## Oil-resistant, Long-range Photoelectric Sensor with Metal Housing

# =3S-C

CSM\_E3S-C\_DS\_E\_6\_1

CE

## Water- and Oil-resistant **Photoelectric Sensor with** Metal Housing Used for Longrange Sensing

- Excellent resistance against the water and oil. Easy application in locations with oil mist.
- Long-range sensing up to 30 m with Through-beam models.
- Shock resistance rated at 1,000m/s<sup>2</sup>.
- Product lineup includes metal M12 pre-wired connector models.
- NPN/PNP selector switch output.



## **Ordering Information**

Sensing method	Appearance	Connection method	Sen	ising dis	stance	Model
<u>-</u>	Horizontal	Pre-wired				E3S-CT11 2M Emitter E3S-CT11-L 2M Receiver E3S-CT11-D 2M
Through-beam	⊈: <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	Pre-wired Connector (M12)			<mark></mark> 30 m	E3S-CT11-M1J 0.3M Emitter E3S-CT11-L-M1J 0.3M Receiver E3S-CT11-D-M1J 0.3M
(Emitter + Receiver) *	Vertical	Pre-wired			30 III	E3S-CT61 2M Emitter E3S-CT61-L 2M Receiver E3S-CT61-D 2M
		Pre-wired Connector (M12)				E3S-CT61-M1J 0.3M Emitter E3S-CT61-L-M1J 0.3M Receiver E3S-CT61-D-M1J 0.3M
	Horizontal	Pre-wired				E3S-CR11 2M
Retro-reflective		Pre-wired Connector (M12)		3 n		E3S-CR11-M1J 0.3M
Relio-reliective	Vertical	Pre-wired		3 1		E3S-CR61 2M
		Pre-wired Connector (M12)				E3S-CR61-M1J 0.3M
		Pre-wired	700 mm			E3S-CD11 2M
	Horizontal	Fie-wiled		2 m		E3S-CD12 2M
Diffuse-reflective	₫,; +	Pre-wired Connector (M12)	700	) mm		E3S-CD11-M1J 0.3M
				2 m		E3S-CD12-M1J 0.3M
	Vertical	Pre-wired	700	) mm		E3S-CD61 2M
	Vertical			2 m		E3S-CD62 2M
		Pre-wired Connector (M12)	700	) mm		E3S-CD61-M1J 0.3M
	₩ <del>G</del>			2 m		E3S-CD62-M1J 0.3M

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

Orders for individual Emitters and Receivers are accepted.

#### Accessories (Order Separately) Slits (A Slit is not provided with Through-beam Sensors. Order a Slit separately if required.) (Refer to Dimensions on page 10.)

Slit width	Sensing distance	Minimum detect- able object (typical)	Model	Quantity	Remarks	
0.5  mm  imes 11  mm	1.8 m	0.5-mm dia.		1 set each for Emitter and Re- ceiver (8 Slits total)		
$1 \text{ mm} \times 11 \text{ mm}$	3.5 m	1-mm dia.	E39-S61		(Snap-in Long Slit) Can be used with the E3S-CT□1(-M1J) Through-beam Sensor. Refer to page 10.	
$2 \text{ mm} \times 11 \text{ mm}$	7 m	2-mm dia.				
$4 \text{ mm} \times 11 \text{ mm}$	15 m	2.6-mm dia.				

#### Reflectors (Reflector required for Retroreflective Sensors)

A Reflector is provided with the E39-R1 Sensor. For other Sensors, order a reflector separately if required. (Refer to Dimensions on E39-L/F39-L/E39-S/E39-R.)

Name	Sensing distance (typical)	Model	Quantity	Remarks
Reflectors	3 m (rated value)	E39-R1	1	Provided with the E3S-CR□1 (-M1J) Retro-reflective Sensor.
Reliectors	4 m	E39-R2	1	
Small Reflectors	1.5 m	E39-R3	1	
	750 mm	E39-R4	1	
	700 mm (50 mm)*	E39-RS1	1	
Tape Reflectors	1,100 mm (100 mm)*	E39-RS2	1	Enables MSR function.
	1,400 mm (100 mm)*	E39-RS3	1	

Note: 1. When using any reflector other than the provided one, use a sensing distance of approximately 0.7 times the typical value as a guide. 2. Refer to *Reflectors* on *E39-L/F39-L/E39-S/E39-R* for details.

