# OMRON

# Ultracompact, Ultrathin Photoelectric Sensor with Built-in Amplifier

# The Improved E3T Series with Easier, Smoother Mounting and Installation

- Newly added Through-beam, Long-distance (2 m) Sensors (E3T-ST3□).
- Easy installation with M3-mounting Sensors (E3T-ST M, E3T-FD M, and E3T-SL M).
- Small Cylindrical Sensors for one-point mounting also added to the Series. (E3T-C□□□(S)).



Be sure to read Safety Precautions on page 13.

### **Lineup Overview**

Appearance		Sensing method	Through-beam	Retro- reflective	Diffuse- reflective	Convergent- reflective	BGS- reflective
Rectangular type	Side-view	M2-mounting	•	•		•	
	Ť	<u>NEW</u> M3-mounting	•			•	
	Flat	M2-mounting	•		•		•
		NEW M3-mounting			•		
<b>NEW</b> Cylindrical	Top-view		•		•		
type	Side-view		•				

# E<sub>3</sub>T **Ordering Information**

#### Sensors [Refer to Dimensions on page 14.]

M2-mounting Sensors A set of mounting screws is included with the Sensor. Red light Infrared light

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Sensing method	Appearance	Sensing distance	Operation mode	NPN output	PNP output
		2 m	Light-ON	E3T-ST31 2M <u>NEW</u>	E3T-ST33 2M <u>NEW</u>
		(Sensitivity Adjustment Unit can be used.)	Dark-ON	E3T-ST32 2M <u>NEW</u>	E3T-ST34 2M <u>NEW</u>
Through-beam		1 m	Light-ON	E3T-ST11 2M	E3T-ST13 2M
Emitter		(Sensitivity Adjustment Unit can be used.)	Dark-ON	E3T-ST12 2M	E3T-ST14 2M
+ Receiver		300 mm	Light-ON	E3T-ST21 2M	E3T-ST23 2M
			Dark-ON	E3T-ST22 2M	E3T-ST24 2M
		500 mm	Light-ON	E3T-FT11 2M	E3T-FT13 2M
		500 mm	Dark-ON	E3T-FT12 2M	E3T-FT14 2M
		300 mm	Light-ON	E3T-FT21 2M	E3T-FT23 2M
		300 mm	Dark-ON	E3T-FT22 2M	E3T-FT24 2M
Retro-		Using the E39-R4 Reflector provided 200 mm [30 mm] *1	Light-ON	E3T-SR41 2M* <sup>3</sup>	E3T-SR43 2M* <sup>3</sup>
reflective		Using the E39-R37-CA 100 mm [10 mm] *1	Dark-ON	E3T-SR42 2M* <sup>3</sup>	E3T-SR44 2M* <sup>3</sup>
Diffuse-	1-1	5 to 30 mm	Light-ON	E3T-FD11 2M	E3T-FD13 2M
reflective			Dark-ON	E3T-FD12 2M	E3T-FD14 2M
	(ii)	5 to 15 mm	Light-ON	E3T-SL11 2M	E3T-SL13 2M
Convergent-			Dark-ON	E3T-SL12 2M	E3T-SL14 2M
reflective	- × •	5 to 30 mm	Light-ON	E3T-SL21 2M	E3T-SL23 2M
	•		Dark-ON	E3T-SL22 2M	E3T-SL24 2M
		1 to 15 mm	Light-ON	E3T-FL11 2M	E3T-FL13 2M
BGS-	/		Dark-ON	E3T-FL12 2M	E3T-FL14 2M
reflective		1 to 30 mm	Light-ON	E3T-FL21 2M	E3T-FL23 2M
	I		Dark-ON	E3T-FL22 2M	E3T-FL24 2M

### M3-mounting Sensors <u>NEW</u> A set of mounting screws is not included with the Sensor. Order a Screw Set separately if required.

Sensing method	Annoaranaa	Sonaing distance	Operation mode	Model		
Sensing method	Appearance	Sensing distance	Operation mode	NPN output	PNP output	
Through-beam	22	) 1 m	Light-ON	E3T-ST11M 2M	E3T-ST13M 2M	
$\int E_{mitter} $			Dark-ON	E3T-ST12M 2M	E3T-ST14M 2M	
+ Receiver		300 mm	Light-ON	E3T-ST21M 2M	E3T-ST23M 2M	
		300 mm	Dark-ON	E3T-ST22M 2M	E3T-ST24M 2M	
Diffuse-		5 to 30 mm	Light-ON	E3T-FD11M 2M	E3T-FD13M 2M	
reflective			Dark-ON	E3T-FD12M 2M	E3T-FD14M 2M	
		5 to 15 mm	Light-ON	E3T-SL11M 2M	E3T-SL13M 2M	
Convergent-	<u> </u>		Dark-ON	E3T-SL12M 2M	E3T-SL14M 2M	
reflective		5 to 30 mm	Light-ON	E3T-SL21M 2M	E3T-SL23M 2M	
			Dark-ON	E3T-SL22M 2M	E3T-SL24M 2M	

