

Proximity Sensors

Cylindrical	Standard	E2E/E2EG	E-2
	Antispatter	E2EQ	E-32
	Chemical Resistance	E2FQ	E-40
Rectangular	Subminiature	E2S	E-44
	Flat	TL-W	E-52
	Standard	TL-N	E-60
Capacitive	Liquid Level	E2K-L	E-68
	Long Distance	E2K-C	E-74
	Flat	E2K-F	E-80
	Chemical Resistance	E2KQ-X	E-84
Peripheral Equipment	Accessories	Y92□	E-87

Cylindrical Proximity Sensor

E2E/E2EG

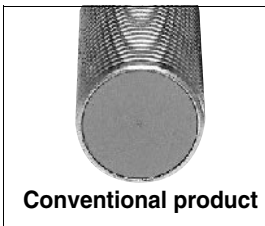
Well established Series of Easy-to-use and Tough E2E/E2EG Models



Features

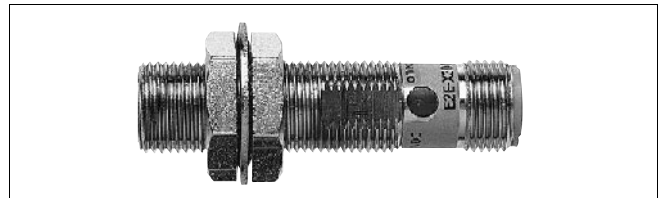
Improved mounting strength

The base bracket strength has been increased. M12 and more cases grew thicker. Moreover, clamping intensity is enhanced, such as adopting stainless steel material as M8.



Connector strength improved

All connector types changed the material of a screw into metal. It can be used for demanding applications now.

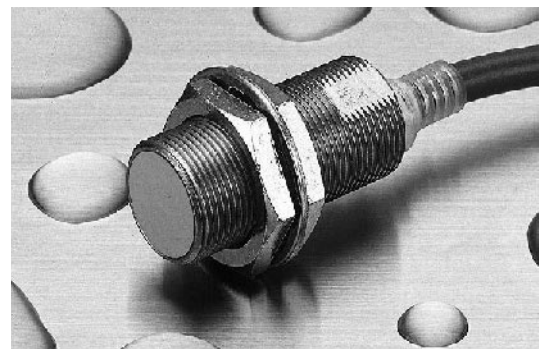
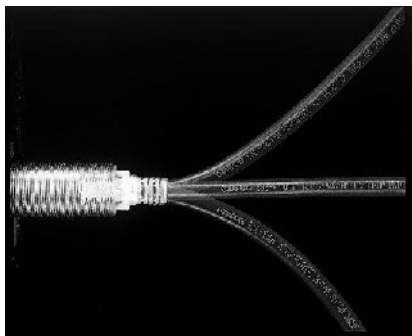


Excellent environmental resistance is realized

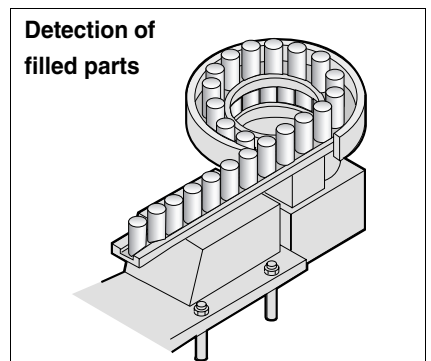
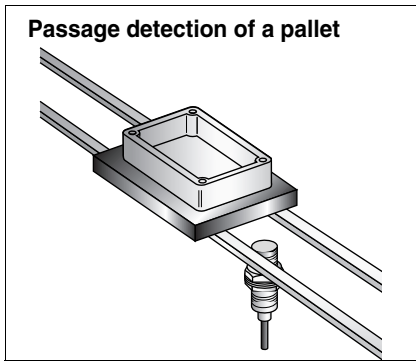
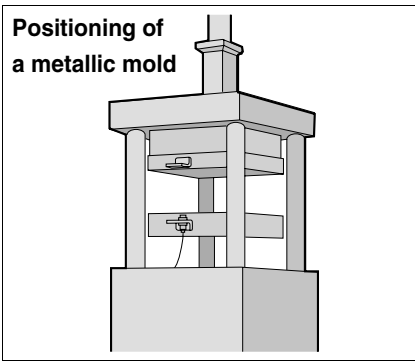
As a detection side is adopted the strong material against cutting oil. It can be used under various environment.

Cable breakage protection

The cable protector was adopted in order to prevent possible refraction.



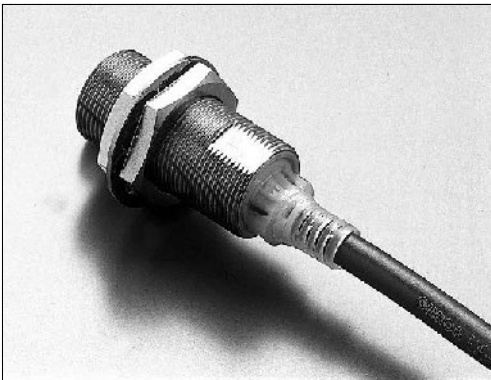
Application



Features

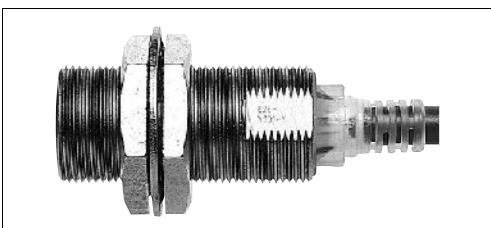
Optimized visibility by firefly display.

The introduction of a tail indicator (firefly display) allowed to increase legibility and vision field. Attachment and maintenance became easy.



Elongated attachment screw.

The general screw type is used for all models. The overall length was not extended, but the screw was lengthened in increasing the installation adjustment range.



Use for a milling cutter

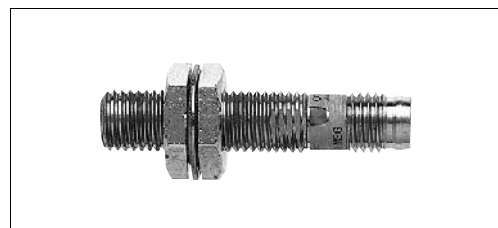
Use for a milling cutter to hold with a spanner. It provides a smooth installation and maintenance.



The E2EG series models include M8 plug-in connector models.

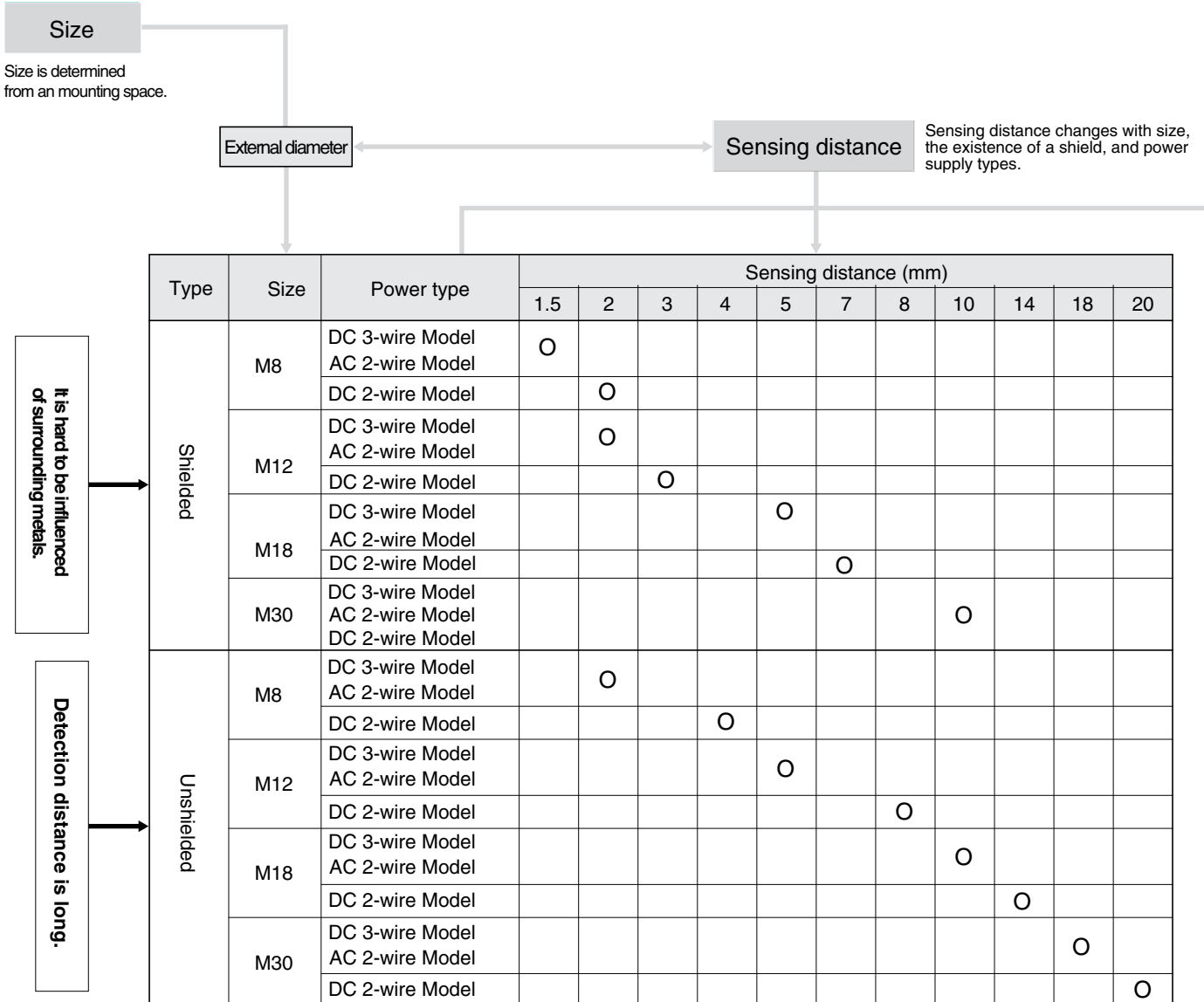
M8 connector series is a compact type with sufficient space efficiency.

It can be used in various places.



E2E/E2EG

Cylindrical Proximity Sensors Selection Guide



Connection check by means of a DC 2-wire proximity sensor and PLC (programmable logic controller)

(Required Conditions)

Connection to a PLC is possible if the specifications of the PLC and the Proximity Sensor satisfy the following conditions. (The meanings of the symbols are given below.)

1. The ON voltage of the PLC and the residual voltage of the Proximity Sensor must satisfy the following.

$$V_{ON} \leq V_{CC} - V_R$$

2. The OFF current of the PLC and the leakage current of the Proximity Sensor must satisfy the following.

$$I_{OFF} \geq I_{LEAK}$$

(If the OFF current of the PLC and the control output (I_{OUT}) of the Proximity Sensor must satisfy the following.)

$$I_{OUT}(\min) \leq I_{ON} \leq I_{OUT}(\max)$$

3. The ON current of the PLC will vary, however, with the supply voltage and the input impedance used as shown in the following equation.

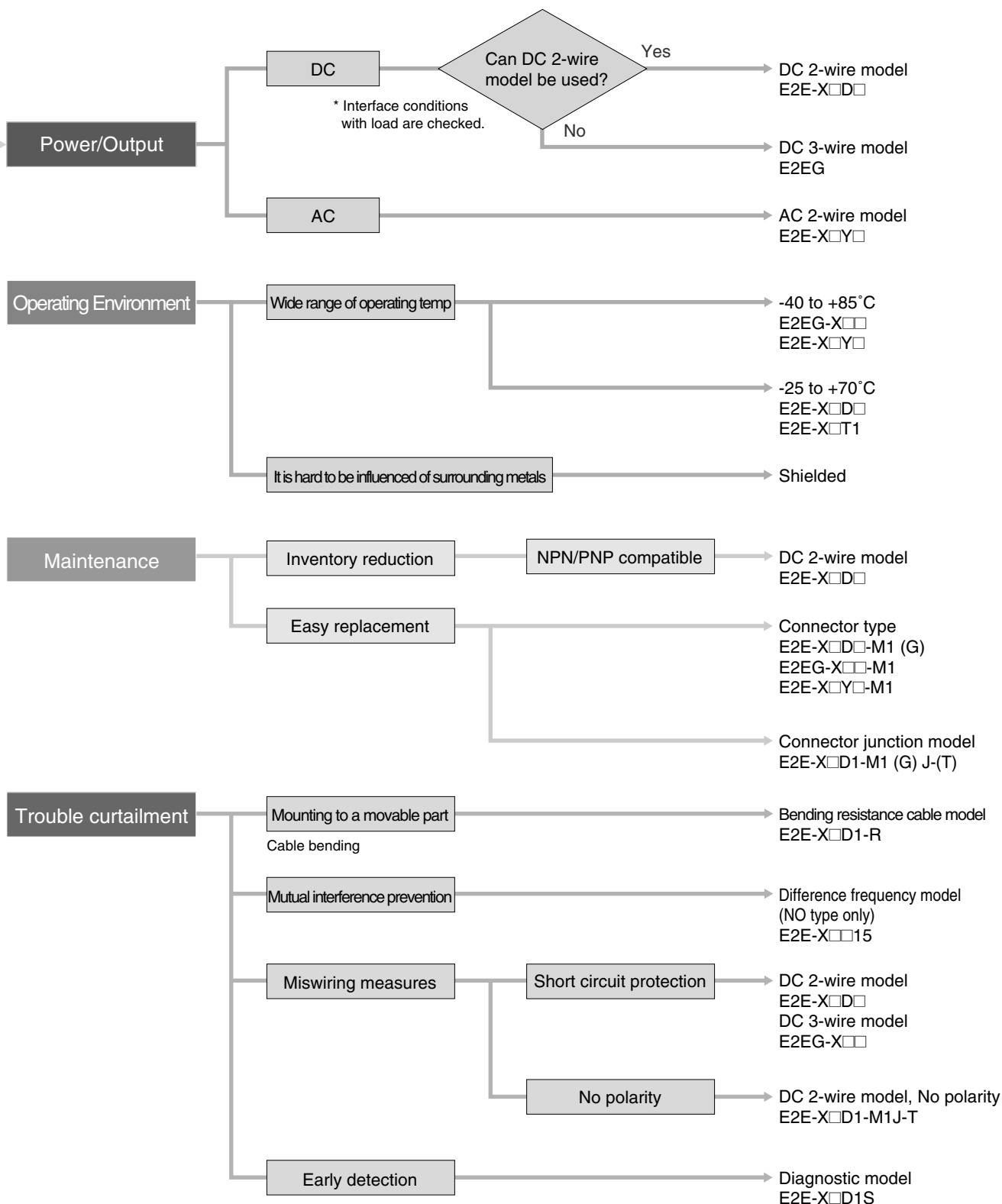
$$I_{ON} = (V_{CC} - V_R - V_{PC}) / R_{IN}$$

(Connection example)

In this example, the above conditions are checked for such case that the PLC model is the C200H-ID212, the proximity sensor model is E2E-X7D1-N, and the supply voltage is 24 VDC.

1. $V_{ON} (14.4 V) \leq V_{CC} (20.4 V) - V_R (3 V) 17.4 V$: OK
2. $I_{OFF} (1.3 mA) \geq I_{LEAK} (0.8mA)$: OK
3. $I_{ON} = (V_{CC} (20.4 V) - V_R (3 V) - V_{PC} (4 V)) / R_{IN} (3 k\Omega) \approx 4.5mA$
Whereas, $I_{OUT}(\min) (3 mA) \leq I_{ON} (4.5 mA)$: OK.

V_{ON}: PLC ON voltage (14.4 V)
 I_{ON}: PLC ON current (typ.7 mA)
 I_{OFF}: PLC OFF current (1.3 mA)
 R_{IN}: PLC input impedance (3 kΩ)
 V_{PC}: PLC internal remains voltage (4 V)
 V_R: Output residual voltage of Proximity Sensor (3 V)
 I_{LEAK}: Leakage current of Proximity Sensor (0.8 mA)
 I_{OUT}: Proximity sensors control output (3 to 100 mA)
 V_{CC}: supply voltage (PLC: 20.4 to 26.4 V)
 The values in parentheses are for the following PLC model and Proximity Sensor model.
 PLC: C200H-ID212
 Proximity Sensor: E2E-X7D1-N





















E2E/E2EG

Ordering Information

Sensors

DC 2-wire/Pre-wired Models (3-wire with a self-diagnostic function.)























Self diagnostic output function	Shape		Sensing distance		Model		
					NO	NC	
ON or OFF delay 0 to 5 s (adjustable)	Shielded 	M12			E2E-X3D1S	*1	---
		M18			E2E-X7D1S	*1	---
		M30			E2E-X10D1S	*1	---
	Unshielded 	M12			E2E-X8MD1S	*1	---
		M18			E2E-X14MD1S	*1	---
		M30			E2E-X20MD1S	*1	---
No	Shielded 	M8			E2E-X2D1-N	*2*3	E2E-X2D2-N *3
		M12			E2E-X3D1-N	*1*2*3	E2E-X3D2-N *3
		M18			E2E-X7D1-N	*1*2*3	E2E-X7D2-N *3
		M30			E2E-X10D1-N	*1*2*3	E2E-X10D2-N
	Unshielded 	M8			E2E-X4MD1	*2*3	E2E-X4MD2
		M12			E2E-X8MD1	*1*2*3	E2E-X8MD2
		M18			E2E-X14MD1	*1*2*3	E2E-X14MD2
		M30			E2E-X20MD1	*1*2*3	E2E-X20MD2

*1. A different frequency type is prepared. (E2E-X □D15; e.g.E2E-X3D15-N)

*2. E2E models with a robotic cable are available as well. The model number of a model with a robotic cable has the suffix "-R" (e.g., E2E-X3D1-R).









*3. Beside standard cable length 2 m the 5 m long cable is the preferred length. Please designate a cable length to the bottom of model number. (e.g. E2E-X2D1-N 5M)

DC 2-wire/Connector Models (3-wire with a self-diagnostic function.)

Con-connector	Self diagnostic output function	Shape		Sensing distance		Model			
						NO	Applicable connector	NC	Applicable connector
M12	ON or OFF delay 0 to 5 s (adjustable)	Shielded 	M12			E2E-X3D1S-M1	D	---	---
			M18			E2E-X7D1S-M1	D	---	---
			M30			E2E-X10D1S-M1	D	---	---
		Unshielded 	M12			E2E-X8MD1S-M1	D	---	---
			M18			E2E-X14MD1S-M1	D	---	---
			M30			E2E-X20MD1S-M1	D	---	---
	No	Shielded 	M8			E2E-X2D1-M1G	A	E2E-X2D2-M1G	D
			M12			E2E-X3D1-M1G	*1	E2E-X3D2-M1G	D
			M18			E2E-X7D1-M1G	*1	E2E-X7D2-M1G	D
			M30			E2E-X10D1-M1G	*1	E2E-X10D2-M1G	D
		Unshielded 	M8			E2E-X4MD1-M1G	A	E2E-X4MD2-M1G	D
			M12			E2E-X8MD1-M1G	*1	E2E-X8MD2-M1G	D
			M18			E2E-X14MD1-M1G	*1	E2E-X14MD2-M1G	D
			M30			E2E-X20MD1-M1G	*1	E2E-X20MD2-M1G	D
M8	Shielded 	M8			E2E-X2D1-M3G	G	E2E-X2D2-M3G	G	
	Unshielded 				E2E-X4MD1-M3G	G	E2E-X4MD2-M3G	G	



*1. A different frequency type is prepared. (E2E-X □D15-M1G; e.g.E2E-X3D15-M1G)

DC 2-wired/Connector Extension Models

Shape		Sensing distance			Operating status	Model			
						Yes polarity	Applicable connector	No polarity	Applicable connector
Shielded 	M12		3mm		NO	E2E-X3D1-M1GJ	A	E2E-X3D1-M1J-T	B
	M18		7mm			E2E-X7D1-M1GJ	A	E2E-X7D1-M1J-T	B
	M30		10mm			E2E-X10D1-M1GJ	A	E2E-X10D1-M1J-T	B
Unshielded 	M12		8mm			E2E-X8MD1-M1GJ	A	---	---
	M18		14mm			E2E-X14MD1-M1GJ	A	---	---
	M30		20mm			E2E-X20MD1-M1GJ	A	---	---





Note: 1. Since non-polarity type residual voltage is 5V, check interface conditions with connection load (e.g. ON voltage of PLC etc.).
 2. Standard cable length is 300 mm. Besides a cable length of 500 mm and 1 m type can be created.

DC 3-wire/Pre-wired Models

Shape		Sensing distance			Model			
					PNP - NO	PNP - NC	NPN - NO	NPN - NC
Shielded 	4 mm dia.	0.8mm			E2E-CR8B1	E2E-CR8B2	E2E-CR8C1	E2E-CR8C2
	M5	1mm			E2E-X1B1	E2E-X1B2	E2E-X1C1	E2E-X1C2
	5.4 mm dia.	1mm			E2E-C1B1	E2E-C1B2	E2E-C1C1	E2E-C1C2
	M8	1.5mm			E2EG-X1R5B1	E2EG-X1R5B2	E2EG-X1R5C1	E2EG-X1R5C2
	M12	2mm			E2EG-X2B1	E2EG-X2B2	E2EG-X2C1	E2EG-X2C2
	M18	5mm			E2EG-X5B1	E2EG-X5B2	E2EG-X5C1	E2EG-X5C2
	M30	10mm			E2EG-X10B1	E2EG-X10B2	E2EG-X10C1	E2EG-X10C2
Unshielded 	M8	2mm			E2EG-X2MB1	E2EG-X2MB2	E2EG-X2MC1	E2EG-X2MC2
	M12	5mm			E2EG-X5MB1	E2EG-X5MB2	E2EG-X5MC1	E2EG-X5MC2
	M18	10mm			E2EG-X10MB1	E2EG-X10MB2	E2EG-X10MC1	E2EG-X10MC2
	M30	18mm			E2EG-X18MB1	E2EG-X18MB2	E2EG-X18MC1	E2EG-X18MC2

Beside standard cable length 2 m, the 5 m cable is the preferred length. Please allocate a cable length to the bottom of model number. (e.g. E2EG-X2C1-5M)

DC 3-wire/Connector Models



Connector	Shape		Sensing distance			Model			
						PNP - NO	PNP - NC	NPN - NO	NPN - NC
M12	Shielded 	M8	1.5mm			E2EG-X1R5B1-M1	E2EG-X1R5B2-M1	E2EG-X1RC1-M1	E2EG-X1R5C2-M1
		M12	2mm			E2EG-X2B1-M1	E2EG-X2B2-M1	E2EG-X2C1-M1	E2EG-X2C2-M1
		M18	5mm			E2EG-X5B1-M1	E2EG-X5B2-M1	E2EG-X5C1-M1	E2EG-X5C2-M1
		M30	10mm			E2EG-X10B1-M1	E2EG-X10B2-M1	E2EG-X10C1-M1	E2EG-X10C2-M1
	Unshielded 	M8	2mm			E2EG-X2MB1-M1	E2EG-X2MB2-M1	E2EG-X2MC1-M1	E2EG-X2MC2-M1
		M12	5mm			E2EG-X5MB1-M1	E2EG-X5MB2-M1	E2EG-X5MC1-M1	E2EG-X5MC2-M1
		M18	10mm			E2EG-X10MB1-M1	E2EG-X10MB2-M1	E2EG-X10MC1-M1	E2EG-X10MC2-M1
		M30	18mm			E2EG-X18MB1-M1	E2EG-X18MB2-M1	E2EG-X18MC1-M1	E2EG-X18MC2-M1
M8	Shielded 	M8	1.5mm			E2EG-X1R5B1-M3	E2EG-X1R5B2-M3	E2EG-X1R5C1-M3	E2EG-X1R5C2-M3
	Unshielded 		2mm			E2EG-X2MB1-M3	E2EG-X2MB2-M3	E2EG-X2MC1-M3	E2EG-X2MC2-M3

AC 2-wire/Pre-wired Models

Shape		Sensing distance		Model	
				NO	NC
Shielded 	M8	1.5mm		E2E-X1R5Y1	E2E-X1R5Y2
	M12	2mm		E2E-X2Y1 *1	E2E-X2Y2 *1
	M18	5mm		E2E-X5Y1 *1	E2E-X5Y2 *1
	M30	10mm		E2E-X10Y1 *1	E2E-X10Y2 *1
Unshielded 	M8	2mm		E2E-X2MY1	E2E-X2MY2
	M12	5mm		E2E-X5MY1 *1	E2E-X5MY2 *1
	M18	10mm		E2E-X10MY1 *1	E2E-X10MY2 *1
	M30	18mm		E2E-X18MY1 *1	E2E-X18MY2 *1

*1. A different frequency type is prepared. (E2E-X □Y□5; e.g.E2E-X5Y15)

AC 2-wire/Connector Models

Connector	Shape		Sensing distance		Model			
					operating configuration, NO	Applicable connector*	operating configuration, NC	Applicable connector*
M12	Shielded 	M12	2mm		E2E-X2Y1-M1	E	E2E-X2Y2-M1	F
		M18	5mm		E2E-X5Y1-M1	E	E2E-X5Y2-M1	F
		M30	10mm		E2E-X10Y1-M1	E	E2E-X10Y2-M1	F
	Unshielded 	M12	5mm		E2E-X5MY1-M1	E	E2E-X5MY2-M1	F
		M18	10mm		E2E-X10MY1-M1	E	E2E-X10MY2-M1	F
		M30	18mm		E2E-X18MY1-M1	E	E2E-X18MY2-M1	F

* Refer to E-20 page for details.

