Built-in Amplifier Photoelectric Sensor (Medium Size)

E3S-A



Be sure to read *Safety Precautions* on page 10.

Ordering Information

Built-in Amplifier Photoelectric Sensors

Red light Infrared light

Sensing method	Appoaranco	Connection	Soneing distance			Functions	Model		
Sensing method	Appearance	method	Jen	Centering distance			T unctions	NPN output	PNP output
								E3S-AT11	E3S-AT31
								Emitter E3S-AT11-L	Emitter E3S-AT31-L
		Pre-wired						Receiver E3S-AT11-D	Receiver E3S-AT31-D
	Horizontal						Timer	E3S-AT21	E3S-AT41
	TIONZONIA						Solf Diagnosis External	Emitter E3S-AT21-L	Emitter E3S-AT41-L
							Diagnosis	Receiver E3S-A121-D	Receiver E3S-A141-D
		Connector						E3S-AT16	E3S-AT36
		(M12)						Emitter E3S-A116-L	Emitter E3S-A136-L
Sonooro *1					<u> </u>	m		FOC ATC1	
Sensors 1								EJJ-AIDI	
	Vertical	Pre-wired				-		Beceiver E3S-AT61-D	Beceiver E3S-AT81-D
								F3S-AT71	F3S-AT91
							Timer Turbo	Emitter E3S-AT71-I	Emitter E3S-AT91-I
							Self Diagnosis External Diagnosis	Receiver E3S-AT71-D	Receiver E3S-AT91-D
		Connector (M12)						E3S-AT66	E3S-AT86
								Emitter E3S-AT66-L	Emitter E3S-AT86-L
								Receiver E3S-AT66-D	Receiver E3S-AT86-D
								E3S-AR11	E3S-AR31
		Pre-wired					Timer	F00 4 D04	500 AD44
	Horizontal						Self Diagnosis Diagnosis	E3S-AR21	E3S-AR41
Retro-reflective Sensors	a _ [] 🛨 []	Connector					Diagnosis		
		(M12)			0 m			E3S-AR16	E3S-AR36
		()		(100 mm)				F3S-AB61	F3S-AB81
		_						LUC ANUT	LUCATION
	Vertical	Pre-wired			*2		Timer Turbo	E3S-AR71	E3S-AR91
							Self Diagnosis External Diagnosis		
	L L	Connector						F35-AB66	F35-AB86
	u	(M12)						LUG-AITUU	LUU-AIIUU

*1. Through-beam Sensors are normally sold in sets that include both the Emitter and Receiver.

Orders for individual Emitters and Receivers are accepted.

*2. Values in brackets are the minimum required distance between the Sensor and Reflector.

	A	Connection	Consing distance	Functions	Мо	del
Sensing method	Appearance	method	Sensing distance	Functions	NPN output	PNP output
					E3S-AD13 *3	E3S-AD33
			100 mm (wide view)	Timer Self Diagnosis	E3S-AD23	E3S-AD43
					E3S-AD11	E3S-AD31
	Horizoptal	Pre-wired	200 mm	Timer Turbo Self Diagnosis	E3S-AD21	E3S-AD41
	HUHZUHIAI				E3S-AD12	E3S-AD32
	⊴		700 mm	Timer Turbo Self Diagnosis	E3S-AD22	E3S-AD42
		Connector (M12)	100 mm (wide view)		E3S-AD18	E3S-AD38
			200 mm		E3S-AD16	E3S-AD36
Diffuse-reflective			700 mm	-	E3S-AD17	E3S-AD37
Sensors] 100 mm (wide view)		E3S-AD63 *3	E3S-AD83
				Timer Self Diagnosis	E3S-AD73	E3S-AD93
					E3S-AD61	E3S-AD81
	Vertical	Pre-wired	200 mm	Timer Turbo Self Diagnosis	E3S-AD71	E3S-AD91
	A				E3S-AD62	E3S-AD82
			700 mm	Timer Self Diagnosis	E3S-AD72	E3S-AD92
			100 mm (wide view)		E3S-AD68	E3S-AD88
		Connector (M12)	200 mm		E3S-AD66	E3S-AD86
		(IVI I Z)	700 mm		E3S-AD67	E3S-AD87

*3. The following models are available with 200-mm sensing distances: E3S-AD14 and E3S-AD64.