### Small Cylindrical Sensors <u>NEW</u> A set of mounting nuts is included with the Sensor.

Sensing method	Appearance	e Sensing distance		Operation mode	Model		
Sensing method	Appearance			Operation mode	NPN output	PNP output	
	all		1 m	Light-ON			
/ Emitter	and a feature	(		Dark-ON	E3T-CT12 2M	E3T-CT14 2M	
+ Receiver		500 mm	500 mm	Light-ON			
(			500 mm	Dark-ON	E3T-CT22S 2M	E3T-CT24S 2M	
Diffuse- reflective (with adjuster)		] 3 to 50 m	mm -	Light-ON	E3T-CD11 2M	E3T-CD13 2M	
				Dark-ON			

\*1. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

\*2. The model number of the Emitter is expressed by adding an "L" to the set model number in the table. Example: E3T-ST11-L 2M The model number of the Receiver is expressed by adding a "D" to the set model number in the table. Example: E3T-ST11-D 2M Orders for individual Emitters and Receivers are accepted. (Modifications are required for some models.)

★3. Models are available either with or without the E39-R37-CA Reflector included. Models with E39-R37-CA Reflector. E3T-SR4□-S

Models without Reflector. E3T-SR4□-C

#### Variety of Connection Specifications

The models with the connection specifications marked with a black circle in the table are available. These are applicable only to M2-mounting Sensors. The model number indication is a combination of the basic model and the connection specification.

Example:	E3T-ST	11-M1T	J 0.3M
		$ \_ \_$	

Basic model number Connection specification

#### **NPN Output**

	Model		Model num- ber example	E3T-ST11-M1TJ 0.3M	E3T-ST11 5M	E3T-ST11R 2M	E3T-ST11-ECON 0.3M	E3T-ST11-ECON 2M
Sensing	Sensing	Operation	Connection specification	M12 pre-wired Smartclick Con- nector (cable length: 0.3 m)	Pre-wired (cable length: 5 m)	Pre-wired robot (cable length: 2 m)	e-CON pre-wired connector (cable length: 0.3 m)	e-CON pre-wired connector (cable length: 2 m)
method	method distance	mode	Basic model number	-M1TJ 0.3M	5M	R 2M	-ECON 0.3M	-ECON 2M
	2	Light-ON	E3T-ST31	•	•	•	•	•
	2 m	Dark-ON	E3T-ST32	•	•	•	•	•
Through-	4	Light-ON	E3T-ST11	•	•	•	•	•
(side-view)	пm	Dark-ON	E3T-ST12	•	•	•	•	•
		Light-ON	E3T-ST21	•	•		•	•
	300 mm	Dark-ON	E3T-ST22	•	•		•	•
	Light-	Light-ON	E3T-FT11	•	•	•	•	•
Through-	500 mm	Dark-ON	E3T-FT12	٠	٠	•	•	•
(flat)	Light-ON	E3T-FT21	•			•	•	
	300 mm	Dark-ON	E3T-FT22	•			•	•
Retro-	200 mm	Light-ON	E3T-SR41	•	•	•	•	•
reflective	(100 mm)*	Dark-ON	E3T-SR42	•	•	•	•	•
Diffuse-	E to 20 mm	Light-ON	E3T-FD11	•	•	•	•	•
reflective	5 to 30 mm	Dark-ON	E3T-FD12	٠	٠	•	•	•
		Light-ON	E3T-SL11	•	•	•	•	•
Convergent-	5 to 15 mm	Dark-ON	E3T-SL12	•	•	•	•	•
reflective	E to 20 mm	Light-ON	E3T-SL21	٠	٠	•	•	•
	5 to 30 mm	Dark-ON	E3T-SL22	٠	٠	•	•	•
	1 to 15 mm	Light-ON	E3T-FL11	•		•		
BGS-	1 to 15 mm	Dark-ON	E3T-FL12	•		•		
reflective	4 40 20 mm	Light-ON	E3T-FL21	•		•	•	
1 to 30 mm	Dark-ON	E3T-FL22	•		•			

\*The sensing distance depends on the Reflector that is used. The sensing distance is 200 mm if an E39-R4 is used and 100 mm if an E39-R37-CA is used. PNP Output

	Model		Model num- ber example	E3T-ST13-M1TJ 0.3M	E3T-ST13 5M	E3T-ST13R 2M
Sensing Sensing		Operation	Connection specification	M12 pre-wired Smartclick Connector (cable length: 0.3 m)	Pre-wired (cable length: 5 m)	Pre-wired robot (cable length: 2 m)
	uistance	mode	Basic model number	-M1TJ 0.3M	5M	R 2M
	0	Light-ON	E3T-ST33	•	•	•
	2 m	Dark-ON	E3T-ST34	•	•	•
Through-	4	Light-ON	E3T-ST13	•	•	•
(side-view)	1 m	Dark-ON	E3T-ST14	•	•	•
	200 mm	Light-ON	E3T-ST23	•		
	300 11111	Dark-ON	E3T-ST24	•		
	500 mm	Light-ON	E3T-FT13	•	•	•
Through-	500 mm	Dark-ON	E3T-FT14	•	•	•
(flat)	300 mm	Light-ON	E3T-FT23	•		
		Dark-ON	E3T-FT24	•	•	
Retro-	200 mm	Light-ON	E3T-SR43	•	•	•
reflective	(100 mm)*	Dark-ON	E3T-SR44	•	•	•
Diffuse-	E to 20 mm	Light-ON	E3T-FD13	•	•	•
reflective	5 to 30 mm	Dark-ON	E3T-FD14	•	•	•
	E 40 4E mm	Light-ON	E3T-SL13	•	•	•
Convergent-	5 to 15 mm	Dark-ON	E3T-SL14	•	•	•
reflective	E to 20 mm	Light-ON	E3T-SL23	•	•	•
	5 to 30 mm	Dark-ON	E3T-SL24	•	•	•
	4 40 45 mm	Light-ON	E3T-FL13	•		•
BGS-	1 to 15 mm	Dark-ON	E3T-FL14	•		•
reflective	4 40 20 mm	Light-ON	E3T-FL23	•		•
	1 to 30 mm	Dark-ON	E3T-FL24	•		•