Rating/Performance

DC 2-wire Models (E2E-X□□□)

Item	Size Shielded Model	M8		M12		M18		M30	
		Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
		E2E -X2D□	E2E -X4MD□	E2E -X3D□	E2E -X8MD□	E2E -X7D□	E2E -X14MD□	E2E -X10D□	E2E -X20MD□
Sensing distance		2 mm ±10%	4 mm ±10%	3 mm ±10%	8 mm ±10%	7 mm ±10%	14 mm ±10%	10 mm ±10%	20 mm ±10%
Setting distance*1		0 to 1.6 mm	0 to 3.2 mm	0 to 2.4 mm	0 to 6.4 mm	0 to 5.6 mm	0 to 11.2 mm	0 to 8 mm	0 to 16 mm
Differential distance		15% max. of sensing distance		10% max.					
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)							
Standard sensing object (mild steel)		8 x 8 x 1 mm	20 x 20 x 1 mm	12 x 12 x 1 mm	30 x 30 x 1 mm	18 x 18 x 1 mm	30 x 30 x 1 mm		54 x 54 x 1 mm
Response frequency*2		1.5 kHz	1 kHz		0.8 kHz	0.5 kHz	0.4 kHz		0.1 kHz
Power supply (Operating voltage range)		12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max.							
Leakage current		0.8 mA max.							
Control output	Switching capacity	3 to 100 mA (5 to 100 mA for -M1J-T models), Diagnostic output: 50 mA for D1 (5) S models							
	Residual voltage*3	3.0 V max. (under load current of 100 mA with cable length of 2 m), 5.0 V min. for -M1J-T models							
Indicator lamp		D1 type: Operation indicator (red), operation setting indicator (green) D2 type: Operation indicator (red)							
Operating status (with sensing object approaching)		D1 type: NO D2 type: NC							
Diagnostic output delay		0.3 to 1s							
Protective circuits		Surge absorber, load short-circuit protection (for control and diagnostic output)							
Ambient temperature		Operating: -25°C to 70°C, Storage: -40°C to 85°C (with no icing or condensation)							
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)							
Temperature influence		±15% max. of sensing distance at 23°C within temperature range of -25°C to 70°C		±10% max. sensing distance at 23°C within temperature range of -25°C to 70°C					
Voltage influence		±1% max. of sensing distance in rated voltage range ±15%							
Insulation resistance		50 MΩ min. (500 VDC) between energized part and case							
Dielectric strength		1000 VAC 50/60 Hz for 1 min between energized part and case							
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 10 times each in X, Y, and Z directions		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions					
Protective structure		Pre-wired, Connector Extension models: IEC60529 IP67 Connector type: IP67							
Connection method		Pre-wired models (Standard length: 2 m), Connector models, Connector extension models (Standard length: 300 mm)							

Item		Size		M8		M12		M18		M30	
		Shielded		Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
		Model		E2E -X2D□	E2E -X4MD□	E2E -X3D□	E2E -X8MD□	E2E -X7D□	E2E -X14MD□	E2E -X10D□	E2E -X20MD□
Weight (Packed state)	Pre-wired models	Approx. 45 g		Approx. 55 g		Approx. 130 g		Approx. 180 g			
	Sensor with Connector Relay	---		Approx. 40g		Approx. 70 g		Approx. 110 g			
	Connector	Approx. 10 g		Approx. 20 g		Approx. 40g		Approx. 90 g			
Material	Case	Stainless steel (SUS303)		Brass							
	Sensing surface	PBT									
Accessories		Instruction manual									

*1. Use within a range where the green indicator is lit. (Excluding the D2 models.)

*2. The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

*3. Since the residual voltage turns 5V when using an M1J-T type, please use it after checking interface conditions with connection device.

DC 3-wire Models (E2EG)

Item	Size Shielded Model	M8		M12		M18		M30	
		Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
		E2EG -X1R5B□/C□	E2EG -X2MB□/C□	E2EG -X2B□/C□	E2EG -X5MB□/C□	E2EG -X5B□/C□	E2EG -X10MB□/C□	E2EG -X10B□/C□	E2EG -X18MB□/C□
Sensing distance		1.5 mm ±10%	2 mm ±10%	5 mm ±10%		10 mm ±10%		18 mm ±10%	
Setting distance		0 to 1.2 mm	0 to 1.6 mm	0 to 4 mm		0 to 8 mm		0 to 14 mm	
Differential distance		10% max.							
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)							
Standard sensing object (mild steel)		8 x 8 x 1 mm	12 x 12 x 1 mm		15 x 15 x 1 mm	18 x 18 x 1 mm	30 x 30 x 1 mm		54 x 54 x 1 mm
Response frequency*1		2 kHz	0.8 kHz	1.5 kHz	0.4 kHz	0.6 kHz	0.2 kHz	0.4 kHz	0.1 kHz
Power supply (Operating voltage range)		12 to 24 VDC, ripple (p-p): 10% max.,(10 to 40 VDC)							
Current consumption		13 mA max.							
Control output	Switching capacity	200 mA max.							
	Residual voltage	2 V max. (under load current of 200 mA with cable length of 2 m)							
Indicator lamp		Operation indicator (yellow)							
Operating status (with sensing object approaching)		B1/C1 models: Load ON B2/C2 models: Load OFF							
Protective circuits		Reverse connection protection, surge absorber, load short-circuit protection							
Ambient temperature		Operating/Storage: -40°C to 70°C (with no icing or condensation)							
Ambient humidity		Operating/Storage: 35% to 95%RH							
Temperature influence		±15% max. of sensing distance at 23°C within temperature range of -40°C to 70°C ±10% max. of sensing distance at 23°C within temperature range of -25°C to 70°C							
Voltage influence		±1% max. of sensing distance within rated voltage range ±15%							
Insulation resistance		50 MΩ min. (500 VDC) between energized part and case							
Dielectric strength		1000 VAC 50/60 Hz for 1 min between energized part and case							
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 10 times each in X, Y, and Z directions		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions					
Protective structure		IEC60529 IP67							
Connection method		Pre-wired models (Standard length: 2 m), Connector models							
Weight	Pre-wired models	Approx. 55 g		65 g		Approx. 140 g		Approx. 190 g	
	Connector	Approx. 10 g		Approx. 20 g		Approx. 40g		Approx. 90 g	
Material	Case	Stainless steel (SUS303)		Brass					
	Sensing surface	PBT							
Accessories		Instruction manual							

*1. The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

DC 3-wire Models (E2E-C□C□/B□, E2E-X1C□/B□)

Item	Size	4 mm dia.	5.4 mm dia.	M5
	Shielded	Shielded		
	Model	E2E-CR8C/B□	E2E-X1C/B□	E2E-C1C/B□
Sensing distance		0.8 mm ±15%	1 mm ±15%	
Setting distance		0 to 0.5 mm	0 to 0.7 mm	
Differential distance		15% max. of sensing distance		
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)		
Standard sensing object		Mild steel, 5 x 5 x 1 mm		
Response frequency		3 kHz		
Power supply (Operating voltage range)		12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max.		
Current consumption		17 mA max.		
Control out- put	Switching capacity	Open collector output 100 mA max. (30 VDC max.)		
	Residual voltage	2 V max. (under load current of 100 mA with cable length of 2 m)		
Indicator lamp		Operation indicator (red)		
Operating status (with sensing object approaching)		C1/B1 type: NO C2/B2 type: NC		
Protective circuits		Reverse connection protection, surge absorber		
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating/Storage: 35% to 95%RH		
Temperature influence		±15% max. of sensing distance at 23°C within temperature range of -25°C to 70°C		
Voltage influence		±2.5% max. of sensing distance within rated voltage range ±25%		
Insulation resistance		50 MΩ min. (500 VDC) between energized part and case		
Dielectric strength		500 VAC 50/60 Hz for 1 min between energized part and case		
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 10 times each in X, Y, and Z directions		
Protective structure		IEC60529 IP67		
Connection method		Pre-wired models (Standard length: 2 m)		
Weight (Packed state)		30 g		
Material	Case	Stainless steel (SUS303)	Brass	
	Sensing surface	Heat-resistant ABS resin		
Accessories		Instruction manual		

* The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

AC 2-wire Models (E2E-X□Y□)

Item	Size	M8		M12		M18		M30	
		Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
Model	E2E	E2E	E2E	E2E	E2E	E2E	E2E	E2E	E2E
		-X1R5Y□	-X2MY□	-X2Y□	-X5MY□	-X5Y□	-X10MY□	-X10Y□	-X18MY□
Sensing distance		1.5 mm ±10%	2 mm ±10%	5 mm ±10%		10 mm ±10%		18 mm ±10%	
Setting distance		0 to 1.2 mm	0 to 1.6 mm	0 to 4 mm		0 to 8 mm		0 to 14 mm	
Differential distance		10% max.							
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)							
Standard sensing object (Mild steel)		8 x 8 x 1 mm	12 x 12 x 1 mm	15 x 15 x 1 mm	18 x 18 x 1 mm	30 x 30 x 1 mm		54 x 54 x 1 mm	
Response frequency		25 Hz							
Power supply (Operating voltage range)*1		24 to 240 VAC 50/60Hz (20 to 264 VAC)							
Leakage current		1.7 mA max.							
Control output	Switching capacity*2	5 to 100 mA		5 to 200 mA		5 to 300 mA			
	Residual voltage	Refer to Specifications							
Indicator lamp		Operation indicator (red)							
Operating status (with sensing object approaching)		Y1 type: NO Y2 type: NC							
Protective circuits		Surge absorber							
Ambient temperature		Operating: -25°C to 70°C Preservation: -25°C to 70°C (with no icing)		Operating/Storage: -40°C to 85°C (with no icing or condensation)					
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)							
Temperature influence		±10% max. of sensing distance at 23°C within temperature range of -25°C to 70°C		±15% max. of sensing distance at 23°C within temperature range -40°C to 85°C±10% max. of sensing distance at 23°C within temperature range -25°C to 70°C					
Voltage influence		±1% max. of sensing distance within rated voltage range ±15%							
Insulation resistance		50 MΩ min. (500 VDC) between energized part and case							
Dielectric strength		4,000 VAC for 1 min between energized parts and case (2,000 VAC for M8 types)							
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 10 times each in X, Y, and Z directions		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions					
Protective structure		IEC60529 IP67							
Connection method		Pre-wired models (Standard length: 2 m), Connector models							
Weight	Pre-wired models	Approx. 45 g		Approx. 55 g		Approx. 130 g		Approx. 180 g	
	Connector	Approx. 10 g		Approx. 20 g		Approx. 40g		Approx. 90 g	
Material	Case	Stainless steel (SUS303)		Brass					
	Sensing surface	PBT (polybutylene terephthalate)							
Accessories		Instruction manual							

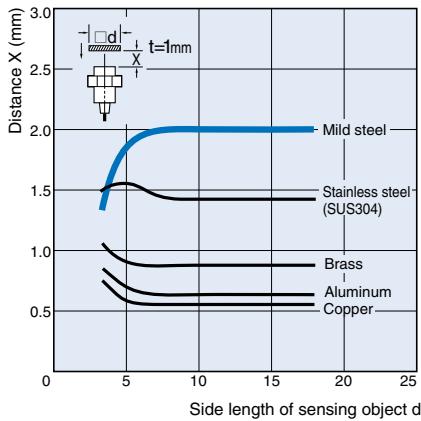
*1. For the 24 VAC supply to any of the aforesaid models, ensure that the operating ambient temperature range exceeds -25°C.

*2. When using M18-or M30-sized E2E within an ambient temperature range of 70°C to 85°C, ensure that E2E has a control output of 200 mA maximum.

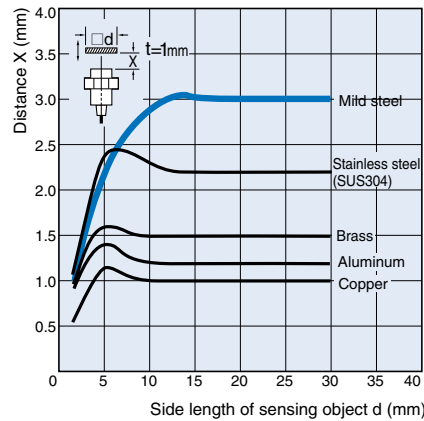
Characteristic data (typical)

Sensing Distance vs. Sensing Object

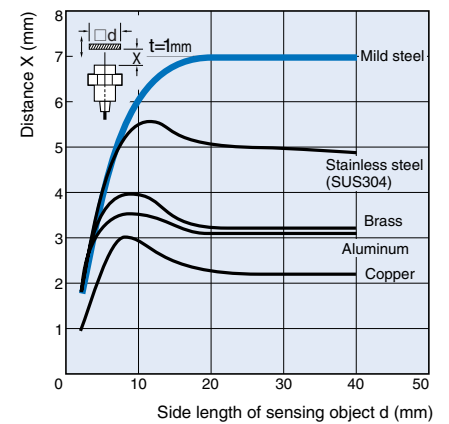
E2E-X2D



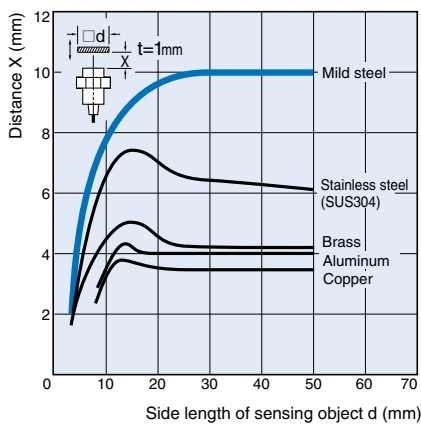
E2E-X3D



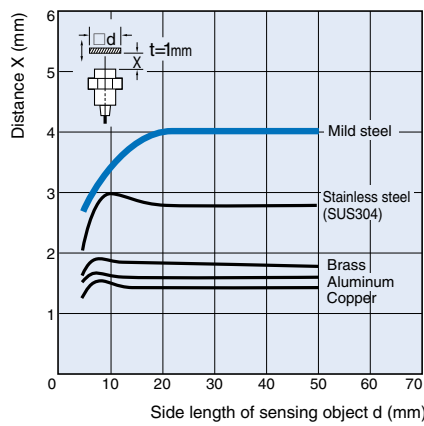
E2E-X7D



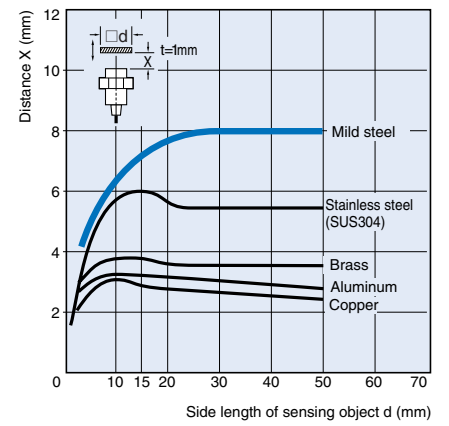
E2E-X10D



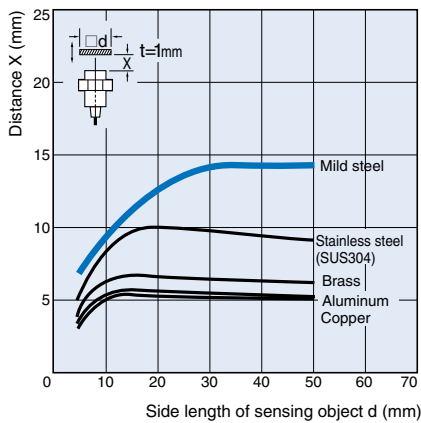
E2E-X4MD



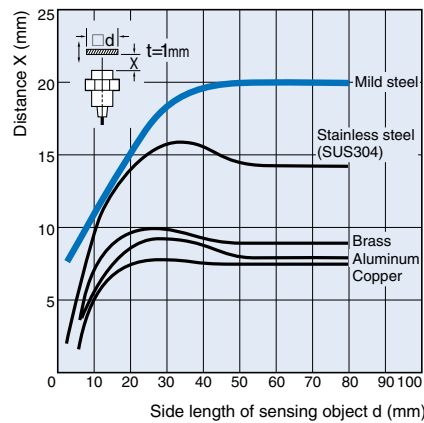
E2E-X8MD



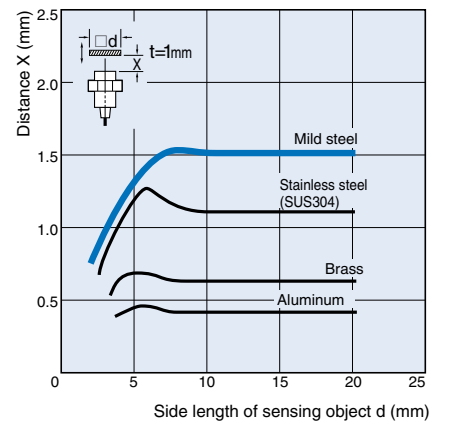
E2E-X14MD



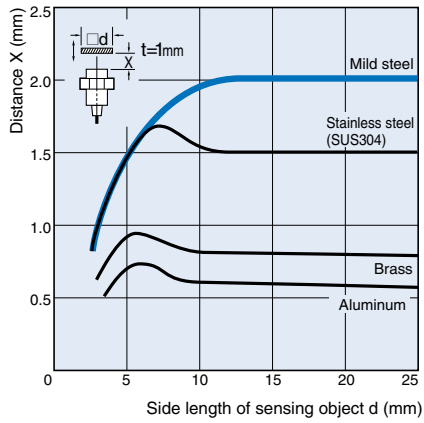
E2E-X20MD



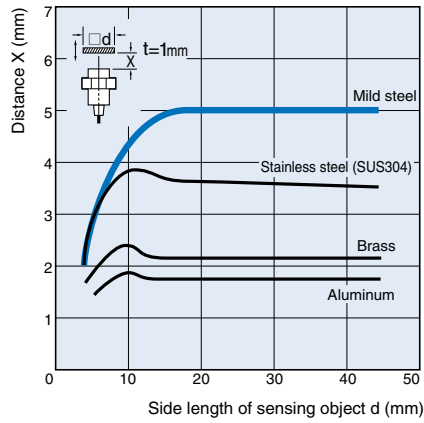
E2EG-X1R5/E2E-X1R5Y



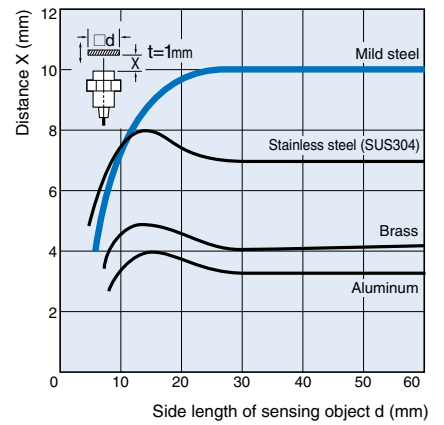
E2EG-X2□/E2E-X2Y□



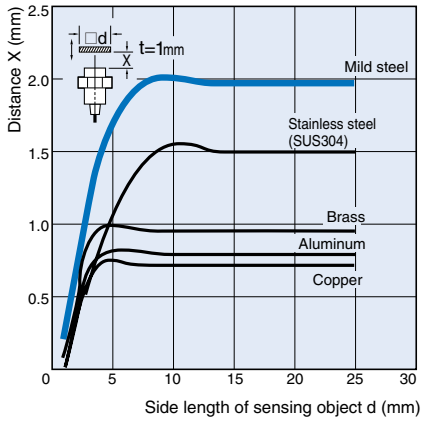
E2EG-X5□/E2E-X5Y□



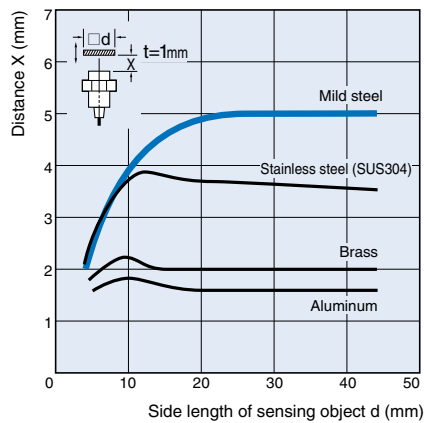
E2EG-X10□/E2E-X10Y□



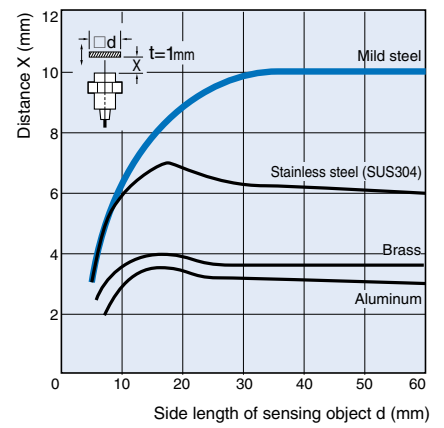
E2EG-X2M□/E2E-X2MY□



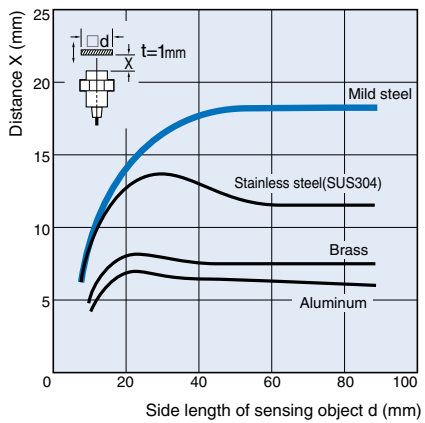
E2EG-X5M□/E2E-X5MY□



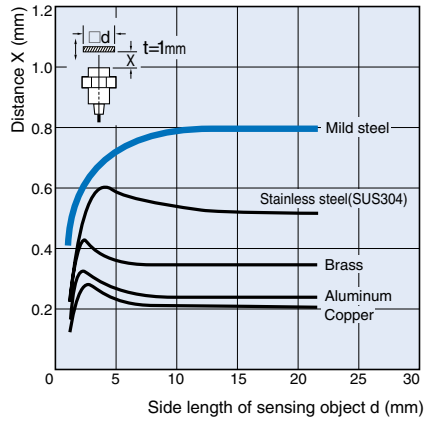
E2EG-X10M□/E2E-X10MY□



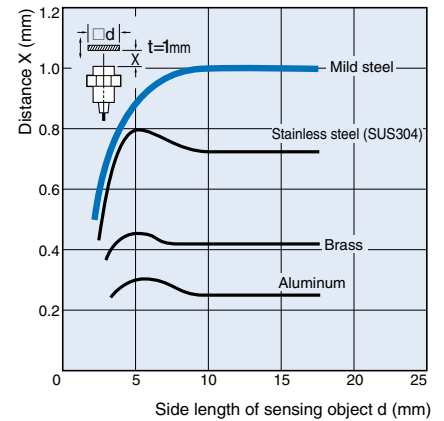
E2EG-X18M□/E2E-X18MY□



E2E-CR8□



E2E-X1□/C1□



Output Circuit Diagram

DC 2-wire Models (E2E-X□□□)

Operating status	Model	Timing chart	Output circuit
<p>No self-diagnostics output, NO</p>	<p>E2E-X□D1-N E2E-X□D1-M1G(J) E2E-X□D1-M3G</p>		<p>Polarised</p> <p>Note: The load can be connected to either the +V or 0-V side.</p>
	<p>E2E-X□D1-M1J-T</p>		<p>No polarity</p> <p>Note: 1. The load can be connected to either the +V or 0-V side. 2. The E2E-X□D1-M1J-T has no polarity. Therefore, terminals 3 and 4 have no polarity.</p>
<p>No self-diagnostic output, NC</p>	<p>E2E-X□D2-N E2E-X□D2-M1G E2E-X□D2-M3G</p>		<p>Note: The load can be connected to either the +V or 0-V side.</p>
<p>With self-diagnostic output, NO</p>	<p>E2E-X□D1S E2E-X□D1S-M1</p>	<p>Note: The diagnostic output is ON when there is coil burnout or the sensing object is located in the unstable sensing range for 0.3 s or more.</p>	<p>Note: The load connects to the +V side both control output and self-diagnostic output.</p>