\* Values in parentheses indicate the minimum distance required between the Sensor and Reflector.

#### **Mounting Brackets**

Some Mounting Brackets are provided with the Sensor. Order other Mounting Brackets separately if required. (Refer to Dimensions on E39-L/F39-L/E39-S/E39-R.)

Appearance	Model	Quantity	Remarks
	E39-L102	1	Provided with Horizontal Models.
A F	E39-L103	1	Provided with Vertical Models.
	E39-L85	1	Mounting bracket for changing from E3S-
A A A	E39-L86	1	Mounting bracket for changing from E3S-
	E39-L87	1	

Note: 1. When using a Through-beam Sensor, order one Connector for the Receiver and one for the Emitter. 2. Refer to Mounting Brackets on E39-L/F39-L/E39-S/E39-R for details.

#### **Sensor I/O Connectors**

(Models with Pre-wired Connectors: A Connector is not provided with the Sensor. Be sure to order a Connector separately.) (Refer to Dimensions on XS2.)

Cable	Appearance	Cable type		Model
	Straight	2 m	- - 3-wire -	XS2F-D421-DC0-A
Ctondord		5 m		XS2F-D421-GC0-A
Standard	L-shape	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Note: 1. When using a Through-beam Sensor, order one Connector for the Receiver and one for the Emitter.

2. For details on Sensor I/O Connectors and cables such as vibration-proof robot cables, refer to Introduction to Sensor I/O Connectors.

## **Ratings and Specifications**

Sensing method		Through-beam	Retro-reflective (with M.S.R. function) *1	Diffuse	reflective		
	Model	Horizontal E3S-CT11(-M1J)	Horizontal E3S-CR11(-M1J)	Horizontal E3S-CD11(-M1J)	Horizontal E3S-CD12(-M1J)		
Item	Woder	Vertical E3S-CT61(-M1J)	Vertical E3S-CR61(-M1J)	Vertical E3S-CD61(-M1J)	Vertical E3S-CD62(-M1J)		
Sensing di	istance	30 m	3 m (when using E39-R1)	700 mm (300 $\times$ 300 mm white paper)	2 m $(300 \times 300 \text{ mm} \text{ white paper})$		
Standard sensing object		Opaque, 15-mm dia. min.	Opaque, 75-mm dia. min.	-			
Differentia	l travel		-	20% max. of sensing distan	ce		
Directional	l angle	Emitter and Receiver: 3° to15°	3° to 10°	-			
Light sour (wavelengt		Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (880 nm)			
Power sup	ply voltage	10 to 30 VDC including 10% (	p.p) ripple				
Current co	onsumption	50 mA max. (Emitter 25 mA max. Receiver 25 mA max.)	40 mA max.				
Control ou	itput	Load power supply voltage: 3 Load current: 100 mA max. (F Open controller output (NPN/f Light-ON/Dark-ON selectable	Residual voltage: NPN output: 1 PNP selectable)	1.2 V max., PNP output: 2.0 V	/ max.)		
Protection circuits         Power supply reverse polari- ty circuit protection, Output short-circuit protection         Power supply reverse polari- Mutual interference prevention				uit protection,			
Response	time	Operate or reset: 1 ms max.			Operate or reset 2 ms max.		
Sensitivity adjustmen		One-turn adjuster		Two-turn endless adjuster w	vith an indicator		
Ambient ill (Receiver s		Incandescent lamp: 5,000 lx n Sunlight: 10,000 lx max.	nax.				
Ambient te range	emperature	Operating: -25°C to 55°C, Sto	prage: –40°C to 70°C (with no i	cing or condensation)			
Ambient her range	umidity	Operating: 35% to 85%, Stora	age: 35% to 95% (with no cond	ensation)			
Insulation	resistance	20 MΩ min. (at 500 VDC)					
Dielectric s	strength	1,000 VAC, 50/60 Hz for 1 min					
Vibration r	resistance	Destruction: 10 to 2,000 Hz, 1	.5-mm double amplitude or 30	0 m/s <sup>2</sup> for 0.5 hours each in $\lambda$	K, Y, and Z directions		
Shock resi	istance	Destruction: 1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions					
Degree of	protection	IEC 60529: IP67 (in-house sta	andards: oil-resistant), NEMA: (	6P (indoors only) *2			
Connectio	n method	Pre-wired (standard cable len	gth: 2 m) or Pre-wired M12 Co	nnector (standard cable leng	h: 0.3 m)		
Weight (packed state)		Approx. 270 gApprox. 160 gApprox. 150 g(Pre-wired cable)(Pre-wired cable)(Pre-wired cable)Approx. 230 gApprox. 130 gApprox. 110 g(Pre-wired Connector (M12))(Pre-wired Connector (M12))(Pre-wired Connector (M12))			)		
(	Case	Zinc die-cast					
	Operation panel cover	PES (polyether sulfone)					
Material Lens Methacrylic resin							
	Lens	Stainless steel (SUS304)					
	Lens Mounting Bracket						