\*The sensing distance depends on the Reflector that is used. The sensing distance is 200 mm if an E39-R4 is used and 100 mm if an E39-R37-CA is used.

#### Accessories (Order Separately)

Accessories for M2-mounting Sensors These accessories are not included with the Sensor. Order them separately if required.

Name		Applicable Sensor	Model	Quantity	Dimensions page	Remarks
Mutual Interference Preven	tion Filter for	E3T-ST3	E20 E14	4 (Two each far Emitter		Sensing distance 1 m
Through-beam Side-view S	ensors *1	E3T-ST1	- 239-214	and Receiver)		Sensing distance 0.5 m
		E3T-ST3				Sensing distance 200 mm, Minimum detectable object (typical) 0.5-mm dia.
Slit for Through-beam Side-view Sensors	0.5 dia.	E3T-ST1□				Sensing distance 100 mm, Minimum detectable object (typical) 0.5-mm dia.
		E3T-ST2	-E39-S63	2 (One each for Emitter and Receiver; common with Slit widths of 1 dia. and 0.5 dia.)		Sensing distance 30 mm, Minimum detectable object (typical) 0.5-mm dia.
		E3T-ST3	-235-303			Sensing distance 600 mm, Minimum detectable object (typical) 1-mm dia.
	1 dia.	E3T-ST1□			19	Sensing distance 300 mm, Minimum detectable object (typical) 1-mm dia.
		E3T-ST2				Sensing distance 100 mm, Minimum detectable object (typical) 1-mm dia.
	0.5 dia	E3T-FT1				Sensing distance 50 mm, Minimum detectable object (typical) 0.5-mm dia.
Slit for Through-beam Flat Sensors	0.0 414.	E3T-FT2				Sensing distance 30 mm, Minimum detectable object (typical) 0.5-mm dia.
	1 dia	E3T-FT1				Sensing distance 100 mm, Minimum detectable object (typical) 1-mm dia.
	i ula.	E3T-FT2				Sensing distance 50 mm, Minimum detectable object (typical) 1-mm dia.
Sensitivity Adjustment Unit	for Through-	E3T-ST3				Sensing distance (typical) 1,200 to 1,800 mm
beam Side-view Sensors	ior miough	E3T-ST1	-E39-E10	1		Sensing distance (typical) 300 to 800 mm
			E39-L116		20	
Mounting Brackets for Side	-view Sensors	E3T-S	E39-L117		20	Nut plate provided
			E39-L118	1		
Mounting Brackets for Flat	Sensors *2	E3T-F	E39-L119		21	
g			E39-L120			
Screw Set for Side-view Se	ensors *3*4	E3T-S	E39-L164	2 for each		Material: Iron (Same type as provided with the Sensor.) Contents: Phillips screws (M2×14), Hexagonal nuts, Spring washers, Flat washers
Screw Set for Flat Sensors *3*4		E3T-F	E39-L165			Material: Iron (Same type as provided with the Sensor.) Contents: Phillips screws (M2×8), Hexagonal nuts, Spring washers, Flat washers
SUS Screw Set for Flat Set	nsors *3	E3T-F	E39-L172	2		Material: SUS304 Contents: Bolt with hexagonal hole (M2×6)
SUS Screw Set for Side-vie	ew Sensors *3	E3T-S	E39-L173	2 for each		Material: SUS304 Contents: Bolt with hexagonal hole (M2×12), Hexagonal nuts, Spring washers, Flat washers

\*1.An arrow indicates the polarization direction. Mutual interference can be prevented by using different polarization directions for adjacent Emitters/Receivers.

 \*2. When using Through-beam Sensors (E3T-ST\_\_\_\_, E3T-FT\_\_\_), order one bracket for the Emitter and one for the Receiver.
 \*3. Order two Sets, one for the Emitter and one for the Receiver, for Through-beam Sensors (E3T-ST\_\_\_ or E3T-FT\_\_\_).
 This is the Screw Set for mounting the Sensor to the Mounting Bracket. Order this Set if you loose the screws. Do not use this Screw Set to mount the Mounting Bracket to the equipment.

\*4. This is included with the Sensor.

#### Accessories for M3-mounting Sensors These accessories are not included with the Sensor. Order them separately if required.