E2E/E2EG

DC 3-wire

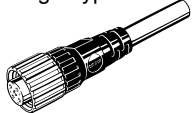



Operating status	Output specifications	Model	Timing chart	Output circuit
NO	NPN Output	E2EG-X□C□ E2EG-X□C□-M1 E2EG-X□C□-M3	<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Yellow indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output between brown and black lines</p> <p>ON </p> <p>OFF </p>	
			<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Yellow indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output between brown and black lines</p> <p>ON </p> <p>OFF </p>	
NC	PNP Output	E2EG-X□B□ E2EG-X□B□-M1 E2EG-X□B□-M3	<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Yellow indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output between brown and black lines</p> <p>ON </p> <p>OFF </p>	
			<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Yellow indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output between brown and black lines</p> <p>ON </p> <p>OFF </p>	
NO	NPN open collector output	E2E-C/X□C□	<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Red indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output</p> <p>ON </p> <p>OFF </p>	
			<p>Sensing object</p> <p>Yes </p> <p>No </p> <p>Red indicator</p> <p>Lit </p> <p>Not lit </p> <p>Control output</p> <p>ON </p> <p>OFF </p>	

Operating status	Output specifications	Model	Timing chart	Output circuit
NO	PNP open collector output	E2E-C/X□B□	Sensing object: Yes (High), No (Low) Red indicator: Lit (High), Not lit (Low) Control output: ON (High), OFF (Low)	
NC			Sensing object: Yes (High), No (Low) Red indicator: Lit (Low), Not lit (High) Control output: ON (Low), OFF (High)	

AC 2-wire Models

Operating status	Model	Timing chart	Output circuit
NO	E2E-X□Y□ E2E-X□Y□-M1	Sensing object: Yes (High), No (Low) Red indicator: Lit (High), Not lit (Low) Control output: ON (High), OFF (Low)	<p>About connector type: NO type: 3 and 4 NC type: 1 and 2</p>
NC		Sensing object: Yes (High), No (Low) Red indicator: Lit (Low), Not lit (High) Control output: ON (Low), OFF (High)	

Sensor I/O Connectors

Connector			Applicable connector	Part number	Applicable proximity sensor mode	Figure No.*1	
Screw	Shape	Cable length					
M12	Straight type 	2 m	A	XS2F-D421-DA0-A	E2E-X□D1-M1G	1	
					E2E-X□D1-M1GJ		
			B	XS2F-D421-DC0-A	E2E-X□D1-M1J-T	2	
					E2EG-X□□1-M1	7	
			D	XS2F-D421-D80-A	E2E-X□D2-M1(G)	5	
			E2E-X□D1S-M1		4		
		E	XS2F-A421-DB0-A	E2E-X□Y1-M1	9		
		F	XS2F-A421-D90-A	E2E-X□Y2-M1	10		
		5 m	A	XS2F-D421-GA0-A	E2E-X□D1-M1G	1	
					E2E-X□D1-M1GJ		
	B		XS2F-D421-GC0-A	E2E-X□D1-M1J-T	2		
				E2EG-X□□1-M1	7		
	D		XS2F-D421-G80-A	E2E-X□D2-M1(G)	5		
		E2E-X□D1S-M1		4			
	E	XS2F-A421-GB0-A	E2E-X□Y1-M1	9			
	F	XS2F-A421-G90-A	E2E-X□Y2-M1	10			
	L type 	2 m	A	XS2F-D422-DA0-A	E2E-X□D1-M1G	1	
					E2E-X□D1-M1GJ		
			B	XS2F-D422-DC0-A	E2E-X□D1-M1J-T	2	
					E2EG-X□□1-M1	7	
D			XS2F-D422-D80-A	E2E-X□D2-M1(G)	5		
		E2E-X□D1S-M1		4			
E		XS2F-A422-DB0-A	E2E-X□Y1-M1	9			
5 m		A	XS2F-D422-GA0-A	E2E-X□D1-M1G	1		
				E2E-X□D1-M1GJ			
		B	XS2F-D422-GC0-A	E2E-X□D1-M1J-T	2		
		E2EG-X□□1-M1		7			
	D	XS2F-D422-G80-A	E2E-X□D2-M1(G)	5			
	E2E-X□D1S-M1		4				
E	XS2F-A422-GB0-A	E2E-X□Y1-M1	9				
M8	Straight type 	2 m	G	XS3F-M421-402-A	E2E-X□D1-M3G	3	
						E2E-X□D2-M3G	6
						E2EG-X□-M3	8
		5 m				E2E-X□D1-M3G	3
						E2E-X□D2-M3G	6
						E2EG-X□-M3	8
	L type 	2 m			E2E-X□D1-M3G	3	
					E2E-X□D2-M3G	6	
					E2EG-X□-M3	8	
		5 m			E2E-X□D1-M3G	3	
					E2E-X□D2-M3G	6	
					E2EG-X□-M3	8	

*1. Refer to the column of the following page "connection figure No." for connection of a proximity sensor and an I/O connector.

Connection with a sensor I/O connector

Figure No.	Proximity Sensors			Sensor I/O Connectors	Connection
	Type	Operating status	Model		
1	DC 2-wire (IEC pin arrangement)	NO	E2E-X□D1-M1G(J)	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-D42□□A0-A	
2	DC 2-wire (No polarity)		E2E-X□D1-M1J-T	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-D42□□C0-A	
3	DC 2-wire (M8 connector)		E2E-X□D1-M3G	1: Straight type 2: L type 2: Cable length 2m 5: Cable length 5m XS3F-M42□□40□-A	
4	DC 2-wire (diagnostic type)		E2E-X□D1S-M1	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-D42□□80-A	
5	DC 2-wire (IEC pin arrangement)	NC	E2E-X□D2-M1G	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-D42□□80-A	
6	DC 2-wire (M8 connector)		E2E-X□D2-M3G	1: Straight type 2: L type 2: Cable length 2m 5: Cable length 5m XS3F-D42□□40□-A	
7	DC 3-wire	NO	E2EG-X□1-M1	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-D42□□C0-A	
8	DC 3-wire (M8 connector)		E2EG-X□1-M3	1: Straight type 2: L type 2: Cable length 2m 5: Cable length 5m XS3F-M42□□40□-A	
9	AC 2-wire Models	NO	E2E-X□Y1-M1	1: Straight type 2: L type D: Cable length 2m G: Cable length 5m XS2F-A42□□B0-A	
10		NC	E2E-X□Y2-M1	D: Cable length 2m G: Cable length 5m XS2F-A421□□90-A	

* Please take note that it differs from the cable color of a proximity sensor.

E2E/E2EG

Precautions

Caution

Do not short-circuit the load, otherwise E2E may explode or burn.

Do not impose an excessive voltage on E2E, otherwise it may explode or burn.



Item

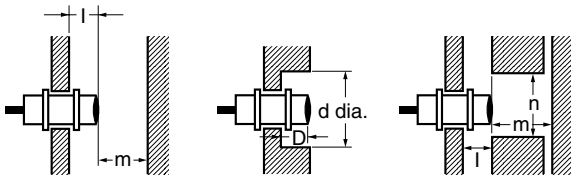
- E2E-CR8□
- E2E-X1□
- E2E-C1□

Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.



Effects of Surrounding Metal (unit: mm) (Relationship between Screw Sizes and Models)

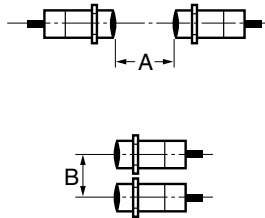
Type	Item	M8	M12	M18	M30		
DC 2-wire E2E-X□D□	Shielded	l	0				
		d	8	12	18	30	
		D	0				
		m	4.5	8	20	40	
		n	12	18	27	45	
	Unshielded	l	12	15	22	30	
		d	24	40	70	90	
		D	12	15	22	30	
		m	8	20	40	70	
		n	24	40	70	90	
DC 3-wire E2E-X□B□/C□ E2EG	Shielded	l	0				
		d	8	12	18	30	
		D	0				
		m	4.5	8	20	40	
		n	12	18	27	45	
	AC 2-wire Models E2E-X□Y□	Unshielded	l	6	15	22	30
			d	24	40	55	90
			D	6	15	22	30
			m	8	20	40	70
			n	24	36	54	90

Type	Model
4 mm dia.	E2E-CR8C□ E2E-CR8B1
M5	E2E-X1C□ E2E-X1B1
5.4 mm dia.	E2E-C1C□ E2E-C1B1
M8	Shielded E2E-X2D□ E2EG-X1R5□ E2E-X1R5Y□
	Unshielded E2E-X4MD□ E2EG-X2M□ E2E-X2MY□
M12	Shielded E2E-X3D□ E2EG-X2□ E2E-X2Y□
	Unshielded E2E-X8MD□ E2EG-X5M□ E2E-X5MY□
M18	Shielded E2E-X7D□ E2EG-X5□ E2E-X5Y□
	Unshielded E2E-X14MD□ E2EG-X10M□ E2E-X10MY□
M30	Shielded E2E-X10D□ E2EG-X10□ E2E-X10Y□
	Unshielded E2E-X20MD□ E2EG-X18M□ E2E-X18MY□

Type	Item	4 dia.	M5	5.4 mm dia.	
DC 3-wire E2E-X□C/B□ E2E-C□C/B□	Shielded	l	0		
		d	4	5	5.4
		D	0		
		m	2.4	3	
		n	6	8	

Mutual Interference

When installing two or more Sensors face to face or side by side, ensure that the minimum distances given in the right-side tables are maintained.



Mutual Interference

Type		Item	M8	M12	M18	M30
DC 2-wire E2E-X□D□	Shielded	A	20	30 (20)	50 (30)	100(50)
		B	15	20(12)	35 (18)	70(35)
	Unshielded	A	80	120(60)	200(100)	300(100)
		B	60	100(50)	110(60)	200(100)
DC 3-wire E2EG	Shielded	A	20	30 (20)	50 (30)	100(50)
		B	15	20(12)	35 (18)	70(35)
	Unshielded	A	80	120(60)	200(100)	300(100)
		B	60	100(50)	110(60)	200(100)
AC 2-wire Models E2E-X□Y□	Unshielded	A	80	120(60)	200(100)	300(100)
		B	60	100(50)	110(60)	200(100)

Type		Item	4 mm dia.	M5	5.4 mm dia.
DC 3-wire E2E-X□C/B□ E2E-C□C/B□	Shielded	A	20		
		B	15		

Note: Values in parentheses: Using a different frequency type model value.

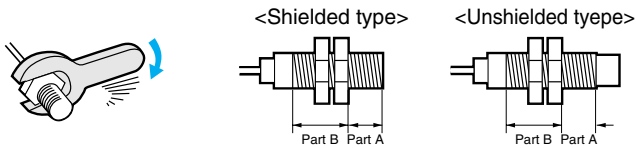
Inrush Current

A load that has a large inrush current (e.g., a lamp or motor) will damage the Proximity Sensor, in such case connect the load to the Proximity Sensor by means of a relay.

Mounting

Mounting

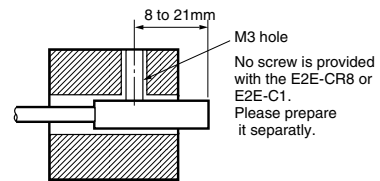
Do not tighten the nut with excessive force.
A washer must be used with the nut.



Note: 1. The table below shows the tightening torques for part A and part B nuts. In the previous examples, the nut is on the sensor head side (part B) and hence the tightening torque for part B applies. If this nut is in part A, the tightening torque for part A applies instead.
2. Following table bolting permission intensity shows the value at the time of using a washer.

Type	Part A		Part B
	Length (mm)	Tensile strength (torque)	Tensile strength (torque)
M5	1 Nm		
M8	Shielded	9	12 Nm
	Unshielded	3	
M12	30 Nm		
M18	70 Nm		
M30	180 Nm		

How to attach a pillar-screwless type (E2 E-CR8, -C1).



If you use a set screw, please increase the below bolting torque by 0.2 Nm.

(E2E-C1: 0.4 Nm max.)

Dimensions (Unit: mm)

Sensors

Models and dimensions chart

Model	Shielded	Type	DC 2-wire		DC 3-wire		AC 2-wire Models	
		Model	Figure No.	Model	Figure No.	Model	Figure No.	
Pre-wired	Shielded	4 mm dia.	---	---	E2E-CR8□	1	---	---
		M5			E2E-X1□	3		
		5.4 mm dia.			E2E-C1□	2		
		M8	E2E-X2D□	4	E2EG-X1R5B□/C□	4	E2E-X1R5Y□	6
		M12	E2E-X3D□	8	E2EG-X2B□/C□	8	E2E-X2Y□	10
		M18	E2E-X7D□	13	E2EG-X5B□/C□	13	E2E-X5Y□	13
	Unshielded	M30	E2E-X10D□	15	E2EG-X10BE□/C□	15	E2E-X10Y□	15
		M8	E2E-X4MD□	5	E2EG-X2MB□/C□	5	E2E-X2MY□	7
		M12	E2E-X8MD□	9	E2EG-X5MB□/C□	9	E2E-X5MY□	11
		M18	E2E-X14MD□	14	E2EG-X10MB□/C□	14	E2E-X10MY□	14
		M30	E2E-X20MD□	16	E2EG-X18MB□/C□	16	E2E-X18MY□	16
		Connector (M12)	Shielded	M8	E2E-X2D□-M1(G)	17	E2EG-X1R5B□/C□-M1	17
Unshielded	M12	E2E-X3D□-M1(G)		19	E2EG-X2B□/C□-M1	19	E2E-X2Y□-M1	21
	M18	E2E-X7D□-M1(G)		23	E2EG-X5B□/C□-M1	23	E2E-X5Y□-M1	23
	M30	E2E-X10D□-M1(G)		25	E2EG-X10B□/C□-M1	25	E2E-X10Y□-M1	25
	M8	E2E-X4MD□-M1(G)		18	E2EG-X2MB□/C□-M1	18	---	
	M12	E2E-X8MD□-M1(G)		20	E2EG-X5MB□/C□-M1	20	E2E-X5MY□-M1	22
	M18	E2E-X14MD□-M1(G)	24	E2EG-X10MB□/C□-M1	24	E2E-X10MY□-M1	24	
Connector(M8)	Shielded	M8	E2E-X2D□-M3G	27	E2EG-X1R5B□/C□-M3	27	---	
	Unshielded	M8	E2E-X4MD□-M3G	28	E2EG-X2MB□/C□-M3	28	---	
Connector extension	Shielded	M12	E2E-X3D1-M1GJ	29	---	---	---	
		M18	E2E-X7D1-M1GJ	31				
		M30	E2E-X10D1-M1GJ	33				
	Unshielded	M12	E2E-X8MD1-M1GJ	30	---	---	---	
		M18	E2E-X14MD1-M1GJ	32				
		M30	E2E-X20MD1-M1GJ	34				
Connector extension (no polarity)	^	M12	E2E-X3D1-M1J-T	29	---	---	---	
		M18	E2E-X7D1-M1J-T	31				
		M30	E2E-X10D1-M1J-T	33				

Note: 1 . Two clamping nuts and one toothed washer are attached to M8 to M30 type.
 2 . The pre-wired models of M8 to M30 mark model number to a cable and a milling cutter by laser.

Pre-wired Models (Shielded)



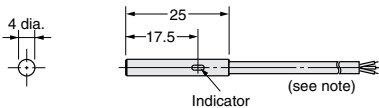
fig.1 E2E-CR8□

CAD file E2E_02

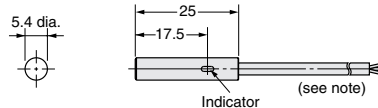


fig.2 E2E-C1□

CAD file E2E_01

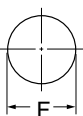


Note:
 Round vinyl-insulated cable (oil-and vibration-resistive), 0.14mm², 3 cores 2.9 dia.
 Standard length: 2m,
 The cable can be extended up to 100m



Note:
 Round vinyl-insulated cable (oil-and vibration-resistive), 0.14mm², 3 cores 2.9 dia.
 Standard length: 2m,
 The cable can be extended up to 100m

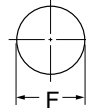
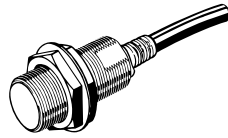
Mounting Holes



Outer diameter	4 mm dia.	5.4 mm dia.
F (mm)	4.2 dia. ^{+0.5} ₀	5.7 dia. ^{+0.5} ₀

Pre-wired Models (Shielded)

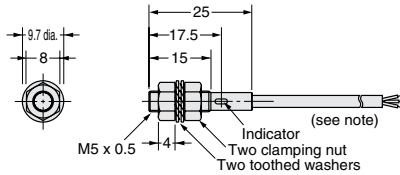
Mounting Holes



Outer diameter	M5	M8	M12
F (mm)	5.5 dia. $^{+0.5}_0$	8.5 dia. $^{+0.5}_0$	12.5 dia. $^{+0.5}_0$

fig.3 E2E-X1□

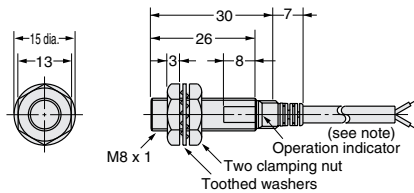
CAD file E2E_19



Note: Round vinyl-insulated cable (oil-and vibration-resistive), 0.14mm², 3 cores 2.9 dia. Standard length: 2m. The cable can be extended up to 100m

fig.4 E2E-X2D□
E2EG-X1R5B□/C□

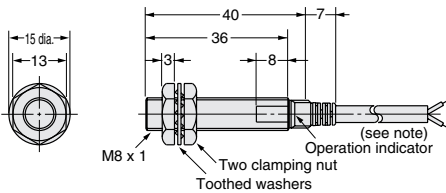
Model	CAD file
E2E-X2D□	E2E_26
E2EG-X1R5B□/C□	E2E_20



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2/3 cores 4 dia. (0.08 dia. x 6/10) for robotics cable models Standard length: 2m

fig.6 E2E-X1R5Y□

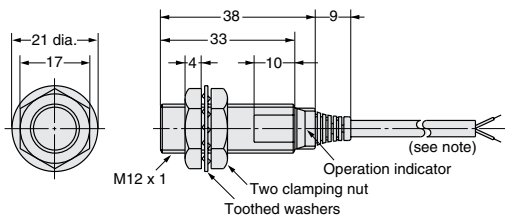
CAD file E2E_21



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2 cores Standard length: 2m

fig.8 E2E-X3D□
E2EG-X2B□/C□

Model	CAD file
E2E-X3D□	E2E_37
E2EG-X2B□/C□	E2E_28



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2/3 cores 4 dia. (0.08 dia. x 6/10) for robotics cable models Standard length: 2m

Pre-wired Models (Unshielded)

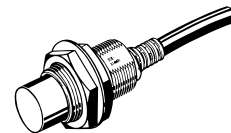
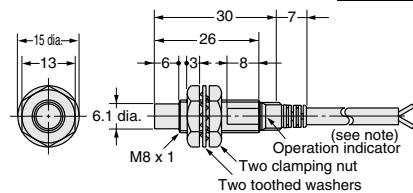


fig.5 E2E-X4MD□
E2EG-X2MB□/C□

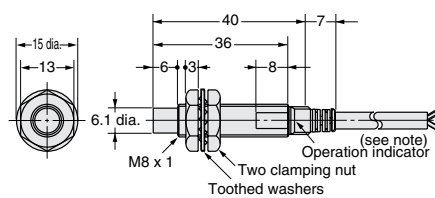
Model	CAD file
E2E-X4MD□	E2E_40
E2EG-X2MB□/C□	E2E_30



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2/3 cores 4 dia. (0.08 dia. x 6/10) for robotics cable models Standard length: 2m

fig.7 E2E-X2MY□

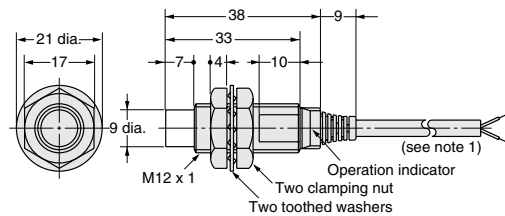
CAD file E2E_31



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2 cores Standard length: 200m

fig.9 E2E-X8MD□
E2EG-X5MB□/C□

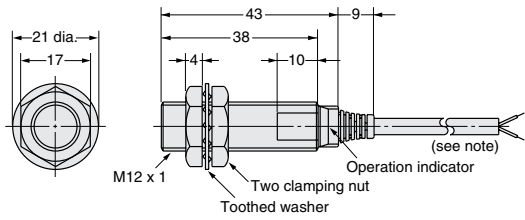
Model	CAD file
E2E-X8MD□	E2E_55
E2EG-X5MB□/C□	E2E_44



Note: Round vinyl-insulated cable 4 dia. (0.08 dia. x 60), 2/3 cores 4 dia. (0.08 dia. x 6/10) for robotics cable models Standard length: 2m

fig.10 E2E-X2Y□

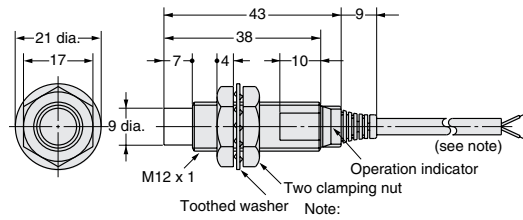
CAD file E2E_32



Note:
Round vinyl-insulated cable 4 dia. (0.08 dia. x 60),
2 cores
Standard length: 2m

fig.11 E2E-X5MY□

CAD file E2E_46



Note:
Round vinyl-insulated cable 4 dia. (0.08 dia. x 60),
2 cores
Standard length: 2m

Pre-wired Models (Shielded)

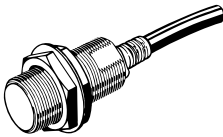
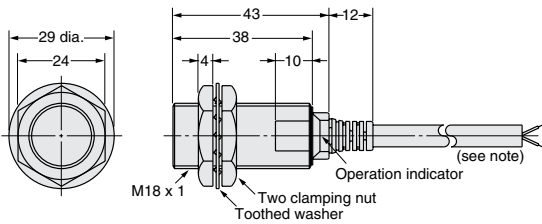


fig.13 E2E-X7D□/E2EG-X5B□/C□
E2E-X5Y□



Model	CAD file
E2E-X7D□	E2E_42
E2EG-X5B□/C□	E2E_48
E2E-X5Y□	E2E_48

Note:
Round vinyl-insulated cable 4 dia. (0.12 dia. x 45),
2/3 cores
6 dia. (0.08 dia. x 6/17) for robotics cable models
Standard length: 2m

Pre-wired Models (Unshielded)

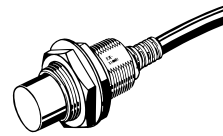
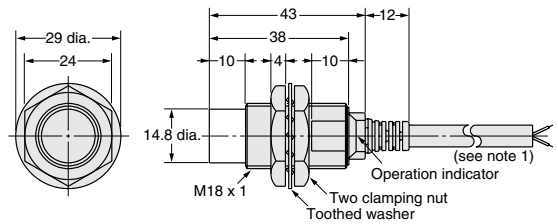


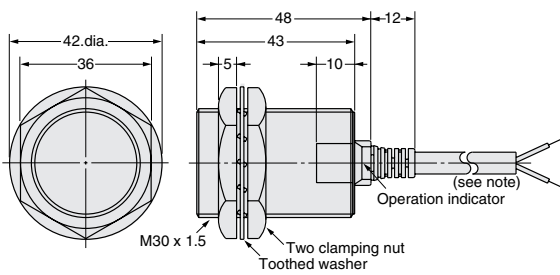
fig.14 E2E-X14MD□/E2EG-X10MB□/C□
E2E-X10MY□



Model	CAD file
E2E-X14MD□	E2E_16
E2EG-X10MB□/C□	E2E_10
E2E-X10MY□	E2E_10

Note:
Round vinyl-insulated cable 6 dia. (0.12 dia. x 45),
2/3 cores
6 dia. (0.08 dia. x 6/17) robotics cable models
Standard length: 2m