\*1. Refer to *MSR function* of *Technical Guide (Technical version).* \*2. NEMA: National Electrical Manufactures Association

#### **Parallel Operating Range**

Through-beam E3S-CT (-M1J)



Through-beam E3S-CT□ (-M1J) + E39-S61 Slit (Order Separately)



Retro-reflective E3S-CR
1 (-M1J) + E39-R1 Reflector (Provided)



#### **Operating Range**

Diffuse-reflective

#### E3S-CD (-M1J)



#### Excess Gain vs. Set Distance

## Through-beam





#### Retro-reflective E3S-CR□1 (-M1J) + E39-R1 Reflector (Provided)



### Diffuse-reflective E3S-CD



## I/O Circuit Diagrams

#### **NPN Output**

Model	Operation mode	Timing charts	Operation selector	Output circuits
E3S-CT11(-M1J) *	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 leads)	L side (LIGHT ON)	Through-beam Model Receivers: Retro-reflective Models, Reflective Models
E3S-CT61(-M1J) * E3S-CR61(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	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 leads)	D side (DARK ON)	* Set the NPN or PNP selector to NPN. Connector Pin Arrangement
	Through-beam	Model Emitters	Brown Blue	Connector Pin Arrangement

#### **PNP Output**

Model	Operation mode	Timing charts	Operation selector	Output circuits	
E3S-CT11(-M1J) *	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 leads)	L side (LIGHT ON)	Through-beam Model Receivers: Retro-reflective Models, Reflective Models	
E3S-CT61(-M1J) * E3S-CR11(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	Dark-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 leads)	D side (DARK ON)	* Set the NPN or PNP selector to NPN. Connector Pin Arrangement	
	Through-beam Model Emitters Power (Red) Photo- electric Sensor main circuit Blue Blue Blue Note: Pins 2 and 4 are not used.				

\* Models numbers for Through-beam Sensors (E3S-CT□1(-M1J)) 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-CT11-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-CT11-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

#### Plug (Sensor I/O Connector)



Note: Pin 2 is not used.

## Nomenclature

#### Horizontal Model



## Safety Precautions

Refer to Warranty and Limitations of Liability.

#### WARNING

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



#### Precautions for Correct Use

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

#### Designing

#### **Fuzzy Mutual Interference Prevention Function**

If Reflective Sensors are installed side by side, each Sensor may be influenced by the light emitted from the other Sensors.

The fuzzy mutual interference prevention function of the E3S-C enables the E3S-C to monitor any light interference for a certain period before the E3S-C starts emitting light so that the E3S-C can retrieve the intensity and frequency of the light interference as data. Using this data, the E3S-C estimates with fuzzy inference the risk of the malfunctioning of the E3S-C and controls the timing of the E3S-C's light emission.

#### When the risk is low:

The E3S-C waits until there is no light interference and emits light.





The E3S-C emits light between each period of light interference.



## Wiring

#### Cable

- The E3S-C uses an oil-resistive cable to ensure oil resistivity.
- Do not allow the cable to be bent to a radius of less than 25 mm.