Name		Applicable Sensor	Model	Quantity	Dimensions page	Remarks
	0.5	E3T-ST1⊡M	E20-876A		19	Sensing distance 100 mm, Minimum detectable object (typical) 0.5-mm dia.
Slits for Through-beam	dia.	E3T-ST2⊡M	L39-370A	2 (One each for		Sensing distance 30 mm, Minimum detectable object (typical) 0.5-mm dia.
Side-view Sensors	1 dia.	E3T-ST1⊡M	E20 6768	Emitter and Receiver)		Sensing distance 300 mm, Minimum detectable object (typical) 1-mm dia.
		E3T-ST2⊡M	E39-576B			Sensing distance 100 mm, Minimum detectable object (typical) 1-mm dia.
Mounting Bracket for Side-v Sensors *1	iew	E3T-SOOM	E39-L166			Nut plate provided
Mounting Bracket for Flat Se	ensors		E39-L167	1	22	
Back-mounting Spacer for F sors	lat Sen-		E39-L168			Use this Spacer when mounting a Flat Sensor (E3T-FDM) from the back.
SUS Screw Set for Flat Sensors *2		r Flat Sensors *2 E3T-FDM		2		Material: SUS304 Contents: Bolt with hexagonal hole (M3×6)
SUS Screw Set for Side-view Sen- sors *1*2		E3T-SOOM	E39-L171	2 for each		Material: SUS304 Contents: Bolt with hexagonal hole (M3×15), Hex- agonal nuts, Spring washers, Flat washers

\*1. When using Through-beam Sensors (E3T-ST M), order one bracket for the Emitter and one for the Receiver.

\*2. This is the Screw Set for mounting the Sensor to the Mounting Bracket. Order this Set if you loose the screws. Do not use this Screw Set to mount the Mounting Bracket to the equipment.

#### **Accessories for Small Cylindrical Sensors**

Name	Applicable Sensor	Model	Quantity	Dimensions Page	Remarks
SUS Nut Set for Through-beam Sensors *1	E3T-CT E3T-CT S	E39-M5	4 (Hexagonal nuts), 2 (Toothed washers)		Material: SUS303
SUS Nut Set for Diffuse-reflective Sensors	E3T-CD	E39-M6	2 (Hexagonal nuts), 1(Toothed washers)		(Same type as provided with the Sensor.)
Adjustment Driver for Diffuse-reflec- tive Sensors		E39-G17	1		This Driver is used to turn the sensitivity adjuster. Provided with E3T-CD $\Box$

\*1. This Nut Set is for the Emitter/Receiver. This is the Nut Set for mounting the Sensor. Order this Set if you loose the screws.

#### **Accessories for All Sensors**

Name	Applicable Sensor	Model	Quantity	Dimensions Page	Remarks
Small Reflectors	E3T-SR4	E39-R4		19	Sensing distance 200 mm [30 mm] *1 Minimum detectable object 2-mm dia. Provided with the E3T-SR4□
(for Retro-reflective Sensors)	E3T-SR4⊡-S	E39-R37-CA *2	1 .	10	Sensing distance 100 mm [10 mm] <sup>*1</sup> Minimum detectable object 2-mm dia. Provided with the E3T-SR4⊡-S
		E39-RS1-CA <sup>*2</sup>		19	Sensing distance 100 mm [10 mm]*1
Tape Reflectors (for Retro-reflective Sensors)	E3T-SR4⊡-C	E39-RS2-CA *2			Use Tape Reflectors in combination
		E39-RS3-CA *2			does not come with a Reflector.

**\*1.**Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

\*2. The E3T-SR4 cannot be used with the E39-R37 or E39-RS1/2/3 (without CA) Tape Reflectors.

The E39-D-CA Reflector is for use only with the E3T-SR4D. It cannot be used with other Sensors.

#### Sensor I/O Connectors

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

Size	Cable	Appearance	Cable t	уре	Model	
M12		Straight	2 m		XS5F-D421-D80-A	
(For -M1TJ models)		9	5 m		XS5F-D421-G80-A	
		Connector on one end	2 m		E39-ECON2M	
e-CON	Standard cable		5 m	4-wire	E39-ECON5M	
			Connector on both ends	0.5 to 1 m		E39-ECONW□M
			1.1 to 1.5 m	_	Replace $\Box$ with the cable length in	
			1.6 to 2 m		0.1-m increments.	

