin Arrangement

PNP output

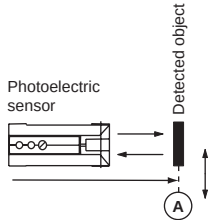
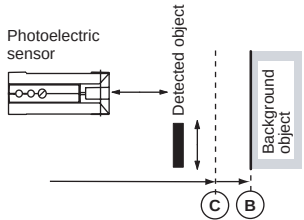
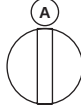
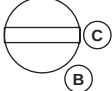
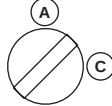
Model	Operating status of output transistor	Timing chart	Mode selection	Output circuit
F3C-AL44-M1J	Light ON	Incident Interrupted Light indicator (red) OFF Output transistor ON Load (Relay) Operate Reset (Between 3 and 4)	Connect ② to ① or disconnect ②.	Connector Pin Arrangement
	Dark ON	Incident Interrupted Light indicator (red) ON Output transistor OFF Load (Relay) Operate Reset (Between 3 and 4)	Connect ② to ③.	Connector Pin Arrangement

Connectors (Sensor I/O connectors)



Class	Wire, outer	Connector	Application
For DC	Brown	①	Power supply (+V)
	White	②	Operation switching
	Blue	③	Power supply (0 V)
	Black	④	Output

Sensitivity Adjustment

Item	Position A	Position B and C	Setting
Adjustment procedure	Place the detected object at the desired location and turn the LIGHT indicator (red) lights. This is position A	Background object Remove the detected object and turn the adjustment knob clockwise until the LIGHT indicator (red) lights. This is the position B. Then turn the adjustment knob counterclockwise until the LIGHT indicator (red) goes out. This is position C. No Background object The maximum adjustment setting is used as position C.	Set the adjustment to halfway between A and C. Confirm that the STAB indicator (green) remains lit both with the detected object present and not present. If the STAB indicator does not remain lit, review the detection method to enable stable operation.
Detecting condition			
Status of distance setting knob			
Indicators	OFF ○ STABILITY (green) ON ● LIGHT (red)	OFF ○ STABILITY (green) OFF ○ LIGHT (red)	ON ● STABILITY (green) OFF ○ LIGHT (red)

Special hints

Recommended adjustment

To assure stable working conditions the green stability LED should be always turned on.

The green LED displays two stability conditions:

1. Output stable ON (red LED on)
2. Output stable OFF (red LED off)

Best performance can be achieved if the sensing object is located closer than -10 % of the setting distance or the shiny background is fixed +10 % behind the switching position.

Precautions

Safety Precaution

Laser beam!



Laser protection class 2

Do not look into the laser beam.

Pay attention to the accident prevention regulations and the laser protection class.

Visible laser emission!

Avoid any indirect or direct radiation of reflected or emitted laser light!

Laser safety

The laser safeguards have been stipulated for laser equipment in and outside Japan. The following gives brief description for use in Japan.

The JIS C6802 Standard stipulates safety preventives that must be taken by the user according to the laser product class. (The outline is given in the following table.)

User's Requirements

Class Item	Class 1	Class 2	Class 3A	Class 3B		Class 4
				3B*	3B	
Using remote interlock		Not required			Connect the remote interlock of the laser beam to the emergency main interlock, the interlock of the room, or the interlock of the door.	
Key control		Not required			Do not keep the key in the lock when the laser beam is not used.	
Beam breaker or attenuator		Not required			Used to protect people from accidental radiation by the laser beam.	
Warning sign		Not required			Post a proper warning sign on the door to the room where laser beam equipment is installed.	
Beam path	Not required	The laser beam must be terminated and, as a rule, must be enclosed. If the laser beam is exposed, the vertical height of the beam must not be the same as that of the eyes.				
Mirror reflection		Not required			Appropriate optical elements must be securely attached and you must be able to control the optical elements during laser radiation.	
Eye protect		Not required			Use eye protectors except in special, specified locations.	
Protection clothes	Not required				Wear protection clothes if exposure of the skin to the laser beam may exceed the MPE of the skin.	
Training	Not required				The laser system must be operated by only properly trained people.	

* 5 mW or less in the visible range

Classification of F3C

Class 2

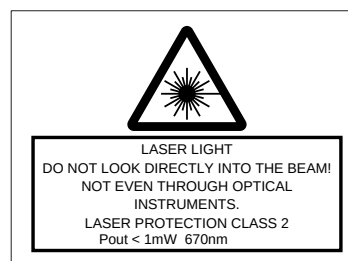
Handle laser equipment in accordance with the following precautions.