#### Mounting

#### Mounting

- When mounting the E3S-C, do not hit the E3S-C with a hammer, or the E3S-C will loose watertightness.
- $\bullet$  Use M4 screws to mount the E3S-C. The tightening torque of each screw must be 1.18 N  $\cdot m$  maximum.

#### Vertical Model



Note: The sensitivity adjuster on Through-beam and Retro-reflective Models is different.

\*1. Use the output selector to select the type of output transistor, NPN or PNP. \*2. Use the operation selector to select the operation mode.

#### Mounting Bracket

• When mounting the E3S-C with the mounting bracket so that sensing objects will be in the direction of the mechanical axis, use the optical axis lock holes.

• If it is not possible to mount the E3S-C so that the sensing objects will be in the direction the mechanical axis, move the E3S-C upwards, downwards, to the left, or to the right and secure the E3S-C in the center of the range where the light indicator will be lit, at which time make sure that the stability indicator is lit.

#### **Direct Mounting**

Mount the E3S-C as shown in the following illustration. **Mounting with M4 Screws** 



#### Adjusting

#### **Optical Axis of Through-beam Sensor**

The E3S-C Through-beam Models incorporates two lenses, one of which will be used as shown in the following illustration. When using a Slit, the Slit must be on the side where the lens to be used is located. Horizontal Model Vertical Model



#### Water Resistance

To ensure the water resistance of the E3S-C, tighten the screws of the operation panel cover to a torque of 0.34  $N{\cdot}m$  to 0.54  $N{\cdot}m$ .

#### • Others

#### **Oil and Chemical Resistance**

- Although the E3S-C is oil-resistance, refer to the following table before using the E3S-C in places where oil may be sprayed on the E3S-C.
- Tests were carried out with the following oils and it was certified that the E3S-C resists these oils.

Oil	Product name	Kinematic viscosity (mm <sup>2</sup> /s (cst)) at 40°C	РН
Lubricating oil	Velocite No.3	2.02	
Water insoluble machining oil	Yushiron Oil No. 2 ac	Less than 10	
	Yushiroken EC50T-3		7 to 9.5
Water soluble machining oil	Yushiron Lubic HWC68		7 to 9.9
	Griton 1700D		7 to 9.2
	Yushiroken S50N		7 to 9.8

Note: 1. The E3S-C maintained a minimum insulation resistance of 100 M $\Omega$  after the E3S-C was dipped in all the above oils at a temperature of 50°C for 240 hours.

2. When using the E3S-C in a place where an oil other than the ones listed above is sprayed on the E3S-C, refer to the above kinematic viscosity and ph values. The location may be suitable for the E3S-C if the kinematic viscosity and pH values of the oil are close to the above kinematic viscosity and pH values, but make sure that the oil does not contain any additive that may have a negative influence on the E3S-C.

### **Dimensions**

(Unit: mm) Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified

Pre-wired Connector (-M1J)

#### Sensors

#### **Through-beam (Horizontal)** E3S-CT11(-M1J)



Note: Models numbers for Through-beam Sensors (E3S-CT11(-M1J)) 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-CT11-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-CT11-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.



Two, M4 \*The Mounting Bracket can be attached to side A.

9.3

1.5

20.8

Note: Models numbers for Through-beam Sensors (E3S-CT61(-M1J)) 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-CT61-L 2M), the model number of the Receiver, by adding "-D" (example: E3S-CT61-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

25.4

A

Optical axis

Emitt



#### Accessories (Order Separately)

## Snap-in Long Slit (For Through-beam Models) E39-S61



Material	Quantity	
Stainless	1 set each for Emitter/Receiver (8 Slits total)	
steel		
	(,	
	Stainless	

#### Reflectors

Refer to E39-L/F39-L/E39-S/E39-R for details.

#### **Mounting Brackets**

Refer to E39-L/F39-L/E39-S/E39-R for details.

#### **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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#### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

#### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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#### 2010.9

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#### OMRON Corporation Industrial Automation Company

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#### ООО "ЛайфЭлектроникс"

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