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

# E3T **Ratings and Specifications**

Sensing method		Through-beam				am			Retro-reflective (without M.S.R. function)	
Appearance		Rectangular type (Side-view) Rectangular type (Flat)			Cylindrical type (Top-view)	Cylindrical type (Side-view)	Rectangular type (Side-view)			
ltem						++	Ĩ			
NPN	Light-ON	E3T-ST31	E3T-ST11 E3T-ST11M	E3T-ST21 E3T-ST21M	E3T-FT11	E3T-FT21			E3T-SR41	
output	Dark-ON	E3T-ST32	E3T-ST12 E3T-ST12M	E3T-ST22 E3T-ST22M	E3T-FT12	E3T-FT22	E3T-CT12	E3T-CT22S	E3T-SR42	
PNP	Light-ON	E3T-ST33	E3T-ST13 E3T-ST13M	E3T-ST23 E3T-ST23M	E3T-FT13	E3T-FT23			E3T-SR43	
output	Dark-ON	E3T-ST34	E3T-ST14 E3T-ST14M	E3T-ST24 E3T-ST24M	E3T-FT14	E3T-FT24	E3T-CT14	E3T-CT24S	E3T-SR44	
Sensing o	listance	2 m	1 m	300 mm	500 mm	300 mm	1 m	500 mm	200 mm [30 mm] *1 (Using the E39-R4) 100 mm [10 mm] *1 (Using the E39-R37- CA)	
Standard sensing object		Opaque, 3- mm dia. min.	Opaque, 2-m	m dia. min.	Opaque, 1.3-mm dia. min.		Opaque, 4- mm dia. min.	Opaque, 5- mm dia. min.	Opaque, 27-mm dia. min.	
Minimum (typical)	detectable object	Opaque, 3- mm dia.	Opaque, 2-m	m dia.	Opaque, 1.3-mm dia.				2-mm dia. (Sensing distance 100 mm)	
Black/whi	te error									
Direction	al angle	Emitter: 2 to Receiver: 2 to	itter: 2 to 20°         Emitter: 3 to 25°           ceiver: 2 to 70°         Receiver: 3° min.		25° nin.	Receiver: 2°	Receiver: 10°	2 to 20°		
Light source (wavelength)		Red LED (650 nm)			Red LED (630 nm)	Red LED (625 nm)	Red LED (650 nm)			
Power su	pply voltage	12 to 24 VDC ±10%, ripple (p-p) 10% max.								
Current consumption		30 mA max. (Emitter 10 mA max., Receiver 20 mA max.)			max., Receiver 15 mA max.)		20 mA max.			
Control output		Load power supply voltage: 26.4 VDC max. Load current: 50 mA max. (residual voltage: 2 V max. for load current of 10 to 50 mA, 1 V max. for load current of less than 10 mA) Open-collector output			Load power supply voltage: 30 VDC max. Load current: 80 mA max. (residual voltage: 1 V max.) Open-collector output		Load power supply voltage: 26.4 VDC max. Load current: 50 mA max. (residual volt- age: 2 V max. for load current of 10 to 50 mA, 1 V max. for load current of less than 10 mA) Open-collector output			
Protection circuits		Power supply and control output reverse polarity protection, Output short-circuit protection				on,	Power supply reverse polarity protection, Output short-circuit protection		Power supply and control output reverse polarity protection, Output short-circuit protection, Mutual interference prevention	
Response	e time	Operate or reset: 1 ms max.					Operate or reset: 0.5 ms max.		Operate or reset: 1 ms max.	
Ambient i	llumination	Incandescent lamp: 5,000 lx max., Sunlight: 10,000 lx max.				ax.	Incandescent lamp: 3,000 lx max.		Incandescent lamp: 5,000 lx max., Sun- light: 10,000 lx max.	
Ambient temperature range		Operating: -25 to +55°C Storage: -40 to +70°C (with no icing or condensation)			Operating: -25 to +55°C Storage: -30 to +70°C (with no icing or condensa- tion)		Operating: -25 to +55°C Storage: -40 to +70°C (with no icing or condensation)			
Ambient humidity range		Operating: 35% to +85% Storage: 35% to +95% (with no condensation)			Operating or Storage: 35% to +85% (with no condensation)		Operating: 35% to +85% Storage: 35% to +95% (with no condensation)			
Insulation resistance		AC1.000V. 50/60 Hz for 1 min.					AC500V, 50/60 Hz for 1 min.		AC1 000V 50/60 Hz for 1 min	
Vibration resistance (destruction)		10 to 2,000 Hz, 1.5-mm double amplitude or 300 m/s <sup>2</sup> for 0.5 hours each in X, Y, and Z directions			10 to 55Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions		10 to 2,000 Hz, 1.5-mm double ampli- tude or 300 m/s <sup>2</sup> fo 0.5 hours each in X, Y, and Z directions			
Shock resistance (destruction)		1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions			500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions		1,000m/s <sup>2</sup> 3 times each in X, Y, and Z directions			
Degree of protection		IP67 (IEC 60529)			IP65 (IEC 60529)		IP67 (IEC 60529)			
Connection method		Pre-wired (standard length: 2 m)							Approx 20 g	
maight (p	Case	PBT (polybutylene terephthalate)					SUS303		PBT (polybutylene terephthalate)	
	Display window	Denatured polyarylate					Polysulfone		Denatured polyarylate	
Materi-	Lens	Denatured polyarylate					Polysulfone		Methacrylc resin	
ais	Hexagonal nuts						SUS303			
	Toothed wash- ers						SUS303			
Accessories *2		Instruction manual, Phillips screws (Side-view Sensors: M2 $\times$ 14, Flat Sensors: M2 $\times$ 8), Nuts, Spring washers, Flat washers *2			Instruction manual, Hexago- nal nuts, Toothed washers		(M2×14), Nuts, Spring washers, Flat washers, E39-R4 (E3T-SR4□ only), E39-R37-CA (E3T-SR4□-S only)			

\*1.Values in parentheses indicate the minimum required distance between the Sensor and Reflector.
 \*2. Only the *Instruction Manual* is included with an M3-mounting Sensor (E3T-ST M). Order the Set of Mounting Screws separately if required.