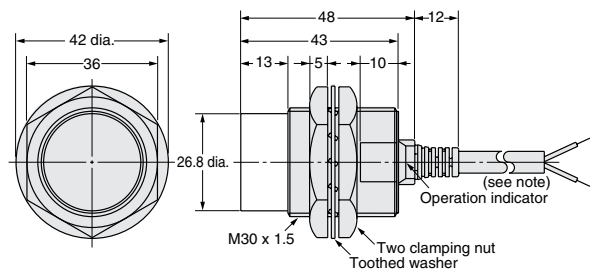
fig.15 E2E-X10D□/E2EG-X10B□/C□
E2E-X10Y□



Model	CAD file
E2E-X10D□	E2E_07
E2EG-X10B□/C□	E2E_06
E2E-X10Y□	E2E_06

Note:
Round vinyl-insulated cable 4 dia. (0.12 dia. x 45),
2/3 cores
6 dia. (0.08 dia. x 6/17) for robotics cable models
Standard length: 2m

fig.16 E2E-X20MD□/E2EG-X18MB□/C□
E2E-X18MY□



Model	CAD file
E2E-X20MD□	E2E_25
E2EG-X18MB□/C□	E2E_17
E2E-X18MY□	E2E_17

Note:
Round vinyl-insulated cable 4 dia. (0.12 dia. x 45),
2/3 cores
6 dia. (0.08 dia. x 6/17) for robotics cable models
Standard length: 2m

M8 Connector Models
(Shielded)

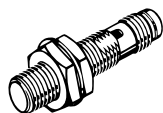
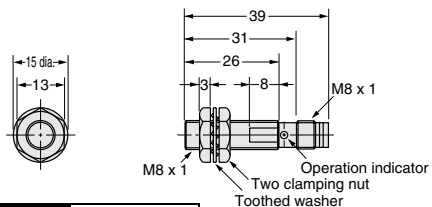


fig.27 E2E-X2D□-M3G/E2EG-X1R5B□/C□



CAD file E2E_59

M8 Connector Models
(Unshielded)

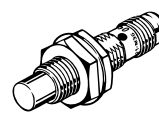
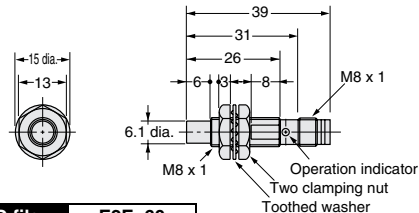


fig.28 E2E-X4MD□-M3G/E2EG-X2MB□/C□



CAD file E2E_60

M12 Connector Models
(Shielded)

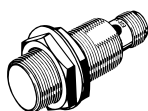
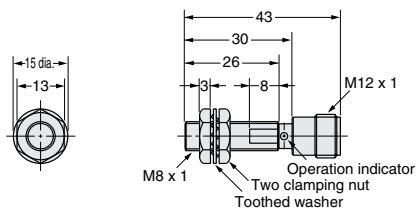


fig.17 E2E-X2D□-M1(G)
E2EG-X1R5B□/C□-M1



CAD file E2E_27

M12 Connector Models
(Unshielded)

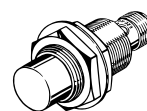
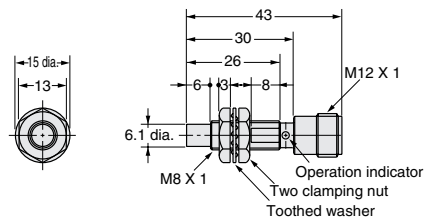
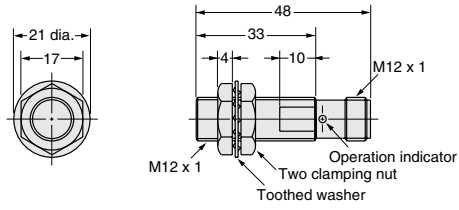


fig.18 E2E-X4MD□-M1(G)
E2EG-X2MB□/C□-M1



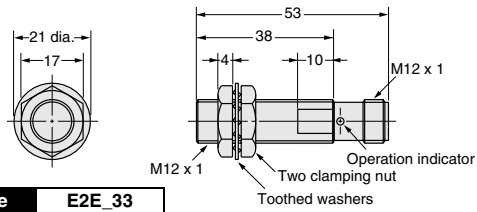
CAD file E2E_41

fig.19 E2E-X3D□-M1G
E2EG-X2B□/C□



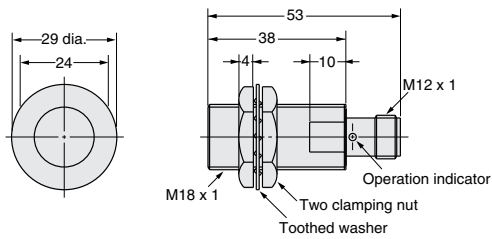
CAD file E2E_34

fig.21 E2E-X2Y□-M1



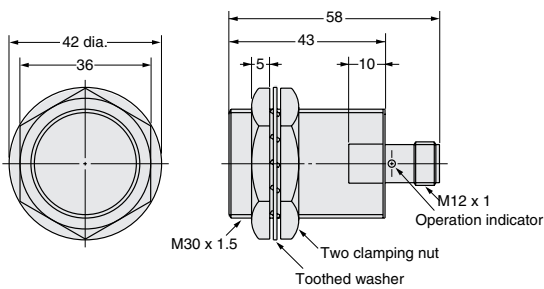
CAD file E2E_33

fig.23 E2E-X7D□-M1G/E2EG-X5B□/C□
E2E-X5Y□-M1



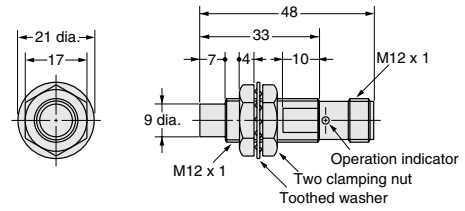
CAD file E2E_49

fig.25 E2E-X10D□-M1(G)/E2EG-X10B□/C□
E2E-X10Y□-M1



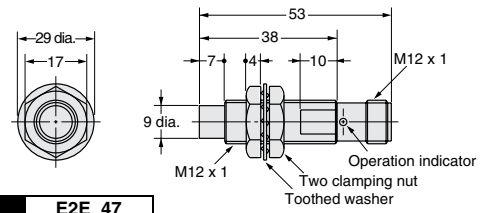
CAD file E2E_04

fig.20 E2E-X8MD□-M1G
E2EG-X5MB□/C□



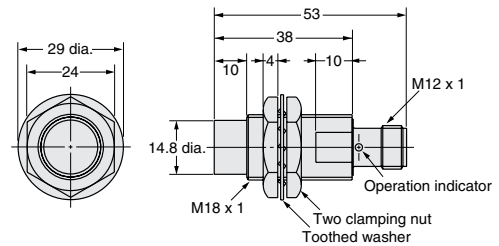
CAD file E2E_57

fig.22 E2E-X5MY□-M1



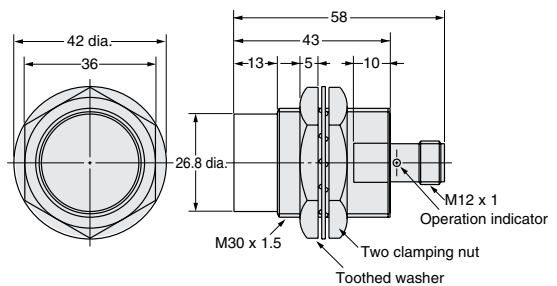
CAD file E2E_47

fig.24 E2E-X14MD□-M1(G)/E2EG-X10MB□/C□
E2E-X10MY□-M1



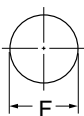
CAD file E2E_14

fig.26 E2E-X20MD□-M1(G)/E2EG-X18MB□/C□
E2E-X18MY□-M1



CAD file E2E_23

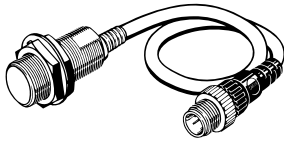
Mounting Holes



Outer diameter	M5	M8	M12	M18	M30
F (mm)	5.5 dia. ^{+0.5} ₀	8.5 dia. ^{+0.5} ₀	12.5 dia. ^{+0.5} ₀	18.5 dia. ^{+0.5} ₀	30.5 dia. ^{+0.5} ₀

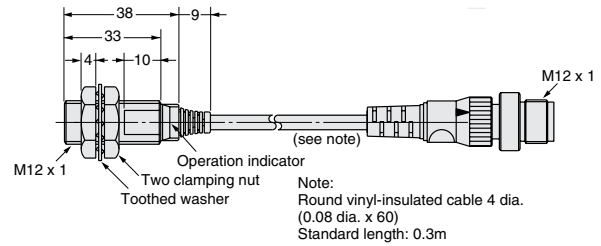
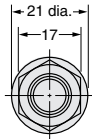
Connector Extension Models (Shielded)

Mounting Holes



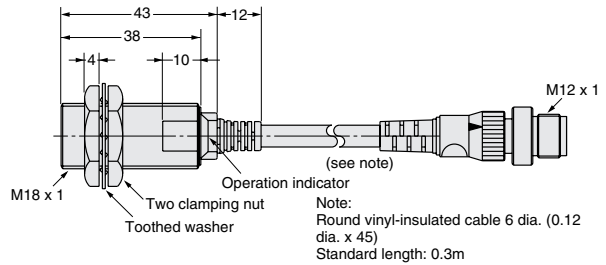
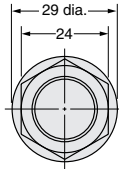
Outer diameter	M12	M18	M30
F (mm)	12.5 dia. ^{+0.5} ₀	18.5 dia. ^{+0.5} ₀	30.5 dia. ^{+0.5} ₀

fig.29 E2E-X3D1-M1GJ
E2E-X3D1-M1J-T



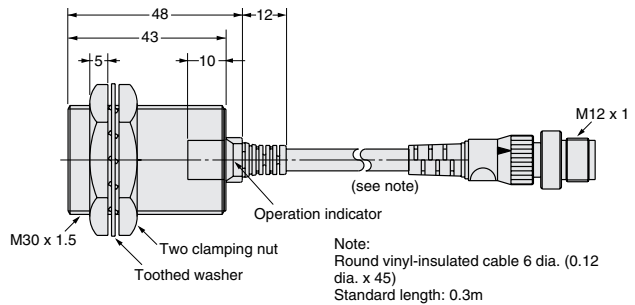
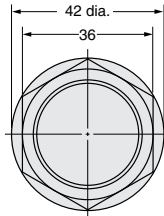
CAD file E2E_36

fig.31 E2E-X7D1-M1GJ
E2E-X7D1-M1J-T



CAD file E2E_52

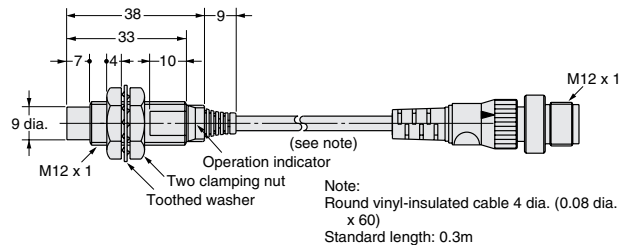
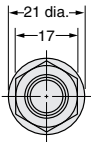
fig.33 E2E-X10D1-M1GJ
E2E-X10D1-M1J-T



CAD file E2E_05

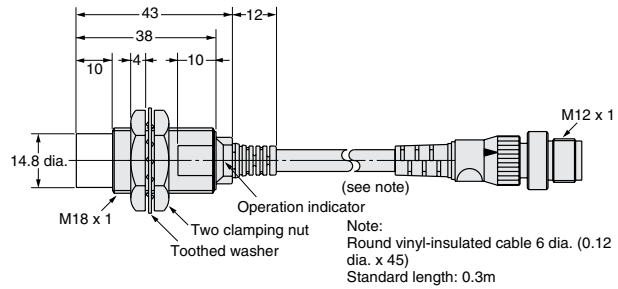
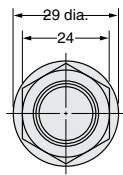
Connector Extension Models (Unshielded)

fig.30 E2E-X8MD1-M1GJ



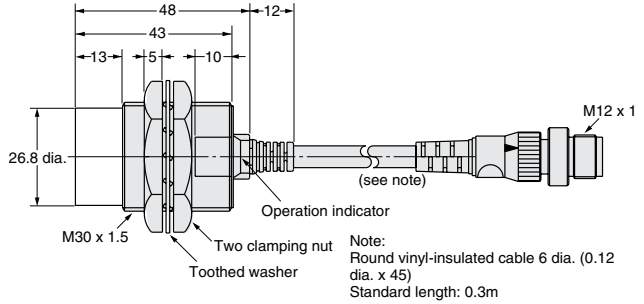
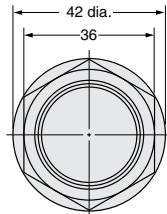
CAD file E2E_58

fig.32 E2E-X14MD1-M1GJ



CAD file E2E_15

fig.34 E2E-X20MD1-M1GJ

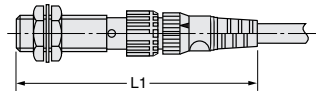


CAD file E2E_24

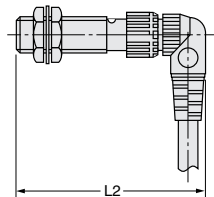
Dimensions of connection with proximity sensor and sensor I/O connector

Shielded

<Straight type connection>

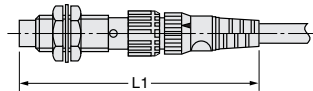


<L type connection>

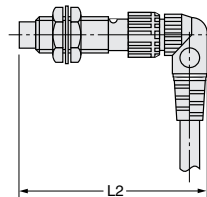


Unshielded

<Straight type connection>



<L type connection>



Dimensions of connection with XS2F

Size	Length	L1	L2
		M8	Approx.75
M12*	DC Models	Approx.80	Approx.67
	AC Models	Approx.85	Approx.72
M18		Approx.85	Approx.72
M30		Approx.90	Approx.77

* Only in the diameter M12 of a sensor, dimensions (sensor full length) differ for AC or DC. Therefore, please consider that a connection with I/O connector changes dimensions.

Dimensions of connection with XS3F

Size	Length	L1	L2
		M8	Approx.65

Accessories (Order Separately)

Sensor I/O Connectors

E-20

MEMO

A large grid of dashed lines for writing notes, consisting of 15 columns and 25 rows.

E2E/E2EG

Spatter immune Proximity Sensors

E2EQ

A Series of Spatter-resistant Proximity Sensors with a Teflon-coated Metal Housing

- Long sensing-distance type included in series.







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

Ordering Information





Sensors

- Pre-wired Models

Long-distance type




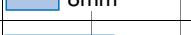
Shape		Sensing distance			Output specifications	Operating status	Model
Shielded 	M12		4mm		DC 2-wire	NO	E2EQ-X4X1
	M18		8mm				E2EQ-X8X1
	M30		15mm				E2EQ-X15X1

Standard




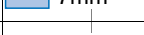
Shape		Sensing distance			Output specifications	Operating status	Model
Shielded 	M12		3mm		DC 2-wire	NO	E2EQ-X3D1
	M18		7mm				E2EQ-X7D1
	M30		10mm				E2EQ-X10D1

- Plug-in Models

Long-distance type

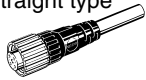



Shape		Sensing distance			Output specifications	Operating status	Model
Shielded 	M12		4mm		DC 2-wire models (3) and (4) Pin arrangement	NO	E2EQ-X4X1-M1J
	M18		8mm				E2EQ-X8X1-M1J
	M30		15mm				E2EQ-X15X1-M1J

Standard

Standard		Sensing distance			Output specifications	Operating status	Model
Shielded 	M12		3mm		DC 2-wire models (1) and (4) Pin arrangement	NO	E2EQ-X3D1-M1GJ
	M18		7mm				E2EQ-X7D1-M1GJ
	M30		10mm				E2EQ-X10D1-M1GJ

Accessories (Order Separately)

Sensor I/O Connectors

Shape	Cable length	Sensor I/O Connectors	Applicable proximity sensor models
 Straight type	2 m	XS2F-D421-DCO-A	E2EQ-X□X1-M1J
	5 m	XS2F-D421-GCO-A	
 L type	2 m	XS2F-D422-DCO-A	
	5 m	XS2F-D422-GCO-A	
 Straight type	2 m	XS2F-D421-DA0-A	E2EQ-X□D1-M1GJ
	5 m	XS2F-D421-GA0-A	
 L type	2 m	XS2F-D422-DA0-A	
	5 m	XS2F-D422-GA0-A	

Rating/Performance

Long-distance type

Model		E2EQ-X4X1 E2EQ-X4X1-M1J	E2EQ-X8X1 E2EQ-X8X1-M1J	E2EQ-X15X1 E2EQ-X15X1-M1J
Item				
Sensing distance		4 mm ±10%	8 mm ±10%	15 mm ±10%
Setting distance*1		0 to 3.2 mm	0 to 6.4 mm	0 to 12 mm
Differential distance		15% max. of sensing distance		
Standard sensing object (mild steel)		12 x 12 x 1 mm	18 ± 18 ± 1 mm	30 ± 30 ± 1 mm
Response frequency*2		1 kHz	0.5 kHz	0.25 kHz
Control output	Switching capacity	3 to 100 mA		
	Residual voltage*3	5.0 V max. (under load current of 100 mA with cable length of 2 m)		
Operating status (with sensing object approaching)		C1 models: NO		
Protective circuits		Surge absorber, load short-circuit protection		
Ambient temperature		Operating: -25°C to 70°C, Storage: -40°C to 85°C (with no icing or condensation)		
Temperature influence		±15% max. of sensing distance at 23°C within temperature range of -40°C to 85°C ±10% max. of sensing distance at 23°C within temperature range of -25°C to 70°C		±15% max. of sensing distance at 23°C within temperature range of -25°C to 70°C
Voltage influence		±1% max. of Sensing distance in rated voltage range ±15%.		
Shock resistance		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions		
Connection method		Pre-wired (standard length: 2 m) Connector Extension Models		
Weight (Packed state)	Pre-wired	65 g	Approx. 140 g	Approx. 190 g
	Junction connector	Approx. 20 g	Approx. 40g	Approx. 90 g

*1. Use within a range where the green indicator is lit.

*2. The response frequencies for DC switching are average values.

*3. Since residual voltage is 5 V, use it after checking interface requirements with the connection devices.

Standard

Model		E2EQ-X3D1 E2EQ-X3D1-M1GJ	E2EQ-X7D1 E2EQ-X7D1-M1GJ	E2EQ-X10D1 E2EQ-X10D1-M1GJ
Item				
Sensing distance		3 mm ±10%	7 mm ±10%	10 mm ±10%
Setting distance		0 to 2.4 mm	0 to 5.6 mm	0 to 8 mm
Differential distance		10% max.		
Standard sensing object (mild steel)		12 x 12 x 1 mm	18 x 18 x 1 mm	30 x 30 x 1 mm
Response frequency		1 kHz	500 Hz	400 Hz
Control out-put	Switching capacity	3 to 100 mA		
	Residual voltage	3.0 V max. (under load current of 100 mA with cable length of 2 m)		
Operating status (with sensing object approaching)		NO		
Protective circuits		Surge absorber, short-circuit protection		
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)		
Temperature influence		±10% max. of sensing distance at 23°C within temperature range of -25°C and 70°C		
Voltage influence		±2.5% max. of Sensing distance within rated voltage range ±15%.		
Shock resistance		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions		
Connection method		E2EQ-X□D1: Pre-wired models (Standard length: 2 m) E2EQ-X□D1-M1GJ type: Connector relay models (Standard length: 300 mm)		
Weight (Packed state)	Pre-wired	Approx. 120 g	Approx. 160 g	Approx. 220 g
	Junction connector	Approx. 80 g	Approx. 110 g	Approx. 190 g

* The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

General

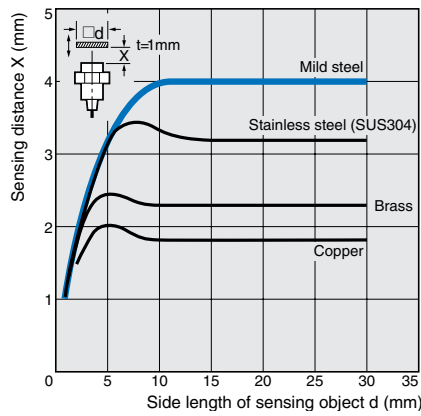
Model		E2EQ-X4X1 E2EQ-X4X1-M1J E2EQ-X3D1 E2EQ-X3D1-M1GJ	E2EQ-X8X1 E2EQ-X8X1-M1J E2EQ-X7D1 E2EQ-X7D1-M1GJ	E2EQ-X15X1 E2EQ-X15X1-M1J E2EQ-X10D1 E2EQ-X10D1-M1GJ
Item				
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)		
Rated supply voltage (operating voltage)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.		
Leakage current		0.8 mA max.		
Indicator lamp		Operation indicator (red), operation setting indicator (green)		
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)		
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case		
Dielectric strength		1,000 VAC for 1 min between energized parts and case		
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions		
Protective structure		IEC60529 IP67		
Material	Case	Teflon resin coating (base: brass) *		
	Sensing surface	Teflon resin *		
Accessories		Instruction manual		

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

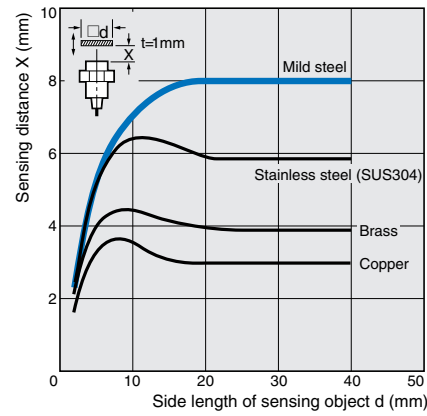
Characteristic data (typical)

Sensing Distance vs. Sensing Object

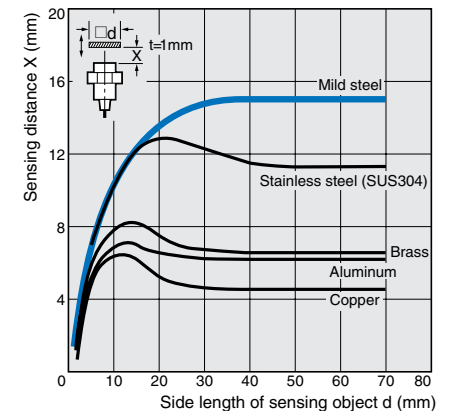
E2EQ-X4X1(-M1J)



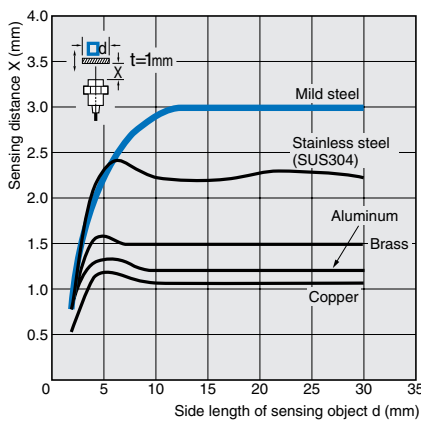
E2EQ-X8X1(-M1J)



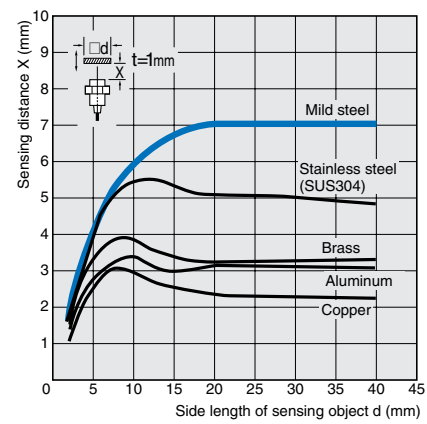
E2EQ-X15X1(-M1J)



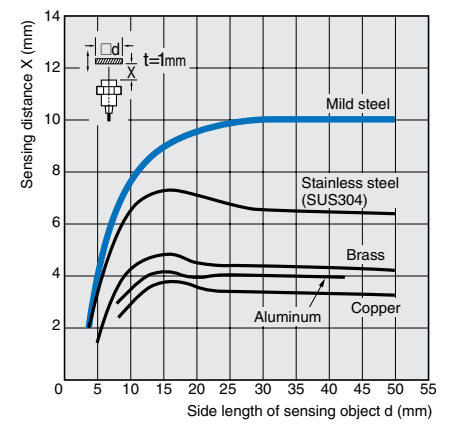
E2EQ-X3D1(-M1GJ)



E2EQ-X7D1(-M1GJ)



E2EQ-X10D1(-M1GJ)



Output Circuit Diagram

Long-distance type

Model	Operating status	Timing chart	Output circuit
E2EQ-X4X1 E2EQ-X8X1 E2EQ-X15X1 E2EQ-X4X1-M1J E2EQ-X8X1-M1J E2EQ-X15X1-M1J	NO		<p>Note: 1. The load can be connected to either the +V or the 0-V line. 2. Since there is no polarity, there is no need to pay attention to the brown or blue polarity.</p> <p style="text-align: center;">Wiring</p> <p>Note: Terminals ② and ③ are not used.</p>

Standard

Model	Operating status	Timing chart	Output circuit
E2EQ-X3D1 E2EQ-X7D1 E2EQ-X10D1 E2EQ-X3D1-M1GJ E2EQ-X7D1-M1GJ E2EQ-X10D1-M1GJ	NO		<p>Note: The Load can be connected to either the +V or the 0-V line.</p> <p style="text-align: center;">Wiring</p> <p>Note: Terminals ② and ③ are not used.</p>

Connecting Plug-in models

Model	E2EQ-X□X1-M1J	E2EQ-X□D1-M1GJ
Connection	<p>Connector relay type E2EQ-X□X1-M1J</p> <p>Sensor I/O Connectors XS2F-D42□-□C0-A</p>	<p>Connector relay type E2EQ-X□D1-M1GJ</p> <p>Sensor I/O Connectors XS2F-D42□-□A0-A</p>

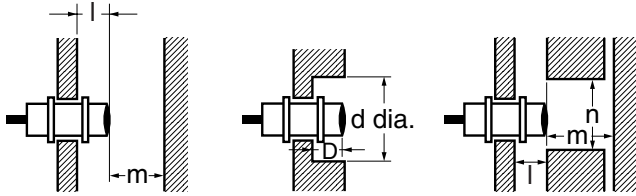
Precautions

Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.