Accessories (Order Separately)

Insert-type Long Slit

Slit width	Sensing distance	Minimum sensing object (typical)	Model	Quantity	Remarks
$0.5 \text{ mm} \times 11.1 \text{ mm}$	500 mm	0.2-mm dia.		1 of each for Emitter/	Slite can be used with the E2S
1 mm × 11.1 mm	1.1 m	0.4-mm dia.	E30-S/16	Receiver (4 Slits total)	AT Through-beam
$2 \text{ mm} \times 13.6 \text{ mm}$	2.5 m	0.8-mm dia.	200-040	1 of each for Emitter/ Receiver (2 Slits total)	Sensor.→Page 10

Mutual Interference Prevention Filters

Sensing distance	Model	Quantity	Remarks
2.4 m	E39-E6	2 of each for Emitter/Receiver (4 Filters total)	Can be used with the E3S-AT□□ Through-beam Sensor. → Page 10

Reflectors/Other Accessories

Name	Sensing distance (typical)	Model	Quantity	Remarks	
Reflectors	2 m (100 mm) * (rated value)	E39-R1	1	Provided with E3S-AR Retro-reflective Sensor.	
Small Reflectors	1.3 m (100 mm) *	E39-R3	1		
	600 mm (70 mm) *	E39-R4	1		
	450 mm (100 mm) *	E39-RS1	1		
Tape Reflectors	700 mm (100 mm) *	700 mm (100 mm) * E39-RS2		Enables MSR function.	
	900 mm (100 mm) *	E39-RS3	1		
Optical Axis Confirmation Reflector		E39-R5	1	Used to check optical axis for the E3S-AT	

Note: When using any Reflector other than the provided one, use a sensing distance of approximately 0.7 times the typical value as a guide. * Values in brackets are the minimum required distance between the Sensor and Reflector.

Mounting Brackets/Other

Appearance	Model	Quantity	Remarks
C C C C C C C C C C C C C C C C C C C	E39-L69	1	Provided with E3S-A Horizontal Sensors.
00000	E39-L70	1	Provided with E3S-A Vertical Sensors.
And a long	E39-L59	1	Provided with E3S-A Vertical Pre-wired Sensors.
5 m	E39-L81	1	Provided with E3S-A Vertical Connector Sensors.
	E39-L97	1	Protective Cover for Horizontal Sensors Note: When mounting Sensors with Connectors, the Sensor I/O Connector will come into contact with the Bracket. Mount the Sensor with care.
	E39-L98	1	Protective Cover for Vertical Sensors Note: When mounting Sensors with Connectors, the Sensor I/O Connector will be longer. Mount the Sensor with care.
	E39-L60	1	Close Mounting Plate: Provided with E3S-A Connector Sensors.

Note: If a Through-beam Model is used, order two Mounting Brackets, one for the Emitter and one for the Receiver.

Sensors I/O Connectors

Model	Quantity	Remarks	
E39-G2	1	Provided with product.	

Sensors I/O Connectors

Cable	Appearance	Cable type		Model
	Straight	2 m		XS2F-D421-DC0-A
Standard		5 m	3-wiro	XS2F-D421-GC0-A
Standard	I-shaped	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Note: When using Through-beam models, order one connector for the Receiver and one for the Emitter.