Sensing method		Diffuse-r	Convergent-reflective		BGS-reflective				
Appearance		Rectangular type (Flat)	Cylindrical type (Top-view)	Rectangular type (Side-view)		Rectangular type (Flat)			
Itom						972. 1973. 1			
Light-ON		E3T-FD11	E3T-CD11	E3T-SL11	E3T-SL21	E3T-FL11	E3T-FL21		
NPN output	Dark-ON	E3T-FD11M E3T-FD12		E3T-SL11M E3T-SL12	E3T-SL21M E3T-SL22	E3T-FL12	E3T-FL22		
	Light-ON	E3T-FD12M E3T-FD13	E3T-CD13	E3T-SL12M E3T-SL13	E3T-SL22M E3T-SL23	E3T-EL 13	E3T-EL 23		
PNP output		E3T-FD13M E3T-FD14		E3T-SL13M E3T-SL14	E3T-SL23M E3T-SL24				
·	Dark-ON	E3T-FD14M		E3T-SL14M	E3T-SL24M	E3T-FL14	E3T-FL24		
Sensing	distance	5 to 30 mm (50 $\times$ 50 mm white paper)	3 to 50 mm (100 $\times$ 100 mm white paper)	$(50 \times 50 \text{ mm})$ white paper)	$(50 \times 50 \text{ mm})$ white paper)	$(50 \times 50 \text{ mm})$ white paper)	$(50 \times 50 \text{ mm})$ white paper)		
Minimun object (ty	n detectable ypical)	0.15-mm dia. (sensing distance 10 mm)		0.15-mm dia. (sensing distance 10 mm)		0.15-mm dia. non-glossy object (sensing distance 10 mm)			
Hysteres	is (white paper)	6 mm max.	15% or less of the sensing distance	2 mm max.	6 mm max.	0.5 mm max.	2 mm max.		
Black/wh	nite error					15% max.			
Direction	al angle								
Light so (wavelen	urce gth)	Red LED (650 nm)	Infrared LED (870 nm)	Red LED (650 nm)					
Power su	upply voltage	12 to 24 VDC ±10%, ripple (p-p)	10% max.						
Current	consumption	20 mA max.							
Control output		Load power supply voltage: 26.4 VDC max. Load current: 50 mA max. (re- sidual voltage: 2 V max. for load current of 10 to 50 mA, 1 V max. for load current of less than 10 mA) Open-collector output	Load power supply voltage: 30 VDC max. Load current: 80 mA max. (residual voltage: 1 V max.) Open-collector output	Load power supply voltage: 26.4 VDC max. Load current: 50 mA max. (residual voltage: 2 V max. for load cur- rent of 10 to 50 mA, 1 V max. for load current of less than 10 mA) Open-collector output					
Protection circuits		Power supply and control output reverse polarity protection, Output short-circuit protection, Mutual interference prevention	Power supply reverse polarity protection, Output short-circuit protection	Power supply and control output reverse polarity protection, Output short-circuit protection, Mutual interference prevention					
Respons	e time	Operate or reset: 1 ms max.	Operate or reset: 0.5 ms max.	Operate or reset: 1 ms max.					
Ambient	illumination	Incandescent lamp: 5,000 lx max., Sunlight: 10,000 lx max.	Incandescent lamp: 3,000 lx max.	Incandescent lamp: 5,000 lx max., Sunlight: 10,000 lx max.					
Ambient temperature range		Operating: -25 to +55°C Storage: -40 to +70°C (with no icing or condensation)	Operating: -25 to +55°C Storage: -30 to +70°C (with no icing or condensation)	Operating: -25 to +55°C Storage: -40 to +70°C (with no icing or condensation)					
Ambient humidity range		Storage: 35% to +85% (with no condensation)	Operating or Storage: 35% to +85% (with no condensation)	Storage: 35% to +85% (with no condensation)					
Dielectri	c strength	1 000 VAC 50/60 Hz for 1 min	500 VAC 50/60 Hz for 1 min	1 000 VAC 50/60 Hz for 1 min					
Vibration resistance (destruction)		10 to 2,000 Hz, 1.5-mm double amplitude or 300 m/s <sup>2</sup> for 0.5 hours each in X, Y, and Z directions	10 to 55Hz, 1.5-mm double am- plitude for 2 hours each in X, Y, and Z directions	10 to 2,000 Hz, 1.5-mm double amplitude or 300 m/s <sup>2</sup> for 0.5 hours each in X, Y, and Z directions					
Shock resistance (destruction)		1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions	500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions	1,000m/s <sup>2</sup> 3 times each in X, Y, and Z directions					
Degree of protection		IP67 (IEC 60529)	35 (IEC 60529) IP67 (IEC 60529)						
Connection method		Pre-wired (standard length: 2 m)	ard length: 2 m)						
Weight (packed state)		Approx. 20 g Approx. 40 g Approx. 20 g							
	Case	PBT (polybutylene terephtha- late)	SUS303	PBT (polybutylene terephthalate)					
	Display window	Denatured polyarylate	Ероху	Denatured polyarylate					
materi-	Lens	Denatured polyarylate	Polysulfone	Denatured polyarylate					
	Hexagonal nuts		SUS303						
	Toothed wash- ers		SUS303						
Accessories *		Instruction manual, Phillips screws(M2 × 8), Nuts, Spring washers, Flat washers *	Instruction manual, Hexagonal nuts, Toothed washers, Adjust- ment driver	Instruction man screws(M2 × 14 washers, Flat w	ual, Phillips ), Nuts, Spring ashers *	Instruction man screws(M2 $\times$ 8) washers, Flat w	ual, Phillips , Nuts, Spring ashers		

\*Only the Instruction Manual is included with an M3-mounting Sensor (E3T-FD M or E3T-SL M). Order the Set of Mounting Screws separately if required.