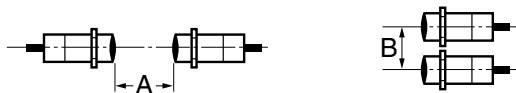


Effects of Surrounding Metal (Unit: mm)

Model	Item	l	d	D	m	n
E2EQ-X4X1(-M1J)		2.4	18	2.4	12	18
E2EQ-X8X1(-M1J)		3.6	27	3.6	24	27
E2EQ-X15X1(-M1J)		6	45	6	45	45
E2EQ-X3D11(-M1GJ)			12		8	18
E2EQ-X7D1(-M1GJ)		0	18	0	20	27
E2EQ-X10D1(-M1GJ)			30		40	45

Mutual Interference

If more than one Proximity Sensor is installed face to face or in parallel, make sure that the distances between two Units adjacent to each other are the same as or larger than the corresponding values shown in the following table.

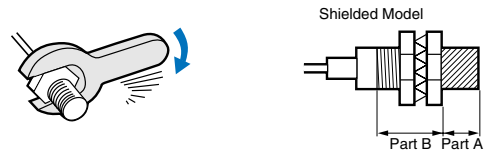


Mutual Interference(Unit: mm)

Model	Item	A	B
E2EQ-X4X1(-M1J)		30	20
E2EQ-X8X1(-M1J)		60	35
E2EQ-X15X1(-M1J)		110	90
E2EQ-X3D1(-M1GJ)		30	20
E2EQ-X7D1(-M1GJ)		50	35
E2EQ-X10D1(-M1GJ)		100	70

Mounting

Do not tighten the nut with excessive force. A washer must be used with the nut.



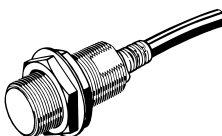
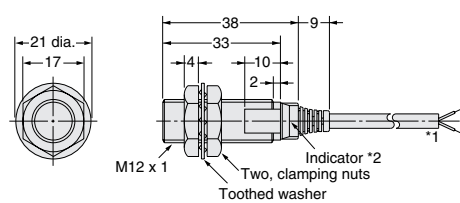
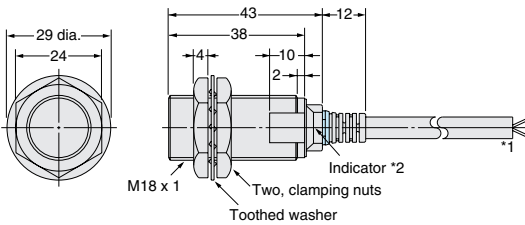
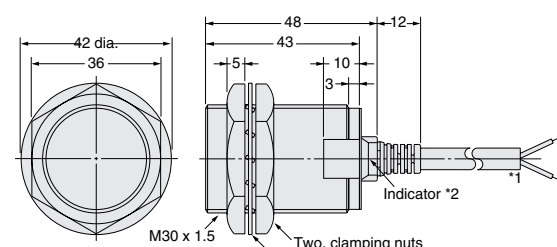
Note: 1. The table below shows the tightening torques for part A and part B nuts. In the previous examples, the nut is on the sensor head side (part B) and hence the tightening torque for part B applies. If this nut is in part A, the tightening torque for part A applies instead.
2. The table below shows the value of tightening torques when using toothed washers.

Model	Torque Length (mm)	Part A	Part B
		Torque	Torque
E2EQ-X4X1(-M1J)		30 Nm	
E2EQ-X8X1(-M1J)	---	70 Nm	
E2EQ-X15A(-M1J)		180 Nm	
E2EQ-X3D1(-M1GJ)	24	15 Nm	---
E2EQ-X7D1(-M1GJ)	29		
E2EQ-X10D1(-M1GJ)	26	39 Nm	78 Nm

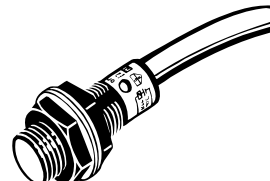
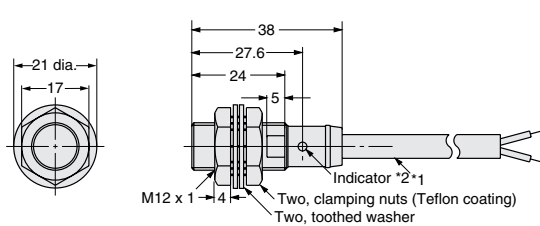
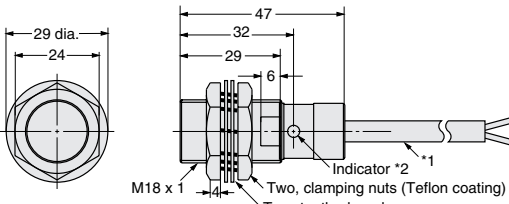
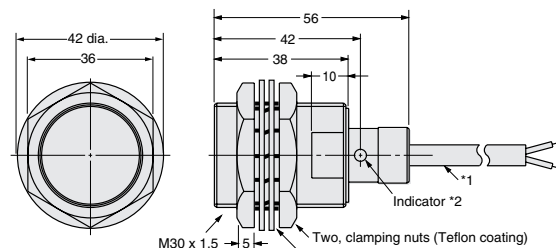
Dimensions (Unit: mm)

● Pre-wired Models

Long-distance type

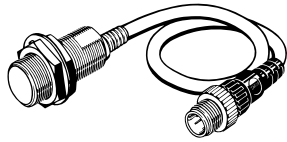
	<p>E2EQ-X4X1 CAD file E2EQ_03</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 4 dia. 2/3 conductors (conducting cross-sectional area: 0.3 mm²/insulator diameter: 1.3 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>
<p>E2EQ-X8X1 CAD file E2EQ_01</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 6 dia. 2/3 conductors (conducting cross-sectional area: 0.5 mm²/insulator diameter: 1.9 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>	<p>E2EQ-X15X1 CAD file E2EQ_05</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 6 dia. 2/3 conductors (conducting cross-sectional area: 0.5 mm²/insulator diameter: 1.9 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>

Standard

	<p>E2EQ-X3D1 CAD file E2EQ_03</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 6 dia., 2 conductors (conducting cross-sectional area: 0.5 mm²/insulator diameter: 1.9 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>
<p>E2EQ-X7D1 CAD file E2EQ_05</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 6 dia., 2 conductors (conducting cross-sectional area: 0.5 mm²/insulator diameter: 1.9 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>	<p>E2EQ-X10D1 CAD file E2EQ_01</p>  <p>*1: Vinyl-insulated round cable (flame-resistant), 6 dia., 2 conductors (conducting cross-sectional area: 0.5 mm²/insulator diameter: 1.9 mm Standard length: 2m Cable extension (through a single metal conduit): 200m max. *2: Operation indicator (red) and setting indicator (green).</p>

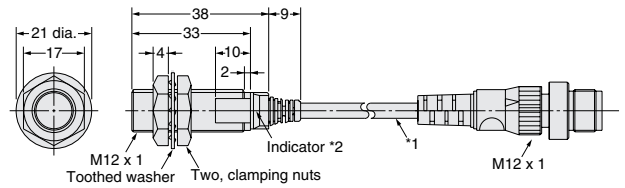
● Plug-in Models

Long-distance type



E2EQ-X4X1-M1J

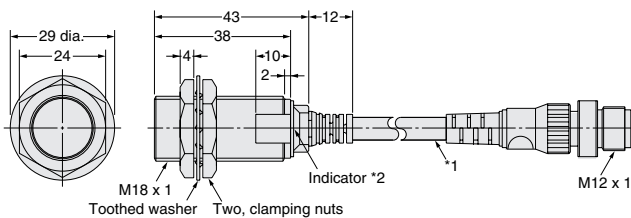
CAD file E2EQ_07



*1: Vinyl-insulated round cable (flame-resistant), 4 dia. (Conducting cross-sectional area: 0.3 mm²; insulator diameter: 1.3 mm) Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

E2EQ-X8X1-M1J

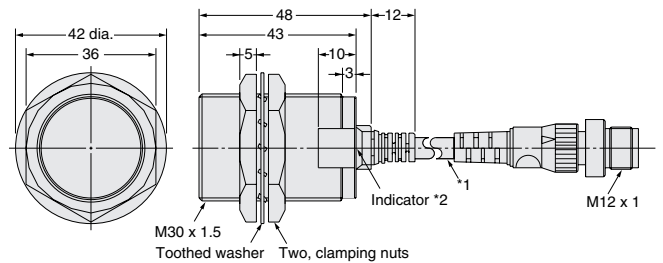
CAD file E2EQ_08



*1: Vinyl-insulated round cable (flame-resistant), 5 dia. (Conducting cross-sectional area: 0.5 mm²; insulator diameter: 1.9 mm) Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

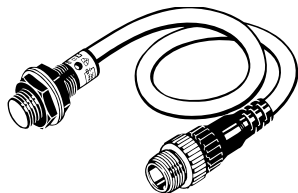
E2EQ-X15X1-M1J

CAD file E2EQ_09



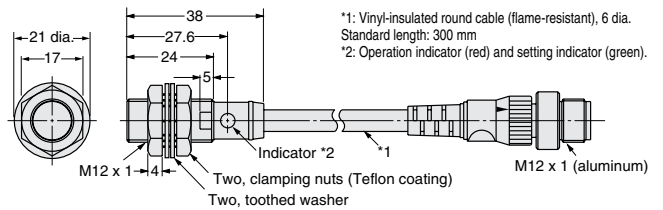
*1: Vinyl-insulated round cable (flame-resistant), 5 dia. (Conducting cross-sectional area: 0.5 mm²; insulator diameter: 1.9 mm) Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

Standard



E2EQ-X3D1-M1GJ

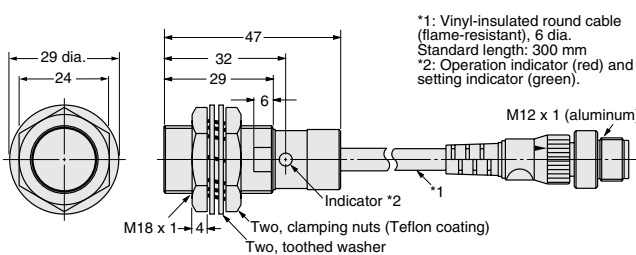
CAD file E2EQ_04



*1: Vinyl-insulated round cable (flame-resistant), 6 dia. Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

E2EQ-X7D1-M1GJ

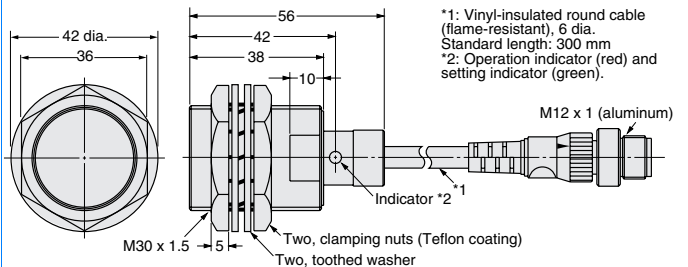
CAD file E2EQ_06



*1: Vinyl-insulated round cable (flame-resistant), 6 dia. Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

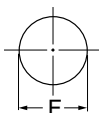
E2EQ-X10D1-M1GJ

CAD file E2EQ_02



*1: Vinyl-insulated round cable (flame-resistant), 6 dia. Standard length: 300 mm
*2: Operation indicator (red) and setting indicator (green).

Mounting Holes



Outer diameter	M12	M18	M30
F (mm)	12.5 dia. ^{+0.5}	18.5 dia. ^{+0.5}	30.5 dia. ^{+0.5}

Inductive Proximity Sensor

E2FQ

Spatter-Resistant Sensor for Welding Application



* Teflon is a registered trademark of Dupont Company and Mitsui Du-pont Chemical Company for their fluoride resin.

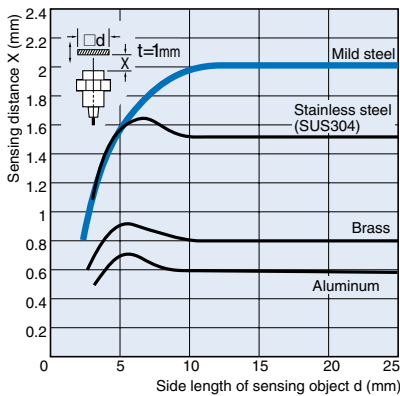
Ordering Information

Shape		Sensing distance		Output specifications	Operating status	Model
Shielded 	M12	2mm		DC 2-wire	NO	E2FQ-X2D1
				DC 3-wire NPN		E2FQ-X2E1
				DC 2-wire		E2FQ-X5D1
	M18	5mm		DC 3-wire NPN		E2FQ-X5E1
				AC 2-wire Models		E2FQ-X5Y1
				DC 2-wire		E2FQ-X10D1
	M30	10mm		DC 3-wire NPN		E2FQ-X10E1
				AC 2-wire Models		E2FQ-X10Y1

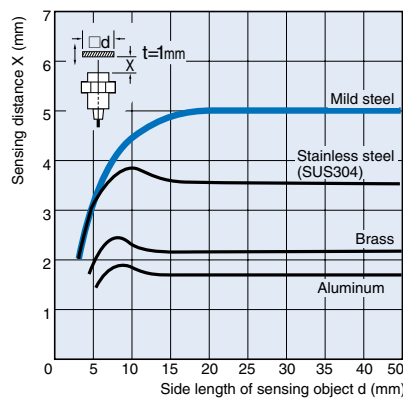
Characteristic data (typical)

Sensing Distance vs. Sensing Object

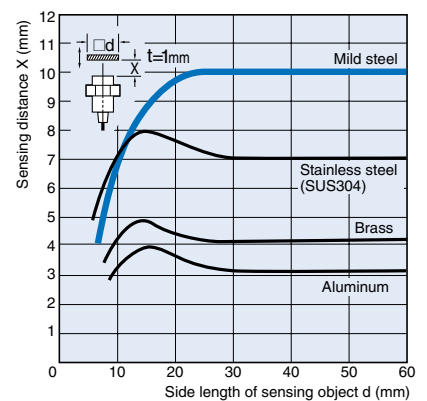
E2FQ-X2



E2FQ-X5



E2FQ-X10



Rating/Performance

Model		E2FQ-X2E1 E2FQ-X2D1	E2FQ-X5E1 E2FQ-X5D1, E2FQ-X5Y1	E2FQ-X10E1 E2FQ-X10D1, E2FQ-X10Y1
Item				
Sensing distance		2 mm ±10%	5 mm ±10%	10 mm ±10%
Setting distance		0 to 1.6 mm	0 to 4 mm	0 to 8 mm
Differential distance		E1, Y1 models: 10% max. of sensing distance		
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)		
Standard sensing object (mild steel)		12 x 12 x 1 mm	18 x 18 x 1 mm	30 x 30 x 1 mm
Response frequency*1		E1 models: 1.5 kHz D1 models: 800 Hz	E1 models: 600 Hz, D1 models: 500 Hz Y1 models: 25 Hz	E1 models: 400 Hz, D1 models: 300 Hz
Power supply (Operating voltage range)		E1 models: 12 to 24 VDC, ripple (p-p) : 10% max., (10 to 30 VDC) D1 models: 12 to 24 VDC, ripple (p-p) : 20% max., (10 to 36 VDC)		
Current consumption		E1 models: 17 mA max.		
Leakage current		D1 models: 0.8 mA max., Y models: 5 to 300 mA		
Control output	Switching capacity	E1 models: 200 mA max., D1 models: 5 to 100 mA DC, Y models: 5 to 300 mA		
	Residual voltage	E1 models: 2 V max. (load current: 200 mA with cable length: 2 m) Y models: Refer to the Specifications. D1 models: 4.0 V max. (under load current of 100 mA with cable length of 2 m)		
Indicator lamp		E,D models: detection indicator (red), Y models: operation indicator (red)		
Operating status (with sensing object approaching)		E1 models, D1 models and Y1 models: NO		
Protective circuits		E1 models: Protection for reverse polarity, load short circuit, surge voltage		
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)		
Temperature influence		10% max. of sensing distance at 23°C within temperature range of -25°C to 70°C		
Voltage influence		E1 models: ±2.5% max. of sensing distance within rated voltage range ±15%		
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case		
Dielectric strength		E1, D1 models: 1,000 VAC 50/60 Hz for 1 min between energized parts and case		
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: 500 m/s ² for 10 times each in X, Y, and Z directions	Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions	
Protective structure		IEC60529 IP67		
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 70 g	Approx. 130 g	Approx. 170 g
Material	Case	Teflon *2		
	Sensing surface			
Accessories		Instruction manual		

*1. The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

*2. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

Output Circuit Diagram

Operating status	Output specifications	Model	Timing chart	Output circuit
NO	NPN	E2FQ-X2E1 E2FQ-X5E1 E2FQ-X10E1	<p>Sensing object: Yes (High pulse), No (Low pulse)</p> <p>Load (between black and blue leads): Operates (High pulse), Releases (Low pulse)</p> <p>Output voltage (between black and blue leads): H (High pulse), L (Low pulse)</p> <p>Operation indicator: ON (High pulse), OFF (Low pulse)</p>	<p>Note: 1. 200 mA max. (load current) 2. When a transistor is connected</p>
	DC 2-wire	E2FQ-X2D1 E2FQ-X5D1 E2FQ-X10D1	<p>Sensing object: Yes (High pulse), No (Low pulse)</p> <p>Load: Operates (High pulse), Releases (Low pulse)</p> <p>Operation indicator: ON (High pulse), OFF (Low pulse)</p>	<p>Note: The load can be connected to either the +V or the 0-V line.</p>
	AC 2-wire Models	E2FQ-X5Y1 E2FQ-X10Y1	<p>Sensing object: Yes (High pulse), No (Low pulse)</p> <p>Load: Operates (High pulse), Releases (Low pulse)</p> <p>Operation indicator: ON (High pulse), OFF (Low pulse)</p>	

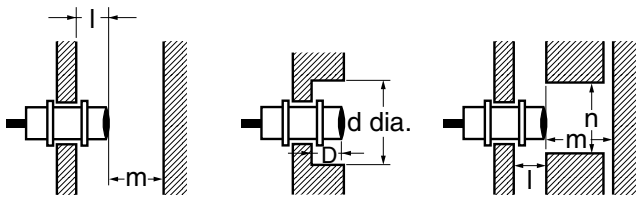
Precautions

Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.



Effects of Surrounding Metal

(Unit: mm)

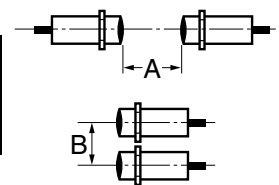
Model	Item	l	d	D	m	n
E2FQ-X2□	0	0	12	0	8	18
E2FQ-X5□			18		20	27
E2FQ-X10□			30		40	45

Mutual Interference

If more than one Proximity Sensor is installed face to face or in parallel, ensure that the distances between two Units adjacent to each other are the same as or larger than the corresponding values shown in the following table.

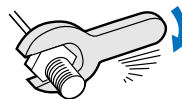
Mutual Interference (Unit: mm)

Model	Item	A	B
E2FQ-X2□		30	20
E2FQ-X5□		50	35
E2FQ-X10□		100	70



Installation

Do not tighten the nut with excessive force. A washer must be used with the nut.



Note: The table below shows the value of tightening torques when using toothed washers.

Model	Torque	Tensile strength (torque)
E2FQ-X2□		0.98 Nm
E2FQ-X5□		2 Nm
E2FQ-X10□		

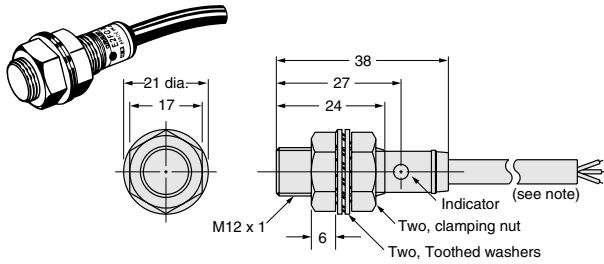
Others

Chemical resistance

Dimensions (Unit: mm)

E2FQ-X2E1

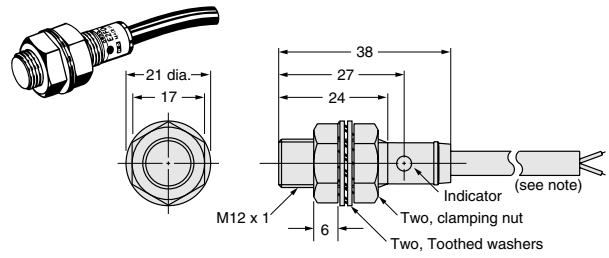
CAD file E2FQ_02



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 3 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

E2FQ-X2D1

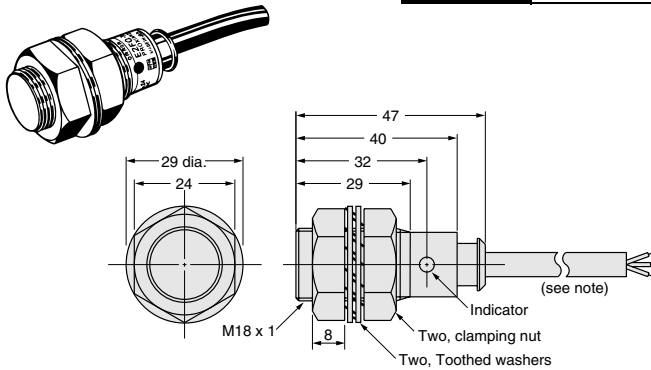
CAD file E2FQ_02



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 2 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

E2FQ-X5E1

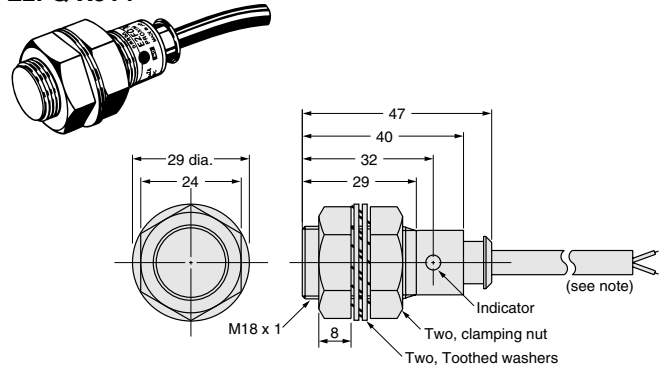
CAD file E2FQ_03



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 3 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

E2FQ-X5D1
E2FQ-X5Y1

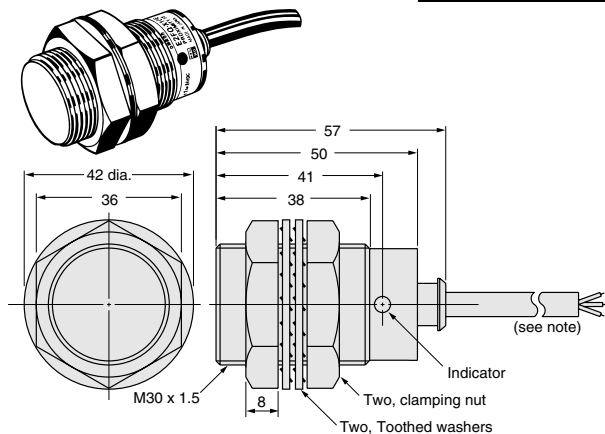
CAD file E2FQ_03



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 2 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

E2FQ-X10E1

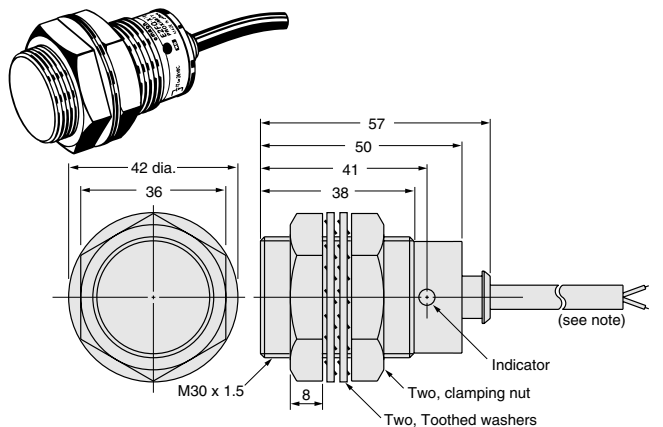
CAD file E2FQ_01



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 3 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

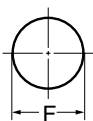
E2FQ-X10D1
E2FQ-X10Y1

CAD file E2FQ_01



Note:
Oil-resistant, vibration-resistant, and fire-retardant vinyl-insulated round cord, 6 dia. x 2 cores, standard length: 2 m
The cord can be extended in an independent conduit for 200 m maximum.