Ratings and Specifications

Sensing method		Through-beam Sensors	Retro-reflective Sensors (with MSR function)	I	Diffuse-reflective Sensors	
		E3S-AT11, 16, 21, 31,	E3S-AR11, 16, 21, 31,	E3S-AD13, 18, 23, 33,	E3S-AD11, 16, 21, 31,	E3S-AD12, 17, 22, 32,
Item	Model	36, 41, 61, 66, 71, 81, 86, 91	36, 41, 61, 66, 71, 81, 86, 91	38, 43, 63, 68, 73, 83, 88, 93	36, 41, 61, 66, 71, 81, 86, 91	37, 42, 62, 67, 72, 82, 87, 92
Sensing dista	nce	7 m	2 m (100 mm) *1 (When using E39-R1)	100 mm (wide view) (white paper 100×100 mm)	10 to 200 mm (white paper 100 \times 100 mm)	700 mm (white paper 200 × 200 mm)
Standard sense	sing object	Opaque: 10-mm dia. min.	Opaque: 75-mm dia. min.			
Differential tra	avel			20% max. of sensing distance	10% max. of sensing distance	20% max. of sensing distance
Directional angle		Both Emitter and Receiver: 3° to 15°	3 to 10°			
Light source (wavelength)	Red LED (700 nm)		Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (880 nm)
Power supply	voltage	10 to 30 VDC, including r	ipple (p-p) 10%			
Current const	umption	Both Emitter and Receiver: 20 mA max. (plus approx. 15 mA with turbo function)	30 mA max. (plus approx. 15 mA with turbo function)	35 mA max.	30 mA max. (plus approx. 15 mA with turbo function)	35 mA max.
Control outpu	control output Load power supply voltage: 30 VDC max., Load cu Open-collector output (NPN or PNP depending on			rrent: 100 mA max. (residu nodel), Light-ON/Dark-ON	ial voltage: 1 V max.) selectable	
Self-diagnosti on Sensors w tic outputs)	c output (Only ith self-diagnos-	(Only Sensors with self-d Load current: 50 mA max Open-collector output (NR	iagnostic function) Load po (residual voltage: 1 V ma PN or PNP depending on r	ower supply voltage: 30 VI ix.), nodel)	DC max.,	
External diagnostic input (Only on Sensors with external diagnostic outputs)	Input voltage	NPN with Emitter OFF: 0 V short-circuit or 1.5 V max. (source current: 1 mA max.) with Emitter ON: Open (leakage current: 0.1 mA max.) PNP with Emitter OFF: +DC short-circuit or -1.5 VDC max. (sink current: 3 mA max.) with Emitter ON: Open (leakage current: 0.1 mA max.)				
	Response time	0.5 ms max.				
Protection cir	cuits	Power supply reverse polarity protection, Output short-circuit protection	Power supply reverse po	larity protection, Output short-circuit protection, Mutual interference prevention		
Response tim	e	Operation or reset: 0.5 m	s max.			
Sensitivity ad	justment	Two-turn endless adjuste	r with an indicator			
Timer function sors with the	n (Only on Sen- timer function)	0 to 100 ms OFF-delay v	ariable adjuster			
Turbo functio sors with the	n (Only on Sen- turbo function)	Yes (with turbo switch)				
Ambient illum er side)	ination (Receiv-	Incandescent lamp: 5,000 Sunlight: 10,000 lx max.) lx max.			
Ambient temp	erature	Operating: -25°C to 55°C Storage: -40°C to 70°C (C (with no icing or condens with no icing or condensat	ation) ion)		
Ambient hum	idity	Operating: 35% to 85% (v Storage: 35% to 95% (vit	with no condensation) th no condensation)			
Insulation res	istance	20 M Ω min. at 500 VDC b	petween current-carrying p	arts and case		
Dielectric stre	ngth	1,000 VAC, 50/60 Hz for	1 min. between current-ca	rrying parts and case		
Vibration resist (destruction)	Vibration resistance (destruction) 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions					
Shock resistance (destruction) Destruction: 500m/s², 3 times each in X, Y, and Z d			rections			
Degree of protection IEC IP67; NEMA: 4X (indoors only) *2						
Connection method Pre-wired (standard length: 2 m) or M12 connector						
Weight (packed state) Pre-wired cable: Approx. 150 g Connector: Approx. 70 g Pre-wired cable: Approx. 110 g Connector: Approx. 60 g Pre-wired cable: Approx. 10 g Pre-wired cable: Approx. 10 g Pre-wired cable: Approx. 60 g			90 g			
	Case	PBT				
Material	Lens	Denatured polyallylate				
	Mounting Bracket	Stainless steel (SUS304)				
Accessories		Mounting bracket (with so (only for Sensors with co	crews), Sensitivity adjustm	ent driver, Sensitivity adjust only for Retro-reflective Set	sting knob, Instruction she	et, Close mounting plate

*1. Values in brackets are the minimum required distance between the Sensor and Reflector. *2. National Electrical Manufacturers Association

Engineering Data (Typical)

Parallel Sensing Range

Through-beam Sensors E3S-AT



Parallel Sensing Range

Retro-reflective Sensors

E3S-AR + E39-R1 (with Reflector)



Excess Gain vs. Set Distance

Through-beam Sensors E3S-AT



Through-beam Sensors E3S-AT + E39-S46 (Slit Sold Separately)



Through-beam Sensors E3S-AT + E39-E6 (Filter Sold Separately)



Sensing Range

Diffuse-reflective Sensors

E3S-AD 1/AD 2/AD 3/AD 6/AD 7/AD 8



Retro-reflective Sensors E3S-AR + E39-R1 (with Reflector)



Diffuse-reflective Sensor

Diffuse-reflective Sensor

E3S-AD 1/AD 2/AD 3/AD 6/AD 7/ AD 8 (Detection of Black Paper)

Sensing Object Size vs. Sensing Distance

E3S-AD 1/AD 2/AD 3/AD 6/AD 7/ AD 8



E3S-AD 1/AD 2/AD 3/AD 6/AD 7/

Sensing object: Black paper ratio (times) E3S-AD 1/3/6/8: 100 100 mm -E3S-AD 2/7: 200 200 mm 50 30 Excess gain 5 E3S-AD 2/ E3S 3 -AD 1/06 Operating level 0.5 0.3 E3S-AD 0.1 ō 200 400 600 800 Distance (mm)