### **Engineering Data (Typical)**

#### M2-mounting and M3-mounting Sensors

#### **Parallel Operating Range**

#### Through-beam

E3T-ST3 + E39-S63 Slit (A Slit is mounted to the Emitter and Receiver.)



E3T-ST1 (M) + E39-S63 Slit (Enlarged graph) E3T-ST2 (M) + E39-S63 Slit (A Slit is mounted to the Emitter and Receiver.)



#### E3T-FT1 + E39-S64 Slit (Enlarged graph) (A Slit is mounted to the Emitter and Receiver.)



**Operating Range** 

**Diffuse-reflective** 





#### E3T-ST + E39-E14 Mutual interference prevention filter



(A Slit is mounted to the Emitter and Receiver.)

E3T-ST3

Without Slit

200

-80 -100

Distance Y (mm)

2

1

1

-10

-15

-2

-2

#### E3T-ST1 (M) + E39-S63 Slit (A Slit is mounted to the Emitter and Receiver.)



E3T-FT1 + E39-S64 Slit (A Slit is mounted to the Emitter and Receiver.)

0.5-dia Sli

Without Slit

1-dia Slit

0.0 0.8 **H** 

1.2

Distance X (m)



E3T-FT2 + E39-S64 Slit (A Slit is mounted to the Emitter and Receiver.)



#### **Convergent-reflective** E3T-SL1 (M)



**Retro-reflective** E3T-SR4







Glass t: 0.7 mm

Angle of -θ inclination . +θ

10 Angle θ (°)



10 Angle θ (°)

**BGS-reflective** 

0∟ –10

**BGS-reflective** 

obiod

50 x 50

nm white pape

Stainless steel

Glass t: 0.7 mm

10

E3T-FL1

Distance Y (mm)

3

2

0

£ 20

10

Distance

E3T-FL1 (Top to Bottom)



E3T-FL2 (Right to Left)





0 ∟ -10

10 Angle θ (°)



Excess Gain vs. Set Distance Through-beam

E3T-ST1 (M)/E3T-ST3









**Inclination Detection Area Characteristic** 

Convergent-reflective

E3T-FL2 (Top to Bottom)







# Sensing Object Size vs. Sensing DistanceConvergent-reflectiveDE3T-SL1□(M)E3T-SL1□(M)



#### E3T-SL2□(M)



OMRON

# E3T-FT2



# Convergent-reflective E3T-SL1 (M)



Diffuse/Convergent-reflective

Sensing object: Pin-gauge, stainless stee

E3T-FD1 (M)

E3T-SL2□(M)

Set distance (mm)

20

30

E3T-FD1 (M)/E3T-SL2 (M)

(mm)

sensing object dia. ຜ

Min.

#### Retro-reflective E3T-SR4□



#### E3T-SL2 (M)



#### Sensing Distance vs. Material Convergent-reflective

#### E3T-SL1\_(M)



#### Diffuse-reflective E3T-FD1□(M)

10



BGS-reflective E3T-FL1





#### Sensing Distance Characteristics of Sensitivity Adjustment Unit (when Completing Optical Axis Adjustment)

## E3T-ST1 + E39-E10 Sensitivity Adjustment Unit E3T-ST3 + E39-E10 Sensitivity Adjustment Unit



### Small Cylindrical Sensors

#### **Parallel Operating Range**

#### Through-beam

#### E3T-CT1



#### **Operating Range**

#### **Diffuse-reflective**

#### E3T-CD1



#### E3T-CT2 S (Top to Bottom)



#### E3T-CT2 S (Right to Left)



#### Sensing Distance vs. Material

**Diffuse-reflective** 





### E3T

### I/O Circuit Diagrams

NPN Output			
Model	Operation mode	Timing charts	Output circuit
E3T-□□□1 E3T-□□□1M	Light-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Reset (Between brown (1) and black (4) leads)	Through-beam Receivers and Reflective Sensors Operation indicator (green) Photo- electric Sensor Circuit Through-beam Emitters M12 e-CON
E3T-002 E3T-002M E3T-002S	Dark-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load (e.g., relay) Operate (Between brown (1) and black (4) leads)	<ul> <li>Photo- electric Main Circuit</li> <li>*1.There is no diode for Small Cylindrical Sensors (E3T-C (S)).</li> <li>*2. This is 80 mA max. for Small Cylindrical Sensors (E3T-C (S)).</li> <li>*3. These connectors do not apply to the E3T- (C) (S).</li> </ul>

#### **PNP Output**

Model	Operation mode	Timing charts	Output circuit
E3T-003 E3T-003M	Light-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Operate (Between blue (3) and black (4) leads)	Through-beam Receivers and Reflective Sensors          Operation       Stability         indicator       indicator         (green)       Control output) *1         Black       50 mA         Blue       0 V         Connector Pin Arrangement*3         Through-beam Emitters       M12         Brown       1
E3T-004 E3T-004M E3T-004S	Dark-ON	Light incident Light interrupted Operation indicator ON (orange) OFF Output transistor OFF Load (e.g., relay) Operate (Between blue (3) and black (4) leads)	<ul> <li>Photo: Sensor Main Circuit</li> <li>*1. There is no diode for Small Cylindrical Sensors (E3T-CCC(S)).</li> <li>*2. This is 80 mA max. for Small Cylindrical Sensors (E3T-CCCC(S)).</li> <li>*3. These connectors do not apply to the E3T-CCCC(S).</li> </ul>

#### Plugs (Sensor I/O Connectors)

#### M12 Connector



e-CON connector

**Pin arrangement** 

Refer to Warranty and Limitations of Liability.