- Do not look into the beam.
- Do not disassemble the product. Doing so will release the laser beam to wander around.

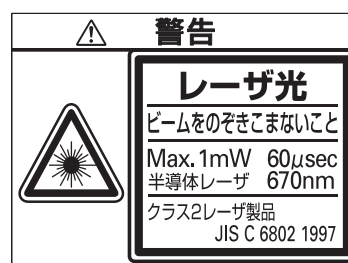
Please obtain or prepare the "Laser product safety standards" on your own responsibility.

Labels related to laser

The following warning label is applied to the side face of the photoelectric sensor.



For use in Japan, change the above label for the one that meets the JIS Standards.



Handling Instructions

F3C radiates a visible-light laser. Do not look into it directly. Use F3C so that the light path of the laser beam is terminated. If there is a mirror-smooth reflector in the light path, confine the beam away from the reflected light path. If F3C must be used with the light path open, avoid placing the light path on the eye level.

Correct Use

Design

Power Reset Time

The Photoelectric Sensor is ready to sense an object in 300 ms after power-on. Therefore, use it 300 ms after power-on. If the load and Sensor are connected to different power supplies, always switch on power for the Sensor first.

Wiring Considerations

Load short-circuit protection

- The F3C-AL has load short-circuit protection. If a load short-circuit or like has occurred, the output turns OFF. Therefore, recheck the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 1.8 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 1.8 times of the rated load current.
- Do not use the input power exceeding the rated voltage. Doing so can cause damage.
- Do not shorten the load with the open collector output. Otherwise, damage might be caused.
- Run the wiring of F3C separately from the high voltage and power cables.
- Avoid wiring them together or running them within the same duct. Doing so may get them induced, causing a malfunction or damage.
- For extension of the cable, use a 0.3-mm² or more cable and run it within 50 m.

Mounting

- Install the photoelectric sensor so that the sun, fluorescent lamp, incandescent lamp or any other strong light will not enter the directional angle range of the sensor.
- If Sensors are installed face-to-face, ensure that no optical axes cross each other. Otherwise, mutual interference may result.
- Use M4 screws to mount the unit.
- When mounting the case tighten it to the torque of 1.2 Nm max.

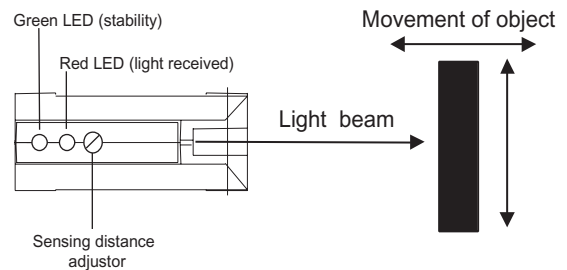
Miscellaneous

Operating Environment

- Avoid using the Sensor in a strong disturbance light (e.g. laser beam or arc welding beam) or strong electromagnetic field.
- Depending on their material and/or shape, some objects may not be detected or may be detected with low accuracy. (Mirror-smooth material, transparent material, material of extremely low reflectivity, object smaller than spot diameter)

Correct operation

The moving direction of the sensor or object should be preferably along the optical axis of the light beam. Lateral approach is also possible. Movement from the top to the bottom or opposite can cause malfunction and should be avoided.

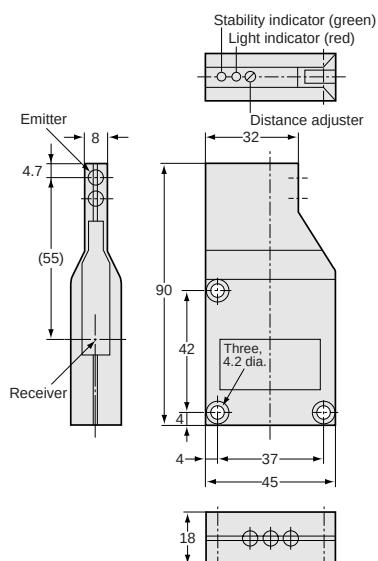


Dimensions (Unit: mm)

Sensors

F3C-AL14-M1J

F3C-AL44-M1J

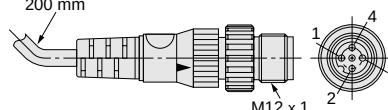


CAD file F3C_01

Terminal No.	Specifications
1	+V
2	L-ON/D-ON selection
3	0V
4	Output

Note. L-ON when 1-2 are connected
D-ON when 2-3 are connected

nyl-insulated round cable of 4 dia.
4 cores conductorStandard length:
200 mm



Accessories (Order Separately)

[Mounting Brackets](#)

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