I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing charts	Mode selector switch	Output circuit
E3S-AT11 * E3S-AT16 * E3S-AT61 * E3S-AT66 * E3S-AR11 E3S-AR16 E3S-AR16	Light-ON	Incident light No incident light Light indicator ON (red) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black)	L Side (LIGHT ON)	Through-beam Receivers, Retro-reflective Sensors, Diffuse-reflective Sensors
E3S-AR61 E3S-AR66 E3S-AD11 E3S-AD16 E3S-AD61 E3S-AD66 E3S-AD12	Dark-ON	Incident light No incident light Light indicator ON (red) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black)	D Side (DARK ON)	Connector Pin Arrangement
E3S-AD17 E3S-AD62 E3S-AD67 E3S-AD13 E3S-AD18 E3S-AD63 E3S-AD68	Through-be	am Emitters	Brown	10 to Image: Connector Pin Arrangement 30 VDC Image: Connector Pin Arrangement Note: Pins 2 and 4 are not used.

*Models numbers for Through-beam Sensors (E3S-AT) are for sets that include both the Emitter and Receiver.

The model number of the Emitter is expressed by adding "-L^{*} to the set model number (example: E3S-AT11-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT11-D 2M). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.



*Models numbers for Through-beam Sensors (E3S-AT□1) are for sets that include both the Emitter and Receiver.

The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT21-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT21-D 2M). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

Structure of Sensor I/O Connector



Classification	Wire color	Connection Pin No.	Application
	Brown	1	+V
Ear DC		2	
TOTEC	Blue	3	0 V
	Black	4	Output

Note: Pin No. 2 is not used.



* Models numbers for Through-beam Sensors (E3S-AT) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT31-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT31-D 2M). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

Model	Operation mode	Timing charts	Mode selector switch	Output circuit
E3S-AR41	Light-ON	Incident light No incident light Light indicator ON (red) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black) T: OFF-delay timer (0 to 100 ms)	L Side (LIGHT ON)	Retro-reflective Sensors
E3S-AR91	Dark-ON	Incident light No incident light Light indicator ON (red) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black) T: OFF-delay timer (0 to 100 ms)	D Side (DARK ON)	(red) electric Sensor arcuit urcuit Uoad (relay) Blue

Structure of Sensor I/O Connector



Adjustment Methods

Sensitivity Adjustment for Diffuse-reflective Sensors Set to Light ON



Unlike conventional Photoelectric Sensors, the variation in the sensitivity of E3S-A Photoelectric Sensors is minimal. This means the sensitivity can be adjusted on only a single Photoelectric Sensor, and then <u>the adjusters on the other Photoelectric Sensors</u> can be set to the same scale position. There is no need to adjust the sensitivity of each Photoelectric Sensor individually.

🕂 WARNING

This product is not designed or rated for ensuring safety of persons. Do not use it for such purposes.



Precautions for Correct Use

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

Mounting

Position of Optical Axis of Through-beam Model

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



Position of Arrow Indicating Optical Axis

Model	Position of lens in use	
E3S-A	Tan	
(Vertical Sensors)	тор	
E3S-A		
(Horizontal	Bottom	
Sensors)		

Tightening the Connector

Manually tighten the connector until the threads have completely disappeared. If tightening is insufficient, the degree of protection may not be maintained, or the connector may become loose when it is subjected to vibration. <u>Using</u> <u>pliers to tighten the connector may damage it.</u>



Use the E39-L60 Close Mounting Plate (provided) if the Sensor is mounted using mounting brackets or if it is mounted directly. (Refer to *Dimensions*.)

Mounting Bracket (Provided)

The direction of the optical axis coincides with the machine axis of the E3S-A when the mounting screw is inserted into the lock hole of the Mounting Bracket. If the mounting surface and the screw hole are correctly aligned toward the sensing object (or toward the Retroreflector for a Through-beam Sensor), the mechanical axis and optical axis will be aligned when the screw is inserted into the hole. Incident light will be detected, and time-consuming adjustment will not be necessary. (If, however, the mounting surface is not flat, adjustment of the optical axis may still be required.) Adjust the position of the Sensor so that incident light points at the center. Make sure that the incident light is at a fixed position.

The maximum tightening torque of the screw is 0.53 N.m max.