Mounting Holes

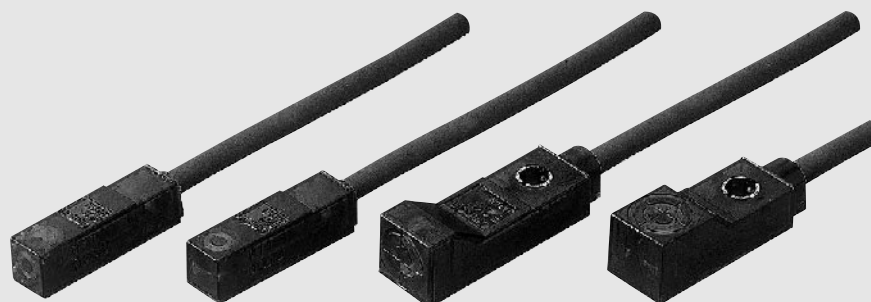


Model	F (mm)
E2FQ-X2□	12.5 mm dia. ^{+0.5} / ₀
E2FQ-X5□	18.5 mm dia. ^{+0.5} / ₀
E2FQ-X10□	30.5 mm dia. ^{+0.5} / ₀

Compact Square Inductive Proximity Sensor

E2S

World's Smallest Square Sensor with Built-in Amplifier

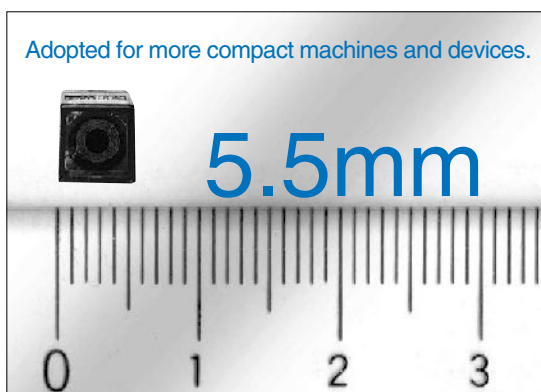


Features

5.5 mm

World's Smallest Sensor with Built-in Amplifier

The 5.5 mm x 5.5 mm type permits smaller, space-saving machines and devices.



1 kHz

High-Speed Response

A 1 kHz response frequency is achieved matching increased machine and device speed.

IP67

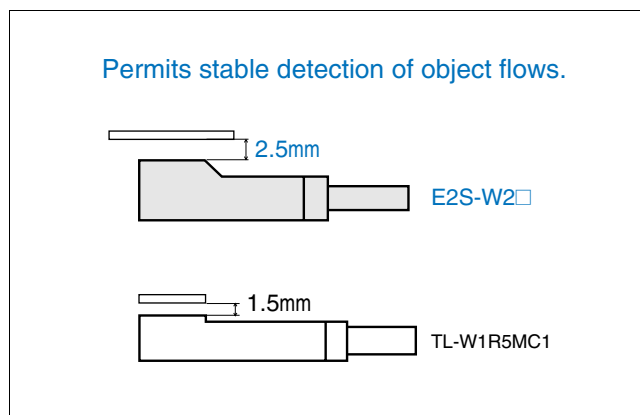
Environment-Resistant Types

Full sealing structure housing, degree of protection IEC60529 IP67.

1.5 times

Long Sensing Distance (Compared to conventional models)

Long Sensing Distance: (E2S-□1, 1.6 mm) (E2S-□2, 2.5 mm)



1/20


Low Current Consumption (Compared to conventional models)

Significantly lower current consumption. The 0.8 mA (for 24 VDC) leakage current for the DC 2-wire type has a ratio of approximately 1/20 compared to the conventional DC 3-wire type. Optimum solution for multiple-sensor applications such as cam switches.

Ordering Information


Sensors

DC 2-wire Models

Shape	Sensing surface	Sensing distance	Model	
			Operating status	
			NO	NC
 Unshielded	Front face	1.6mm	E2S-W11 *	E2S-W12
	End face		E2S-Q11 *	E2S-Q12
	Front face	2.5mm	E2S-W21 *	E2S-W22
	End face		E2S-Q21 *	E2S-Q22

* Models with different response frequency are available (NO only). These model numbers take the form E2S-□□□B (e.g., E2S-W11B)





DC 3-wire Models

Shape	Sensing surface	Sensing distance	Output specifications	Model		
				Operating status		
				NO	NC	
 Unshielded	Front face	1.6mm	NPN	E2S-W13*	E2S-W14	
	End face			E2S-Q13*	E2S-Q14	
	Front face	2.5mm		E2S-W23*	E2S-W24	
	End face			E2S-Q23*	E2S-Q24	
	Front face	1.6mm	PNP	E2S-W15*	E2S-W16	
	End face			E2S-Q15*	E2S-Q16	
	Front face			2.5mm	E2S-W25*	E2S-W26
	End face				E2S-Q25*	E2S-Q26

* Models with different response frequency are available (NO only). These model numbers take the form E2S-□□□B (e.g., E2S-W11B)

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	Y92E-C1R6	1	Provided with E2S-□1□□
	Y92E-C2R5		Provided with E2S-□2□□
	Y92E-D1R6		---
	Y92E-D2R5		---

Nomenclature

E2S - □ □ □ □

① ② ③ ④ ⑤

① Compact square series

② Sensing direction
W: Front face sensing
Q: End face sensing

③ Size and sensing distance (standard sensing object)
1: 5.5 x 5.5 mm, 1.6 mm (iron)
2: 8 x 8 mm, 2.5 mm (iron)

④ Output
1: DC 2-wire NO
2: DC 2-wire NC
3: DC 3-wire NPN NO
4: DC 3-wire NPN NC
5: DC 3-wire PNP NO
6: DC 3-wire PNP NC

⑤ Different response frequency
No: Standard
B: Different response frequency

Rating/Performance

DC 2-wire Models

Item	Model E2S-W11 E2S-W12	E2S-Q11 E2S-Q12	E2S-W21 E2S-W22	E2S-Q21 E2S-Q22
Sensing surface	Front face	End face	Front face	End face
Sensing distance	1.6 mm ±10%		2.5 mm ±15%	
Setting distance	0 to 1.2 mm		0 to 1.9 mm	
Differential distance	10% max.			
Sensing object	Ferrous metal (Sensitivity lowers with non-ferrous metals)			
Standard sensing object	Iron, 12 x 12 x 1 mm		Iron, 15 x 15 x 1 mm	
Response frequency	1 kHz min.			
Rated supply voltage (operating voltage)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.			
Leakage current	0.8 mA max.			
Control output	Switching capacity	3 to 50 mA DC max.		
	Residual voltage	3 V max. (under load current of 50 mA with cable length of 1 m)		
Indicator lamp	□□1 models: Operation indicator(red LED), Operation set indicator(green LED) □□2 models: Operation indicator(red LED)			
Operating status (with sensing object approaching)	□□1 models: NO □□2 models: NC			

* The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

DC 3-wire Models

Item	Model E2S-W13 E2S-W14	E2S-Q13 E2S-Q14	E2S-W23 E2S-W24	E2S-Q23 E2S-Q24	E2S-W15 E2S-W16	E2S-Q15 E2S-Q16	E2S-W25 E2S-W26	E2S-Q25 E2S-Q26
Sensing surface	Front face	End face	Front face	End face	Front face	End face	Front face	End face
Sensing distance	1.6 mm ±10%		2.5 mm ±15%		1.6 mm ±10%		2.5 mm ±15%	
Setting distance	0 to 1.2 mm		0 to 1.9 mm		0 to 1.2 mm		0 to 1.9 mm	
Differential distance	10% max.							
Sensing object	Ferrous metal							
Standard sensing object	Iron, 12 x 12 x 1 mm		Iron, 15 x 15 x 1 mm		Iron, 12 x 12 x 1 mm		Iron, 15 x 15 x 1 mm	
Response frequency	1 kHz min.							
Rated supply voltage (operating voltage)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.							
Current consumption	13 mA max. (24 VDC, unload)							
Control output	Switching capacity	NPN open collector 100 mA max. (30 VDC max.)			PNP open collector 50 mA max. (30 VDC max.)			
	Residual voltage	1 V max. (under load current of 50 mA with cable length of 1 m)						
Indicator lamp	Operation indicator (orange)							
Operating status (with sensing object approaching)	□□3 models: NO □□4 models: NC				□□5 models: NO □□6 models: NC			

* The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

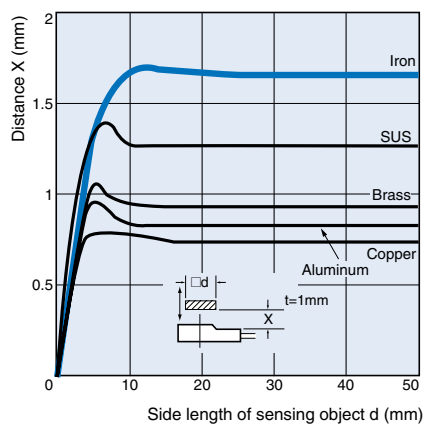
Specifications

Item	Model	E2S-□□□
Protective circuits	Reverse polarity connection and surge absorber	
Ambient temperature	Operating: -25°C to 70°C, Storage: -40°C to 85°C (with no icing or condensation)	
Ambient humidity	Operating: 35% to 90%RH, Storage: 35% to 95%RH (with no condensation)	
Temperature influence	±15% max. of sensing distance at 23°C in temperature range of -25°C to 70°C	
Voltage influence	±2.5% max. of sensing distance within a range of ±10% of rated supply voltage	
Insulation resistance	50 MΩ min. (at 500 VDC) between energized parts and case	
Dielectric strength	1,000 VAC for 1 min between energized parts and case	
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	IEC60529 IP67	
Connection method	Pre-wired models (Standard length: 3 m)	
Weight (Packed state)	Approx. 10 g	
Material	Case	Polyarylate
Accessories	Mounting Brackets	

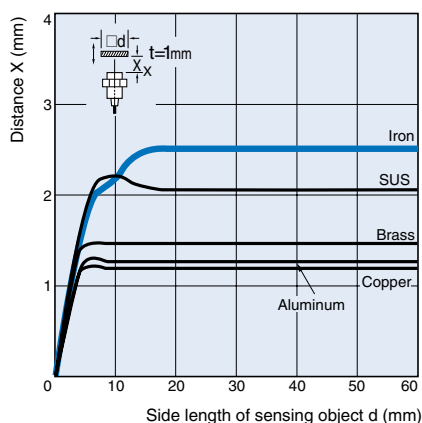
Characteristic data (typical)

Sensing Distance vs. Sensing Object

E2S-W1□/-Q1□



E2S-W2□/-Q2□



Output Circuit Diagram

DC 2-wire Models

Operating status	Model	Timing chart	Output circuit
NO	E2S-W11 E2S-W21 E2S-Q11 E2S-Q21	<p>The timing chart for NO models shows a proximity sensor with a sensing object. The sensing range is divided into a non-sensing zone, an unstable sensing zone, and a stable sensing zone. The setting position is indicated at 80% of the rated sensing distance. The output signals are: Setting indicator (green) ON, Operation indicator (red) ON, and Control output ON.</p>	<p>The output circuit diagram for NO models shows a main circuit connected to a Brown wire (Load) and a Blue wire (0V).</p>
NC	E2S-W12 E2S-W22 E2S-Q12 E2S-Q22	<p>The timing chart for NC models shows a proximity sensor with a sensing object. The sensing range is divided into a non-sensing zone and a sensing zone. The output signals are: Operation indicator (red) ON and Control output ON.</p>	<p>The output circuit diagram for NC models shows a main circuit connected to a Brown wire (Load) and a Blue wire (0V).</p>

DC 3-wire Models

Operating status	Output specifications	Model	Timing chart	Output circuit
NO	NPN	E2S-W13 E2S-W23 E2S-Q13 E2S-Q23	<p>The timing chart for NPN NO models shows sensing object (Yes/No), output transistor (load) ON/OFF, and operation indicator (orange) ON/OFF.</p>	<p>The output circuit diagram for NPN NO models shows a main circuit connected to a Brown wire (+V), a Black wire (Output), and a Blue wire (0V). A load is connected between the Brown and Black wires.</p>
NC		E2S-W14 E2S-W24 E2S-Q14 E2S-Q24	<p>The timing chart for NPN NC models shows sensing object (Yes/No), output transistor (load) ON/OFF, and operation indicator (orange) ON/OFF.</p>	<p>* Maximum load current: 50 mA</p>
NO	PNP	E2S-W15 E2S-W25 E2S-Q15 E2S-Q25	<p>The timing chart for PNP NO models shows sensing object (Yes/No), output transistor (load) ON/OFF, and operation indicator (orange) ON/OFF.</p>	<p>The output circuit diagram for PNP NO models shows a main circuit connected to a Brown wire (+V), a Black wire (Output), and a Blue wire (0V). A load is connected between the Brown and Black wires.</p>
NC		E2S-W16 E2S-W26 E2S-Q16 E2S-Q26	<p>The timing chart for PNP NC models shows sensing object (Yes/No), output transistor (load) ON/OFF, and operation indicator (orange) ON/OFF.</p>	<p>* Maximum load current: 50 mA</p>

Precautions

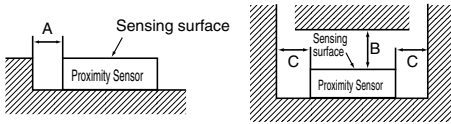
Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.

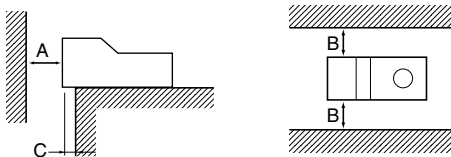
Front Surface Sensing Type (Not exceeding the sensor head height)



(Unit: mm)

Model	Length	A	B	C
E2S-W1□		0	8	2
E2S-W2□			15	10

End Surface Sensing Type



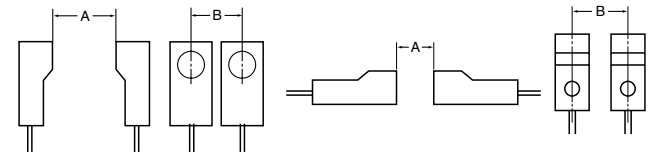
(Unit: mm)

Model	Length	A	B	C
E2S-Q1□		8	3	2
E2S-Q2□		15	10	3

Mutual Interference

If more than one Sensor is located face to face or in parallel, be sure to maintain enough space between adjacent Sensors to suppress mutual interference as provided in the following diagram.

Front Surface Sensing Type End Surface Sensing Type



(Unit: mm)

Model	Length	A	B
E2S-W(Q)1□		50 (40)	20 (5.5)
E2S-W1□		75 (50)	25 (8)

Note: The above values in parentheses are applicable when using two sensors with different frequencies.

Mounting

Tightening torques

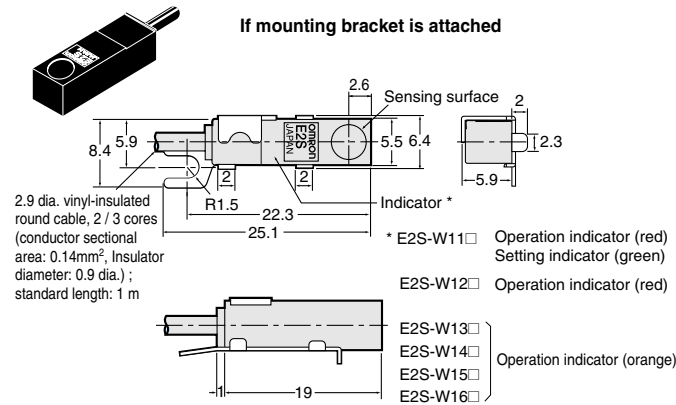
Do not tighten the E2S-W(Q)2□ mounting screws to a torque exceeding 0.7 Nm.

Dimensions (Unit: mm)

Sensors

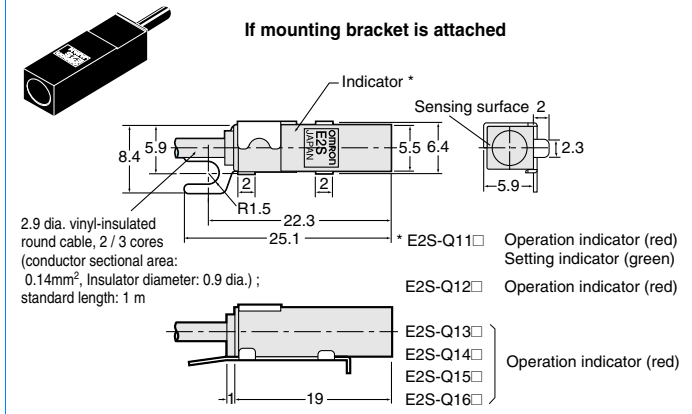
E2S-W1□

CAD file E2S_03



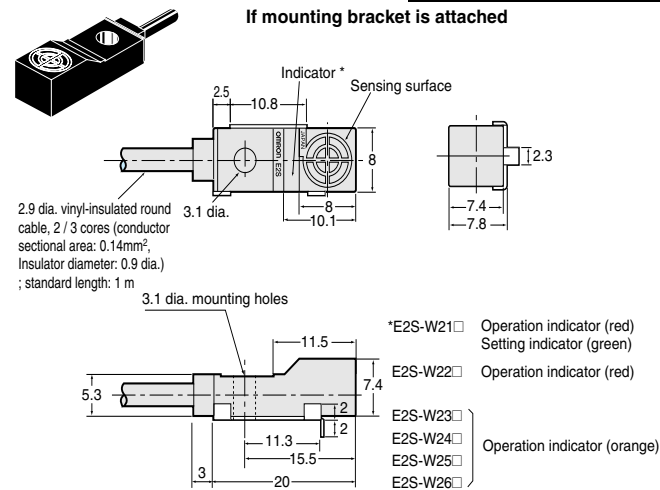
E2S-Q1□

CAD file E2S_04



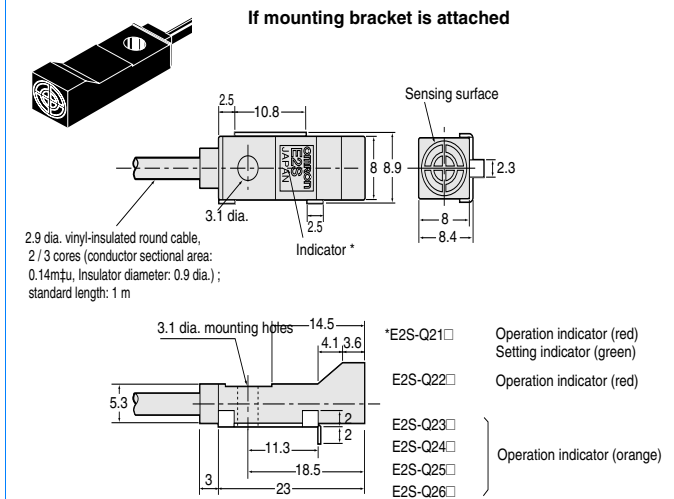
E2S-W2□

CAD file E2S_02



E2S-Q2□

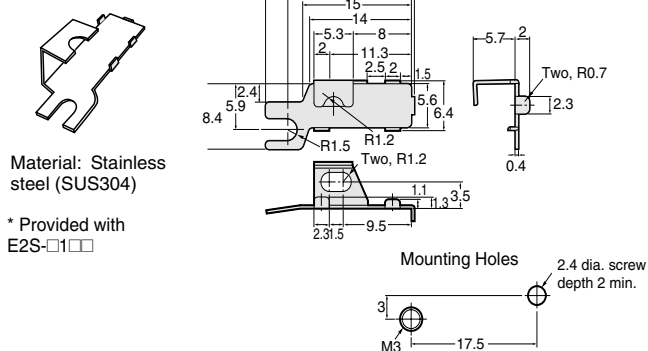
CAD file E2S_01



Accessories (Order Separately*)

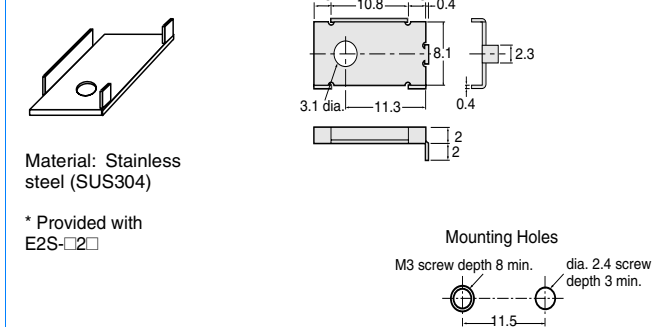
Mounting Brackets

Y92E-C1R6



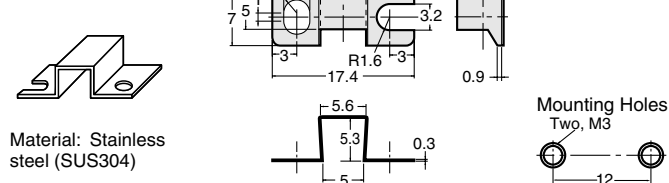
Mounting Brackets

Y92E-C2R5



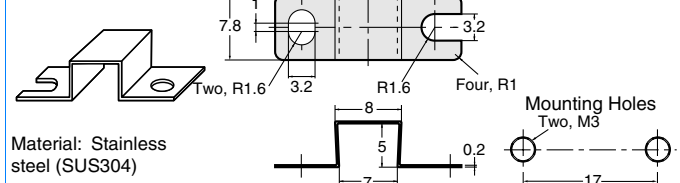
Mounting Brackets

Y92E-D1R6

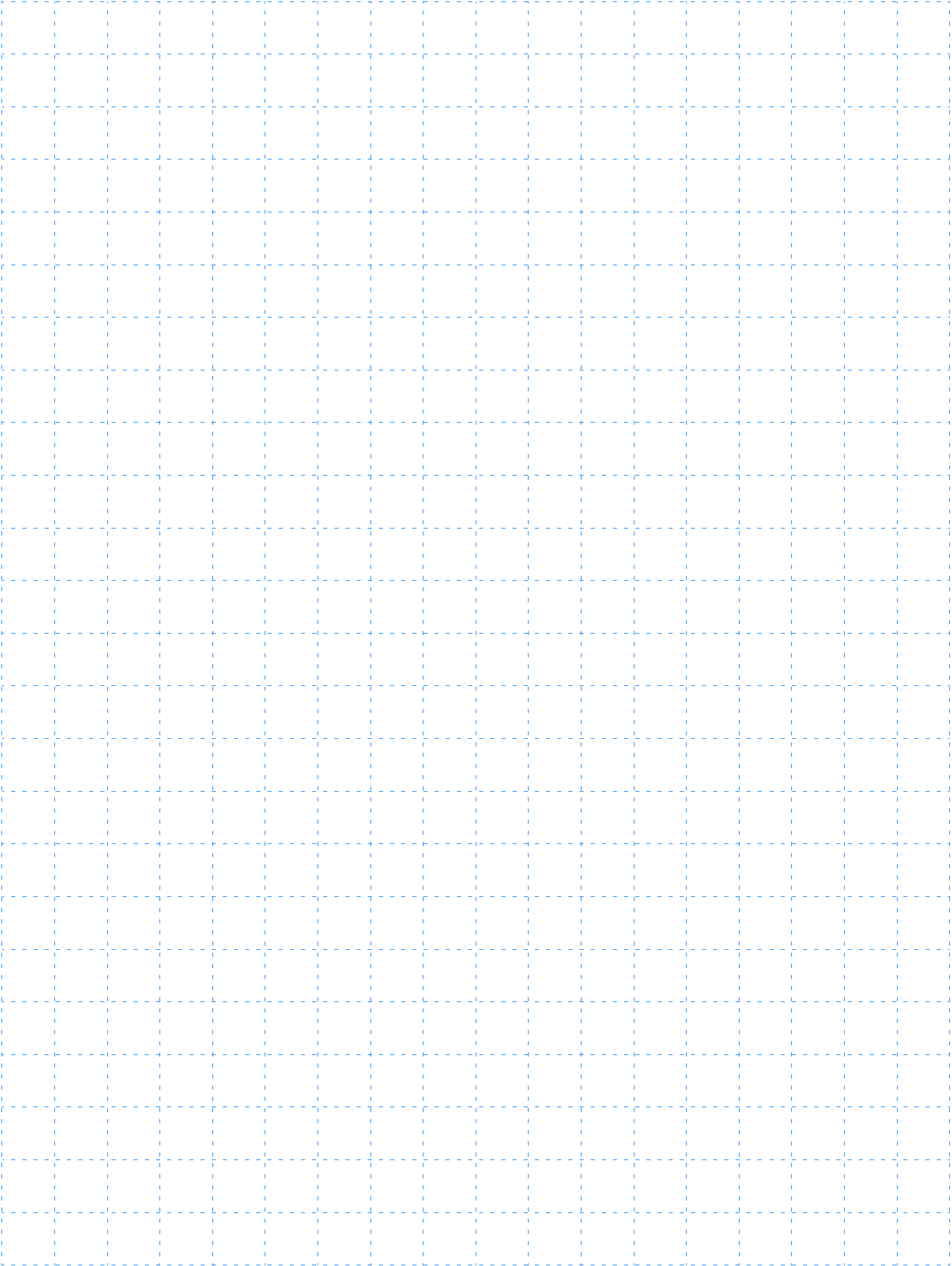


Mounting Brackets

Y92E-D2R5



MEMO



Flat size Proximity Sensors

TL-W

Space-Saving Flat Proximity Sensor



Ordering Information

DC 2-wire Models

Shape	Sensing distance	Model	
		Output and operating status	
		NO	NC
	5mm	TL-W5MD1*1	TL-W5MD2*1