#### 🕂 WARNING

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



Do not apply AC power to the E3T, otherwise the E3T may rupture.

#### **Precautions for Correct Use**

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

#### • Wiring

The maximum power supply voltage is 26.4 VDC. Before turning the power ON, make sure that the power supply voltage be not more than maximum voltage.

#### Load short-circuit protection

The E3T incorporates a load short-circuit protection function. If the load short-circuits, the output of the E3T will be turned OFF. Then, recheck the wiring and turn on the E3T again to reset the load short-circuit protection function. The load short-circuit protection function will work if there is a current flow that is 1.5 times larger than the rated load current. When using a capacitance load, be sure that the inrush current will not exceed 1.5 times larger than the rated current.

#### Mounting

When mounting the Sensor, never strike it with a heavy object, such as a hammer. Doing so may reduce its watertight properties. Use screws with spring, flat, or toothed washers to secure the Sensor. Tightening Torque

M2-mounting Sensors: 0.15 N·m max M3-mounting Sensors: 0.5 N·m max Small Cylindrical Sensors: 1 N·m max

#### Mounting the Sensor on Moving Parts

Consider models that use break resistant cables (e.g., Robotics Cables) if the Sensor will be mounted on a moving part, such as a robot hand. The flexing resistance of Robotics Cable at approximately 400 thousand times is far superior to that of standard cable at approximately 14 thousand times.



# Cable Bending Rupture Test (Tough Cable Breaking Test)

The cable is repeatedly bent with power supplied to check the number of bends until the current is turned OFF.

Test	Specimen	Standard cable 2.4-mm dia. (7/0.127-mm dia.), 3 conductors	Robotics cable 2.4-mm dia. (20/0.08-mm dia.), 3 conductors			
	Bending angle (θ)	90° each to the left and right				
Con- tents/ condi- tions	Bending speed 50 times/min					
	Load	200 g				
	Operation per bend	Once in 1 to 3 in the diagram				
	Curvature radius of support point (R)	5 mm				
Result		Approx. 14,000 times	Approx. 400,000 times			

#### Adjusting

#### Indicators

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



\* If the E3T fs operating 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 operating 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





- 1. Mount the Unit on the Receiver.
- 2. Set the adjuster of the Sensitivity Adjustment Unit to Max. (Before shipping: Max.)
- 3. After mounting on the Sensor, adjust the optical axis and secure the Sensor.
- 4. Place a workpiece between the Emitter and Receiver and gradually turn the adjuster counterclockwise toward the Min. side. Stop turning the adjuster when the operation indicator and stability indicator (green) turn ON.
- Remove the workpiece and confirm that the operation indicator is OFF and the stability indicator (green) is ON. This completes the adjustment.
- Note: If the light attenuation rate due to a workpiece is 40% or less, the stability indicator will not turn ON whether or not light is received. When the variation of light is small such as when sensing semi-transparent workpieces, carefully perform preliminary testing.

#### E3T-CD Sensitivity Adjustment

Use the special screwdriver that is provided with the Sensor to adjust the sensitivity. Do not exceed 0.8 N·m when turning the adjuster.

#### Others

#### Do not install the E3T in the following locations.

- · Locations subject to excessive dust or dirt
- Locations subject to direct sunlight
- Locations subject to corrosive gas
- Locations subject to contact with organic solvents
- Locations subject to vibration and shock
- Locations subject to contact with water, oil, or chemicals
- Locations subject to high humidities that might result in condensation

### E3T

### Dimensions

#### Sensors



### Retro-reflective Side-view Sensors



\*The mounting holes are made of SUS301.

# E3T





3.9

6.3

2.4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.1 mm<sup>2</sup> (AWG27), Insulator diameter: 0.7 mm),

\*The mounting holes are made of SUS304.

Standard length: 2 m

16

#### **Diffuse-reflective Flat Sensors** E3T-FD1 M



# E3T







18

#### **Accessories (Order Separately)**



# E3T



# Mounting Bracket for M2-mounting Side-view Sensors E39-L117



-7

20



# Mounting Bracket for M2-mounting Flat Sensors E39-L119



# Mounting Bracket for M2-mounting Flat Sensors E39-L120



With Mounting Bracket (Example: E3T-FT11)





#### Mounting Bracket for M3-mounting Side-view Sensors

13.5

8

22







(7

13.5

# Mounting Bracket for M3-mounting Flat Sensors E39-L167

З

| 12.9 16 |





With Mounting Bracket (Example: E3T-FD11M)



# Back-mounting Spacer for M3-mounting Flat Sensors



Note: Use this Spacer when mounting the Sensor from the back.



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