Adjustments

E39-S46 Through-beam Slits

(Accessory, order separately)

Use the rubber attachment with the metal cover if a slit width of 2 mm is required. (A Slit is not required in this case.) Insert the 0.5- or 1-mm Slit between the metal cover and rubber attachment if a slit width of 0.5 or 1 mm is desired. These Slits fit into the rubber attachment.



Apply the Slit to the lens of the Photoelectric Sensor marked with an arrow indicating the position of the optical axis (apply it to the bottom lens of Horizontal Sensors and the top lens of Vertical Sensors).

E39-E6 Polarized Mutual Interference Prevention Filters for Through-beam Sensors

(Accessory, order separately)

Receiver

A set of 4 Filters are sold together for two Through-beam Sensors (for 2 each for Emitters and Receivers). Order one for every two sets of Photoelectric Sensors.

For mounting, refer to the figure of the Through-beam Slits.



Up to two units can be attached

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Note: The arrows on the Filters can be attached in either direction when two Sensors are mounted next to each other. The Filter attached to an Emitter and to the corresponding Receiver must be the same in direction of polarization or the Sensor will not function.

The arrow printed on the cover indicates the direction of polarization. By attaching the Filters opposite to each other in polarization to the Emitters and the Receivers in rows, mutual interference can be prevented (in any case, the Filter attached to an Emitter and to the corresponding Receiver must be the same in direction of polarization or the Photoelectric Sensor will not function).

Operating Mode Selection

As shown in the following illustration, the E3S-A has an operating mode selector on the panel where the Receiver connector is located.

With this operating mode selector, the E3S-A is in either Dark-ON or Light-ON mode.



The default operating mode is shown in the following table.

Sensing method	Default switch setting	
Through-beam Sensors Retro-reflective Sensors	Dark-ON	
Diffuse-reflective Sensors	Light-ON	

Timer and Turbo Switch

The Emitter of the Through-beam Sensor with the selfdiagnostic feature incorporates a turbo switch. When this switch is ON, the intensity of the red LED light source can be increased to make a brighter spot.

Turbo Function (Turbo Switch)

The turbo function is effective with the turbo switch pressed, and the function is reset automatically when released. With the turbo function switched ON, the light spot is visible even at a distance of 200 mm, making it easy to check the sensing position and the angle of the optical axis.

Precautions

- (1)Do not keep the turbo switch pressed for longer than 3 minutes. (It will not break even if it is pressed for an extended period.)
- (2)Pressing the switch may change the timer delay settings. Set the timer after using the turbo function to check the optical axis.
- (3)To press the switch, use a force of 9.8 N max.



Using the E39-R5 Optical Axis Reflector for Throughbeam Sensors

(Accessory, order Separately)

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



Attach the Reflector to the Receiver.

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

When the Reflector is removed, the light beam strikes the Receiver.

Dimensions

(Unit: mm) Unless otherwise specified, the tolerance class IT16 is used for dimensions in this data sheet.

E3S-A Built-in Amplifier Photoelectric Sensor

Through-beam Sensors (Horizontal)



Note: Models numbers for Through-beam Sensors (E3S-AT⊡1) are for sets that include both the Emitter and Receiver.

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Note: Models numbers for Through-beam Sensors (E3S-ATD1) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT11-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT11-D 2M). Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

Sensors with Standard Connectors



Note: Models numbers for Through-beam Sensors (E3S-AT 6) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT16-L 2M), the model number of the Receiver, by adding "-D"

(example: E3S-AT16-D 2M). Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

Through-beam Sensors (Vertical) Pre-wired Sensors



Note: Models numbers for Through-beam Sensors (E3S-ATD1) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT61-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT61-D 2M). Refer to Ordering Information to confirm model numbers for Emitter and Receivers.







Note: Models numbers for Through-beam Sensors (E3S-AT 6) are for sets that include both the Emitter and Receiver.

The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3S-AT66-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-AT66-D 2M). Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

Retro-reflective Sensors (Horizontal) Pre-wired Sensors



Sensors with Connectors



Retro-reflective Sensors (Vertical) Pre-wired Sensors



Diffuse-reflective Sensors (Horizontal) Pre-wired Sensors



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Diffuse-reflective Sensors (Vertical)

Pre-wired Sensors



E39-L60 Close Mounting Plate (provided) (Attach the mounting plate or the plug cannot be connected.) *The Mounting Bracket can be attached to side A. г÷.

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Two, $M3 \times 12$ screws

⊦10.5

A

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Accessories (Order Separately)



E39-R5 Bracket to be attached to the Emitter panel of E3S-A Material: Reflector: Acryl Back: ABS

In the interest of product improvement, specifications are subject to change without notice.

Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

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- · Systems, machines, and equipment that could present a risk to life or property.

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