DC 3-wire Models

Shape	Sensing distance	Output specifications	Model			
			Output and operating status			
			PNP-NO	PNP-NC	NPN-NO	NPN-NC
	1.5mm	DC 3-wire	TL-W1R5MB1	---	TL-W1R5MC1*1	---
	3mm		TL-W3MB1	TL-W3MB2	TL-W3MC1*1	TL-W3MC2
	5mm		TL-W5MB1	TL-W5MB2	TL-W5MC1*1	TL-W5MC2
	20mm		---	---	TL-W20ME1*1	TL-W20ME2*1
Shielded 	5mm	DC 3-wire	TL-W5F1	TL-W5F2	TL-W5E1	TL-W5E2

*1. Models with different response frequency are available. These model numbers take the form TL-W5MDL5 (e.g., TL-W5MD15)

Rating/Performance

DC 2-wire Models

Item	Model	TL-W5MD□
Sensing distance		5 mm ±10%
Setting distance		0 to 4 mm
Differential distance		10% max.
Sensing object		Ferrous metal(Sensitivity decreases with non-ferrous metals)
Standard sensing object		Iron, 18 x 18 x 1 mm
Response frequency		0.5 kHz
Rated supply voltage (operating voltage)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.
Leakage current		0.8 mA max.
Control output	Switching capacity	3 to 100 mA
	Residual voltage	3.3 V max. (under load current of 100 mA with cable length of 2 m)
Indicator lamp		D1 models: Operation indicator (Red LED), Operation set indicator (Green LED) D2 models: Operation indicator (Red LED)
Operating status (with sensing object approaching)		D1 models: NO D2 models: NC
Protective circuits		Surge absorber, short-circuit protection
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)
Temperature influence		±10% max. of sensing distance at 23°C within a temperature range of -25°C and 70°C
Voltage influence		±2.5% max. of Sensing distance within a rated voltage range ±15%.
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case
Dielectric strength		1,000 VAC for 1 min between energized parts and case
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		IEC60529 IP67
Connection method		Pre-wired models (standard length: 2 m)
Weight (Packed state)		Approx. 45 g
Material	Case	Heat-resistant ABS resin
	Sensing surface	
Accessories		Instruction manual

* The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

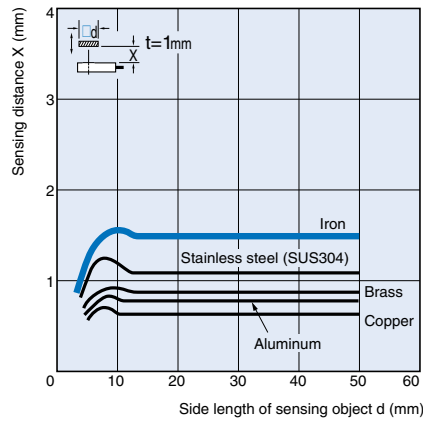
DC 3-wire Models

Model		TL-W1R5M□1	TL-W3M□□	TL-W5M□□	TL-W5E□/F□	TL-W20ME□
Sensing distance		1.5 mm ±10%	3 mm ±10%	5 mm ±10%		20 mm ±10%
Setting distance		0 to 1.2 mm	0 to 2.4 mm	0 to 4 mm		0 to 16 mm
Differential distance		10% max.				1% to 15% of sensing distance
Sensing object		Ferrous metal (refer to Engineering Data for non-ferrous metal on page E-55)				
Standard sensing object		Iron, 8 x 8 x 1 mm	Iron, 12 x 12 x 1 mm	Iron, 18 x 18 x 1 mm		Iron, 50 x 50 x 1 mm
Response frequency		1 kHz min.	600 Hz min.	500 Hz min.	300 Hz min.	40 Hz min.
Power supply (Operating voltage range)		12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max.			10 to 30 VDC with a ripple (p-p) of 20% max.	12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max.
Current consumption		15 mA max. at 24 VDC (no-load)		10 mA max.	15mA max. at 24 VDC (no-load)	8 mA at 12 VDC, 15 mA at 24 VDC
Control output	Switching capacity	NPN open collector 100 mA max. (30 VDC max.)		NPN open collector 12 VDC 50 mA max. (30 VDC max.) 24 VDC 100 mA max. (30 VDC max.)	200 mA	12 VDC 100mA max., 24 VDC 200 mA max.
	Residual voltage	1 V max. (under load current of 100 mA with cable length of 2 m)		1 V max. (under load current of 50 mA with cable length of 2 m)	2 V max. (under load current of 200 mA with cable length of 2 m)	1 V max. (under load current of 200 mA with cable length of 2 m)
Indicator lamp		Detection indicator (red LED)				
Operating status (with sensing object approaching)		NO	C1 models: NO C2 type: NC		E1 models, F1 models: NO E2 models, F2 models: NC	
Protective circuits		Reverse connection protection, surge absorber				
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)				
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)				
Temperature influence		±10% max. of sensing distance at 23°C within the temperature range of -25°C and 70°C				
Voltage influence		±2.5% max. of sensing distance within a range of ±10% of rated power supply voltage		±2.5% max. of sensing distance within a range of ±20% of rated power supply voltage	±2.5% max. of sensing distance within a range of ±10% of rated power supply voltage	
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case				
Dielectric strength		1000 VAC 50/60 Hz for 1 min between energized part and case				
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				Destruction: 500 m/s ² for 10 times each in X, Y, and Z directions
Protective structure		IEC60529 IP67				
Connection method		Pre-wired models (standard length: 2 m)				
Weight (Packed state)		30 g	Approx. 45 g	Approx. 70 g	Approx. 180 g	
Material	Case	Heat-resistant ABS resin			Diecast aluminum	Heat-resistant ABS resin
	Sensing surface	Heat-resistant ABS resin				
Accessories		Mounting bracket, instruction manual		Instruction manual		

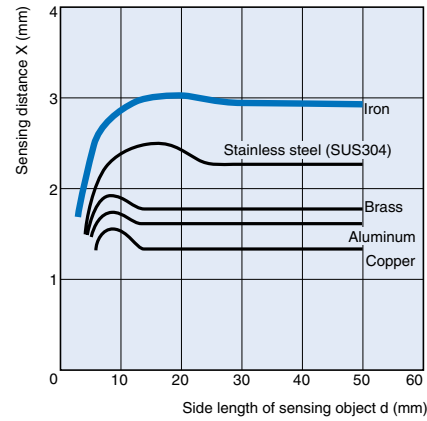
Characteristic data (typical)

Sensing Distance vs. Sensing Object

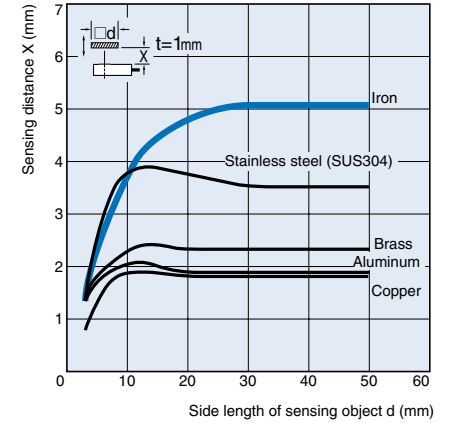
TL-W1R5M□



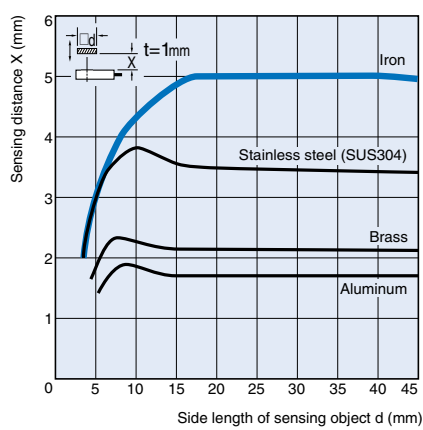
TL-W3M□



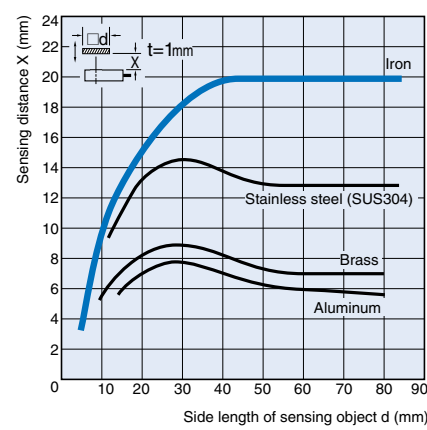
TL-W5MB□/C□



TL-W5E□/-W5F□/-W5MD□



TL-W20□



Output Circuit Diagram

DC 2-wire Models

Operating status	Model	Timing chart	Output circuit
NO	TL-W5MD1	<p>Setting position Non-sensing zone Unstable Sensing zone Stable sensing zone Proximity Sensor Sensing object (%) 100 80(TYP) 0 Rated sensing distance ON Setting indicator (green) OFF ON Operation indicator (red) OFF ON Control output OFF</p>	<p>Note: The Load can be connected to either the +V and 0-V side.</p>
NC	TL-W5MD2	<p>Non-sensing zone Sensing zone Proximity Sensor Sensing object (%) 100 0 Rated sensing distance ON Operation indicator (red) OFF ON Control output OFF</p>	

DC 3-wire Models

Operating status	Model	Timing chart	Output circuit
NO	TL-W1R5M□1 TL-W3M□1 TL-W5M□1	<p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p>	<p>* Maximum load current: 100 mA</p>
NC	TL-W3M□2 TL-W5MC2	<p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p>	
NO	TL-W1R5B1 TL-W3MB1 TL-W5MB1	<p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p>	
NC	TL-W3MB2 TL-W5MB2	<p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p>	
NO	TL-W5E1 TL-W20ME1	<p>Sensing object Yes No Load Operate (between brown and black) Release Output voltage (between blue and black) H L Operation indicator (red) ON OFF</p>	<p>* Maximum load current: 100 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p>
NC	TL-W5E2 TL-W20ME2	<p>Sensing object Yes No Load Operate (between brown and black) Release Output voltage (between blue and black) H L Operation indicator (red) ON OFF</p>	

Operating status	Model	Timing chart	Output circuit
NO	TL-W5F1		<p>* 1. Maximum load current: 200 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p>

Precautions

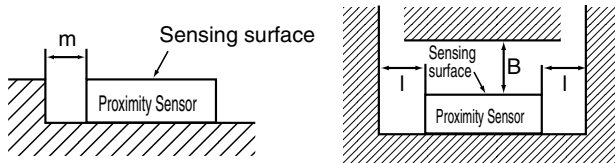
Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.

Front Surface Sensing Type (Not exceeding the sensor head height).

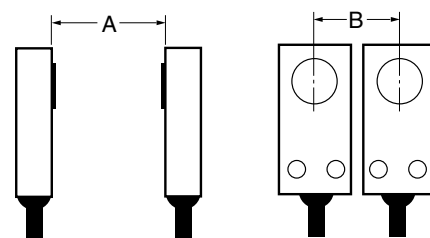


Effects of Surrounding Metal(Unit: mm)

Model	Length	l	m	n
TL-W1R5M□		2	0	8
TL-W3M□		3		12
TL-W5MD□		5	0	20
TL-W5M□				20
TL-W20ME□		25	16	100
TL-W5E□/-W5F□		0	0	20

Mutual Interference

If two or more Sensors are mounted face to face or side by side, keep them separate at the following minimum distance.



Mutual Interference (unit: mm)

Model	Length	A	B
TL-W1R5M□		75 (50)	120(60)
TL-W3MC□		90 (60)	200(100)
TL-W5MD□		120(80)	60(30)
TL-W5MC□			200(100)
TL-W20ME□		200(100)	200(100)
TL-W5E□/-W5F□		50	35

Note: The above values in parentheses are applicable when using two sensors with different frequencies.

Installation

Use M3 flat-head screws to install TL-W1R5M□ and TL-W3M□.

Ensure that the resin cover should be tightened with a torque according to the following table.

Model	Tensile strength (torque)
TL-W1R5MC1	0.98 Nm
TL-W3MC□	
TL-W5MD□	
TL-W20M□	1.5 Nm

● Adjustment

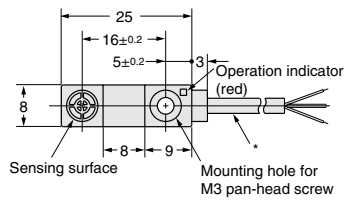
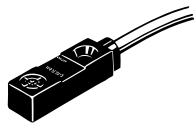
Power ON

Please note that the power injection AND connection generate an error pulse for approximately 1 ms.

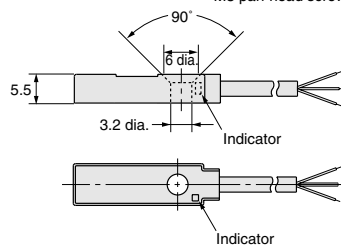
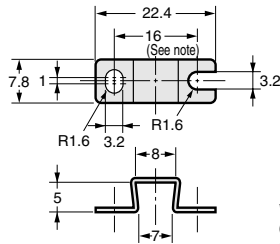
Dimensions (Unit: mm)

TL-W1R5M□1

CAD file TL_18



Mounting Bracket (Attachment)

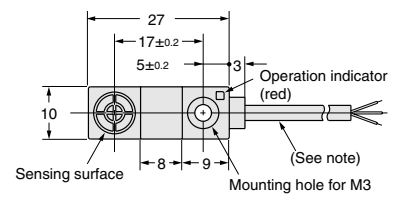
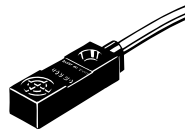


* Vinyl-insulated round cable with three conductors, 2.9 dia. (conductor cross-sectional area: 0.15 mm²; insulation diameter: 0.9 mm); standard length: 2 m

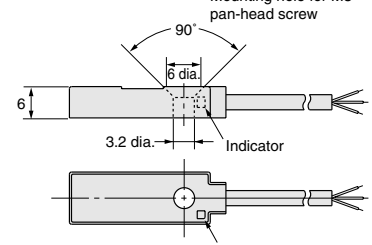
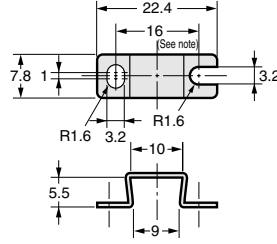
Note: Mounting dimensions: 17±0.2

TL-W3M□□

CAD file TL_20



Mounting Bracket (Attachment)

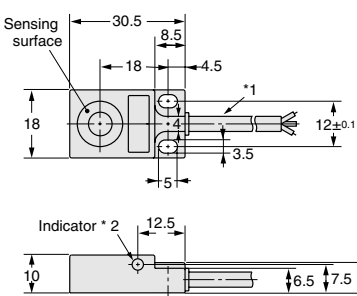
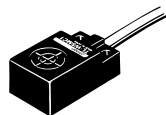


* Vinyl-insulated round cable with three conductors, 2.9 dia. (conductor cross-sectional area: 0.14 mm²; insulation diameter: 0.9 mm); standard length: 2 m

Note: Mounting dimensions: 17±0.2

TL-W5M□□

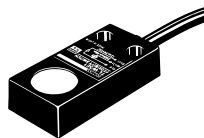
CAD file TL_22



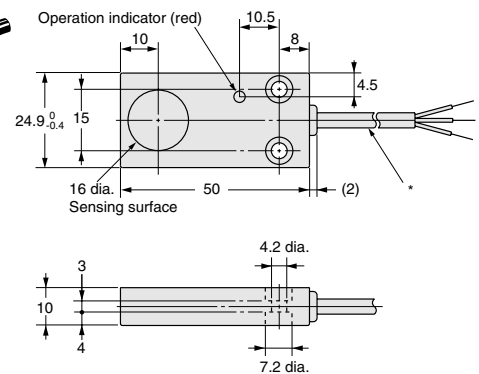
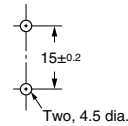
* 1. TL-W5MC1: Vinyl-insulated round cable with three conductors, 4 dia. (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.2 mm); standard length: 2 m
 TL-W5MD□: Vinyl-insulated round cable with two conductors, 4 dia. (conductor cross-sectional area: 0.3 mm²; insulation diameter: 1.3 mm); standard length: 2 m
 * 2. C type: Operation indicator (red)
 D type: Operation indicator (red), Setting indicator (green)

TL-W5E□

CAD file TL_21



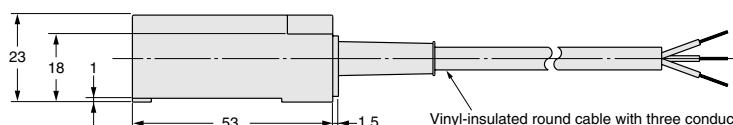
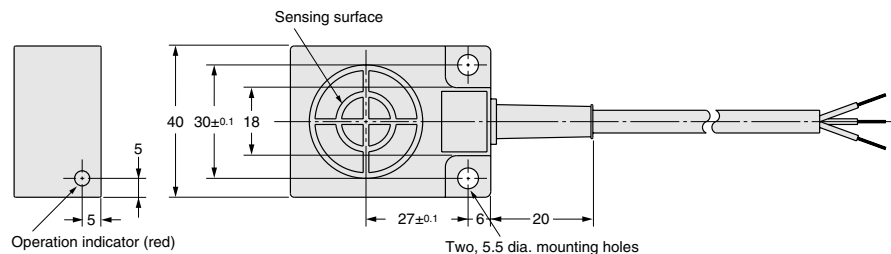
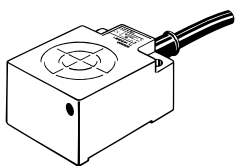
Mounting Holes



* Vinyl-insulated round cable with three conductors, 4 dia. (conductor cross-sectional area: 0.2mm²; insulation diameter: 1.2 mm); standard length: 2 m

TL-W20ME□

CAD file TL_19



Vinyl-insulated round cable with three conductors, 6 dia. (conductor cross-sectional area: 0.5 mm²; insulation diameter: 1.9 mm); standard length: 2 m

MEMO

A large grid of dashed blue lines for writing, consisting of 15 columns and 25 rows.

TL-W

Square Size Proximity Sensors

TL-N


A Variety of Models Available for a Wide Range of Applications



Ordering Information


Sensors

DC 2-wire

Shape	Sensing distance	Model		
		Operating status		
		NO	NC	
 Unshielded	□25	7mm	TL-N7MD1	TL-N7MD2
	□30	12mm	TL-N12MD1	TL-N12MD2
	□40	20mm	TL-N20MD1	TL-N20MD2

Note: Models with different response frequency are available. These model numbers take the form TL-N□MD□5 (e.g., TL-N5ME15)

DC 3-wire and AC 2-wire Models

Shape	Sensing distance	Output specifications	Model		
			Operating status		
			NO	NC	
 Unshielded	□25	5mm	DC 3-wire NPN	TL-N5ME1 ^{*1} _{*2}	TL-N5ME2 ^{*1} _{*2}
			AC 2-wire Models	TL-N5MY1	TL-N5MY2
	□30	10mm	DC 3-wire NPN	TL-N10ME1 ^{*1} _{*2}	TL-N10ME2 ^{*1} _{*2}
			AC 2-wire Models	TL-N10MY1	TL-N10MY2
	□40	20mm	DC 3-wire NPN	TL-N20ME1 ^{*1} _{*2}	TL-N20ME2 ^{*2}
			AC 2-wire Models	TL-N20MY1	TL-N20MY2

Note: Models with different response frequency are available. These model numbers take the form TL-□□M□□5 (e.g., TL-N5ME15)

*1. Each of these models has a cord with a standard length of 5 m.

*2. Each of these models with a robot cord is available and classified with the suffix "R" added to the model number (e.g., TL-N5ME1-R).

Accessories (Order Separately)

Mounting Brackets

Item	Model	Applicable models	
		The Mounting Bracket is provided with this models.	Order separately
Mounting Brackets	Y92E-C5	TL-N5ME□, TL-N7MD□	TL-N5MY□
	Y92E-C10	TL-N10ME□, TL-N12MD□	TL-N10MY□
	Y92E-C20	TL-N20ME□, TL-N20MD□	TL-N20MY□
Mounting Bracket for Conduit	Y92E-N5C15	---	TL-N5ME□, TL-N5MY□
	Y92E-N10C15	---	TL-N10ME□, TL-N10MY□

Rating/Performance

DC 2-wire

Item	Model	TL-N7MD□	TL-N12MD□	TL-N20MD□
Sensing distance		7 mm ±10%	12 mm ±10%	20 mm ±10%
Setting distance		0 to 5.6 mm	0 to 9.6 mm	0 to 16 mm
Differential distance		10% max.		
Sensing object		Ferrous metal(Sensitivity decreases with non-ferrous metals)		
Standard sensing object		Iron, 30 x 30 x 1 mm	iron, 40 x 40 x 1 mm	iron, 50 x 50 x 1 mm
Response frequency		0.5 kHz		0.3 kHz
Power supply (Operating voltage range)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.		
Leakage current		0.8 mA max.		
Control output	Switching capacity	3 to 100 mA		
	Residual voltage	3.3 V max. (Load current 100 mA, Cable length: 2 m)		
Indicator lamp		D1 models: Operation indicator (red LED), Operation set indicator (green LED) D2 models: Operation indicator (red LED)		
Operating status (with sensing object approaching)		D1 models: NO D2 models: NC		
Protective circuits		Surge absorber, short-circuit protection		
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating/Storage: 35% to 95%RH		
Temperature influence		±10% max. sensing distance at 23°C within the temperature range of -25°C and 70°C		
Voltage influence		±2.5% max. sensing distance within rated voltage range ±15%.		
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case		
Dielectric strength		1,000 VAC for 1 min between energized parts and case		
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions		
Shock resistance		Destruction: 1,000 m/s ² for 10 times each in X, Y, and Z directions		
Protective structure		IEC60529 IP67		
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 145 g	Approx. 170 g	Approx. 240 g
Material	Case	Heat-resistant ABS resin		
	Sensing surface			
Accessories		Mounting bracket, instruction manual		

* The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

DC 3-wire and AC 2-wire Models

Item	Model	TL-N5ME□, TL-N5MY□	TL-N10ME□, TL-N10MY□	TL-N20ME□, TL-N20MY□
Sensing distance		5 mm ±10%	10 mm ±10%	20 mm ±10%
Setting distance		0 to 4 mm	0 to 8 mm	0 to 16 mm
Differential distance		15% max. of sensing distance		
Sensing object		Ferrous metal (Sensitivity decreases with non-ferrous metals)		
Standard sensing object (mild steel)		30 x 30 x 1 mm	40 x 40 x 1 mm	50 x 50 x 1 mm
Response frequency*1		E models: 500Hz Y models: 10 Hz		E models: 40Hz Y models: 10 Hz
Supply voltage*2 (operating voltage range)		E models: 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. Y models: 100 to 220 VAC (90 to 250 VAC) 50/60 Hz		
Current consumption		E models: 8 mA max. at 12 VDC, 15 mA max. at 24 VDC		
Leakage current		Y models: Refer to the Specifications		
Control output	Switching capacity	E models: 100 mA max. at 12VDC, and 200 mA max. at 24 VDC Y models: 10 to 200 mA		
	Residual voltage	E models: 1 V max. with a current of 200 mA		
Indicator lamp		E models: Detection indicator (red LED) Y models: Operation Indicator (red LED)		
Operating status (with sensing object approaching)		E1, Y1 models: NO E2, Y2 models: NC		
Protective circuits		E models: Reverse connection protection and surge absorber Y models: Surge absorber		
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)		
Temperature influence		±10% max. sensing distance at 23°C within a temperature range of -25°C and 70°C		
Voltage influence		E models: ±2.5% max. sensing distance within a range of ±10% of rated supply voltage Y models: ±1% max. sensing distance within a range of ±10% of rated supply voltage		
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case		
Dielectric strength		E models: 1,000 VAC, 50/60 Hz for 1 min between energized parts and case Y models: 2,000 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 hours each in X, Y, and Z directions		
Shock resistance		Destruction: 500 m/s ² for 10 times each in X, Y, and Z directions		
Protective structure		IEC60529 IP67		
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 145 g	Approx. 170 g	Approx. 240 g
Material	Case	Heat-resistant ABS resin		
	Sensing surface			
Accessories		E models: Mounting bracket, instruction manual		

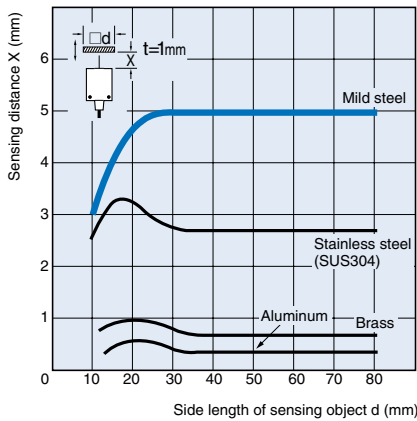
*1. The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

*2. The E models (DC switching type) can be used with a full-wave rectification power of 24 VDC ±10%.

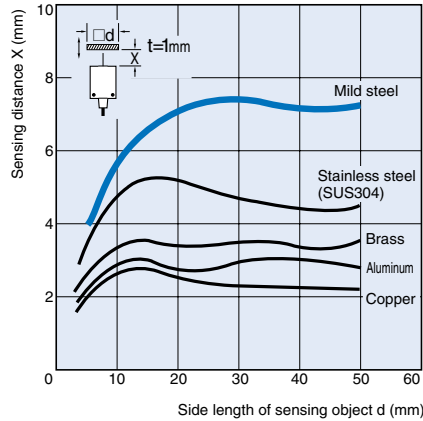
Characteristic data (typical)

Sensing Distance vs. Sensing Object

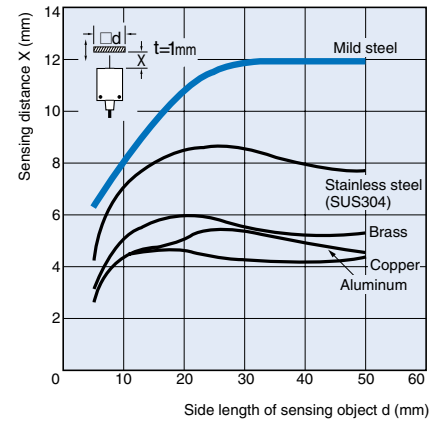
TL-N5



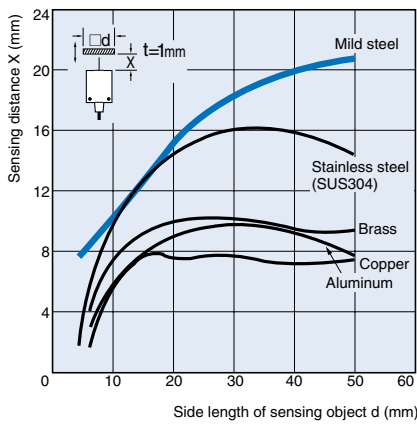
TL-N7MD



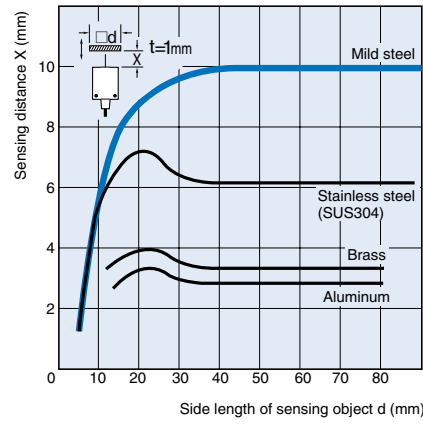
TL-N12MD



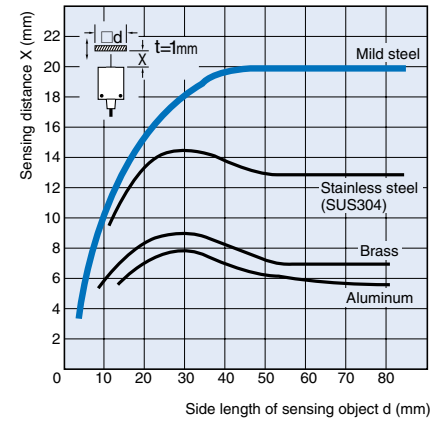
TL-N20MD



TL-N10



TL-N20



Output Circuit Diagram

DC 2-wire Models

Operating status	Model	Timing chart	Output circuit
NO	TL-N7MD1 TL-N12MD1 TL-N20MD1	<p>Setting point</p> <p>Non-sensing area Unstable sensing area Stable sensing area</p> <p>Sensing object</p> <p>(%) 100 80 (typ) 0</p> <p>Rated sensing distance</p> <p>ON Setting indicator (green) OFF (green)</p> <p>ON Operation indicator (red) OFF (red)</p> <p>ON Control output OFF</p>	<p>Note: The load can be connected to either the +V or 0-V side.</p>
NC	TL-N7MD2 TL-N12MD2 TL-N20MD2	<p>Non-sensing area Sensing distance</p> <p>Sensing object</p> <p>(%) 100 0</p> <p>Rated sensing distance</p> <p>ON Operation indicator (red) OFF</p> <p>ON Control output OFF</p>	

DC 3-wire Models

Operating status	Model	Timing chart	Output circuit
NO	TL-N5ME1 TL-N10ME1 TL-N20ME1	<p>Sensing object Yes No</p> <p>Load (between brown and black) Operates Releases</p> <p>Output voltage (between black and blue) H L</p> <p>Operation indicator (red) ON OFF</p>	<p>* 1. 200 mA max. (load current) * 2. When a transistor is connected.</p>
NC	TL-N5ME2 TL-N10ME2 TL-N20ME2	<p>Sensing object Yes No</p> <p>Load (between brown and black) Operates Releases</p> <p>Output voltage (between black and blue) H L</p> <p>Operation indicator (red) ON OFF</p>	

AC 2-wire Models

Operating status	Model	Timing chart	Output circuit
NO	TL-N5MY1 TL-N10MY1 TL-N20MY1	<p>Sensing object Yes No</p> <p>Load Operates Releases</p> <p>Operation indicator (red) ON OFF</p>	
NC	TL-N5MY2 TL-N10MY2 TL-N20MY2	<p>Sensing object Yes No</p> <p>Load Operates Releases</p> <p>Operation indicator (red) ON OFF</p>	

Precautions

Warning

Do not short-circuit the load, otherwise the TL-N may explode or burn.

Do not supply power to TL-N without load, otherwise TL-N may be damaged (AC 2-wire Models).

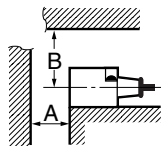


Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.



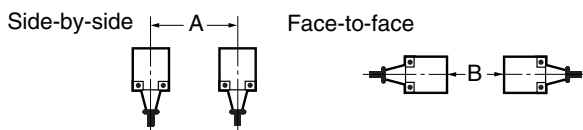
Effects of Surrounding Metal(Unit: mm)

Model	Length	A (see note)	B (see note)
TL-N7MD□		40	35
TL-N12MD□		50	40
TL-N20MD□		70	60
TL-N5ME□, TL-N5MY□		20	23
TL-N10ME□, TL-N10MY□		40	30
TL-N20ME□, TL-N20MY□		80	45

* The figures are applicable for one metal object, otherwise the figure must be multiplied by the number of metal objects.

Mutual Interference

If more than one Sensor is located face to face or in parallel, ensure to maintain enough space between adjacent Sensors to suppress mutual interference as provided in the following diagram.



Mutual Interference (unit: mm)

Model	Length	A	B
TL-N7MD□		100(50)	120(60)
TL-N12MD□		120(60)	200(100)
TL-N20MD□		200(100)	200(100)
TL-N5ME□		80(40)	80(40)
TL-N5MY□		80(40)	90(40)
TL-N10ME□, TL-N10MY□		120(60)	120(60)
TL-N20ME□, TL-N20MY□		200(100)	120(60)

Note: Figures in parentheses will apply if the Sensors in use are different from each other in response frequency.

Mounting

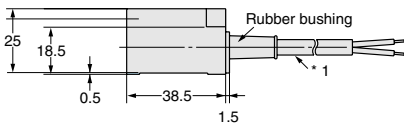
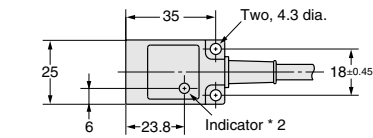
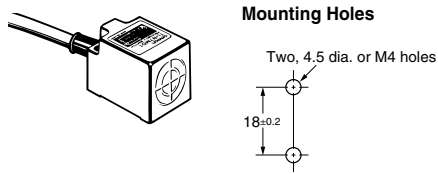
Ensure that each screw is tightened with a torque within a range of 0.9 to 1.5 Nm.

Dimensions (Unit: mm)

Sensors

TL-N7MD□

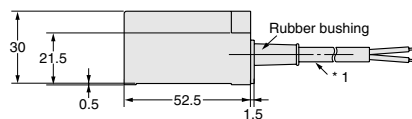
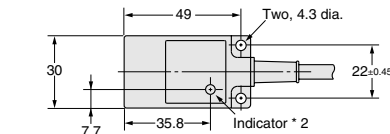
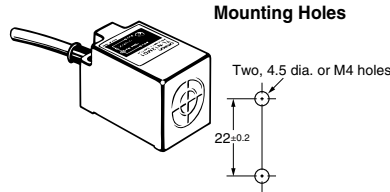
CAD file TL_13



* 1. 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
* 2. Operation indicator (red), Setting indicator (green)

TL-N12MD□

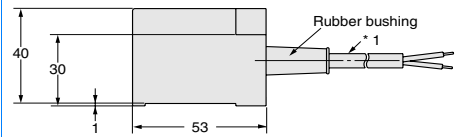
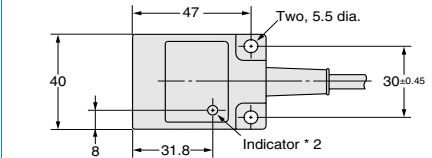
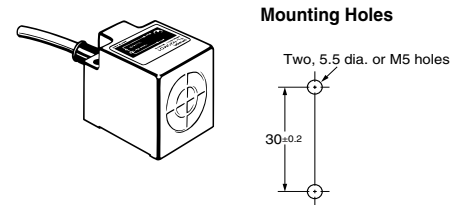
CAD file TL_09



* 1. 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
* 2. Operation indicator (red), Setting indicator (green)

TL-N20MD□

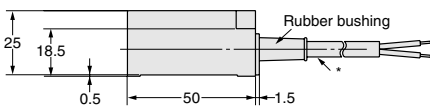
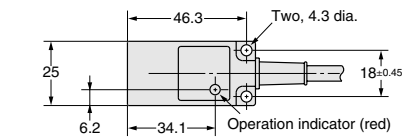
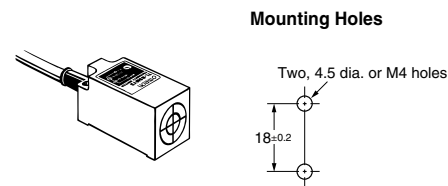
CAD file TL_10



* 1. 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
* 2. Operation indicator (red), Setting indicator (green)

TL-N5MY□

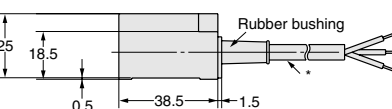
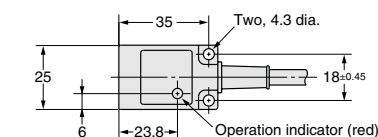
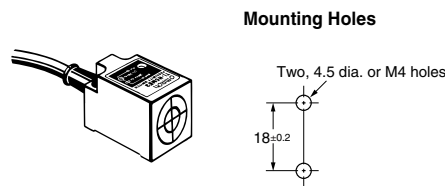
CAD file TL_12



* 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m

TL-N5ME□

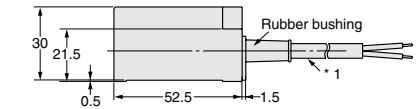
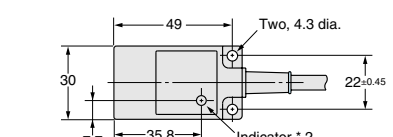
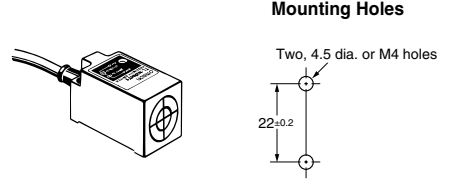
CAD file TL_11



* 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m

TL-N10ME□, TL-N10MY□

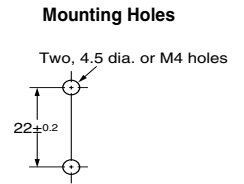
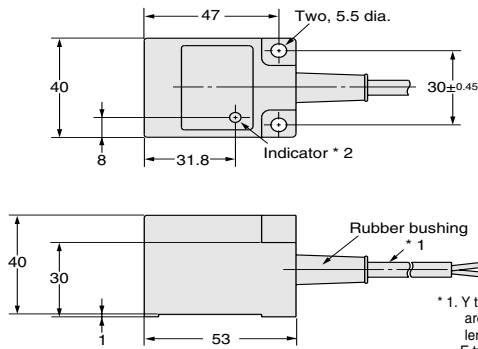
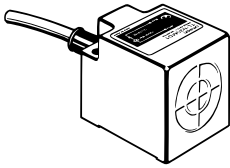
CAD file TL_09



* 1. Y type: 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
E type: 6-dia. three conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
* 2. E type: operation indicator (red) Y type: operation indicator (red)

TL-N20ME□, TL-N20MY□

CAD file TL_10

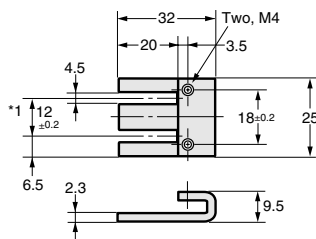


- * 1. Y type: 6-dia. two conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
E type: 6-dia. three conductors vinyl-insulated round cable (cross-sectional area of conductors: 0.5 mm²; insulation diameter: 1.9 mm) Standard length: 2 m
- * 2. E type: operation indicator (red) Y type: operation indicator (red)

Accessories (Order Separately)

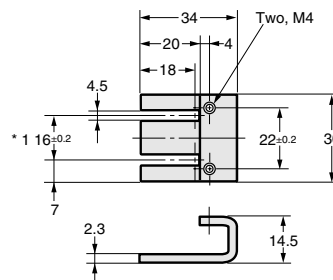
Mounting Brackets

Y92E-C5



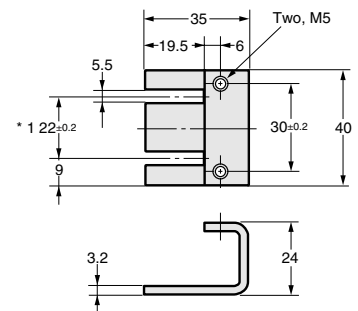
Applicable Models: TL-N5ME□ * 2
TL-N5MY□
TL-N7MD□ * 2

Y92E-C10



Applicable Models: TL-N10ME□ * 2
TL-N10MY□
TL-N12MD□ * 2

Y92E-C20

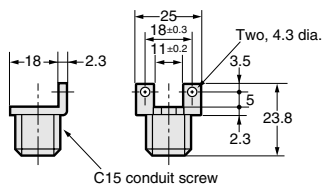


Applicable Models: TL-N20ME□ * 2
TL-N20MY□
TL-N20MD□ * 2

*1. The numeric values are Mounting Bracket Holes dimensions.
*2. Supplied with the product.

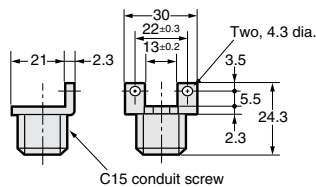
Mounting Bracket for Conduit

Y92E-N5C15



Applicable Models: TL-N5ME□
TL-N5MY□

Y92E-N10C15



Applicable Models: TL-N10ME□
TL-N10MY□

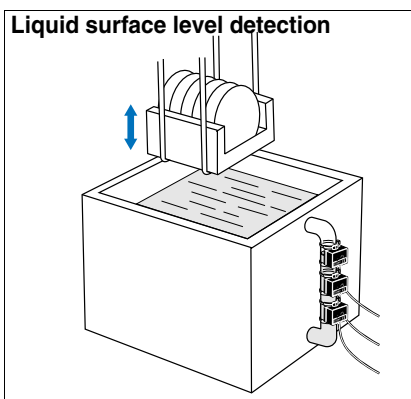
Liquid Level Sensor

E2K-L



- Installation on pipes.
- Sensing by means electrostatic capacity and is not influenced by the color of the pipe or liquid.
- Available in 8 to 11 mm dia. and 12 to 26 mm dia. models to enable sensing for a wide range of pipe diameters.
- Built-in amplifier for space-saving.



Applications



Ordering Information

Sensor type	Applicable pipe diameters	Shape	Output form		Model
Electrostatic capacity method	8 to 11 mm dia.		NPN open-collector output	NO	E2K-L13MC1
	12 to 26 mm dia.				E2K-L26MC1

Rating/Performance

Item		Model	E2K-L13MC1	E2K-L26MC1
Applicable pipes	Material		Non-metal	
	Size	External diameter	8 to 11 mm dia.	12 to 26 mm dia.
		Wall thickness	1 mm max.	1.5 mm max.
Sensing object		Liquid (see note)		
Repetition precision		±0.2 mm max.		
Response difference (reference value only; varies with pipe size and solution)		0.6 to 5 mm		0.3 to 3 mm
Supply voltage (operating voltage range)		12 to 24 VDC, 10% max. ripple (10.8 to 30 VDC)		
Current consumption		12 mA max.		
Control output	Switching capacity		100 mA max.	
	Residual voltage		1 V max. (under load current of 100 mA with cable length of 2 m)	
Detection position of liquid surface		Notch position (For details, refer to Sensitivity Adjustment on next page.)		
Indicator lamp		Operation indicator (orange)		
Ambient temperature		Operating: 0 to 55°C; Storage: -10 to 65°C (with no icing or condensation)		
Ambient humidity		Operating/storage: 25% to 85% (with no condensation)		
Temperature influence		In the range 0 to 55°C: Detection level at 23°C 4 mm (with distilled water or 20 % salt water concentration) (±6 mm with E2K-L13MC1 for distilled water in pipe of 8 mm diameter)		
Voltage influence		At the rated power supply voltage ±10%: Detection level at rated supply voltage ±0.5 mm		
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case		
Dielectric strength		500 VAC 50/60 Hz for 1 min between energized part and case		
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions		
Shock resistance		500 m/s ² for 3 times each in X, Y, and Z directions		
Protective structure		IEC 60529 IP66		
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 70 g		
Material	Case, cover		Heat-resistant ABS resin	
	Cable clamp		NBR	
Accessories		2 binding bands, 4 nonskid tubes, instruction manual		

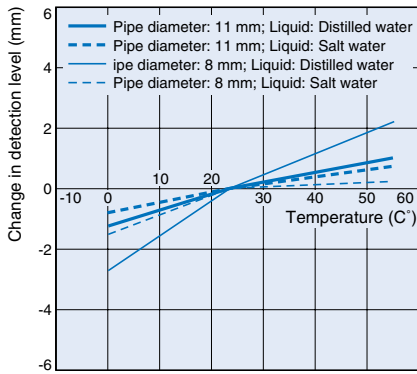
Note: In the following cases, stable detection may not be possible and ensure to confirm correct operation in the actual installation before use.

1. If the dielectric constant or conductivity of the liquid is low.
2. If the capacity of the liquid is small, or if the pipe diameter is so small or the pipe walls are so thick that the amount by which the capacity changes relating to the liquid level is small.
3. In case of an increased gassing or a highly viscous liquid firm residue on the inside walls of the pipe, or a dirt clogging on the inner or outer walls of the pipe.

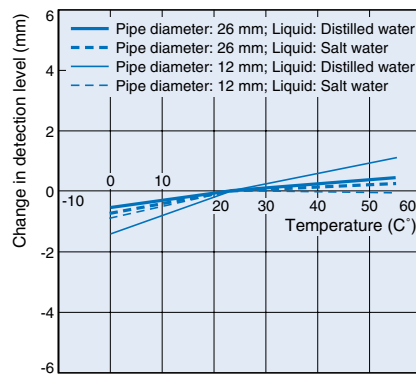
Characteristic data (typical)

Influence of Temperature on Detection Level

E2K-L13MC1



E2K-L26MC1



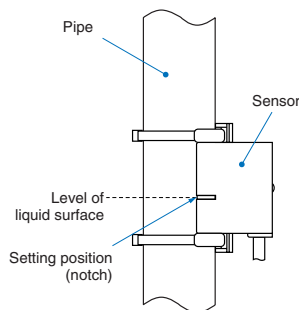
Output Circuit Diagram

Output form	Model	Timing chart	Output circuit
NO	E2K-L13MC1 E2K-L26MC1	<p>Liquid surface</p> <p>Load (brown-black)</p> <p>Operation indicator (orange)</p> <p>Yes</p> <p>No</p> <p>Operates</p> <p>Releases</p> <p>ON</p> <p>OFF</p>	

Operation

Sensitivity adjustment

1. Install the Sensor with the setting position (notch) in line with the liquid level to be detected.

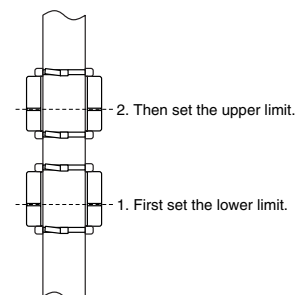


2. After Sensor installation adjust the detecting sensitivity using the (12-step) sensitivity adjuster in the way shown below.

Status of the indicator when the liquid level is aligned with the setting position	Sensitivity adjuster	Adjustment procedure
Not lit		Turn the sensitivity adjuster clockwise using a screwdriver until the indicator lights.
Lit		Turn the sensitivity adjuster counterclockwise using a screwdriver until the indicator turns OFF. Then, turn the sensitivity adjuster clockwise until the indicator lights up again.

Note: 1. During sensitivity adjustment do not put your hand on the Sensor and make sure that the cable is properly secured. Failure to observe these points may affect the detection level.

2. When using more than one Sensor (e.g., to detect for upper and lower limits), adjust the sensitivity of the Sensors in order starting from the bottom. Adjusting the sensitivity of a Sensor may affect the detection level of the Sensor above it.



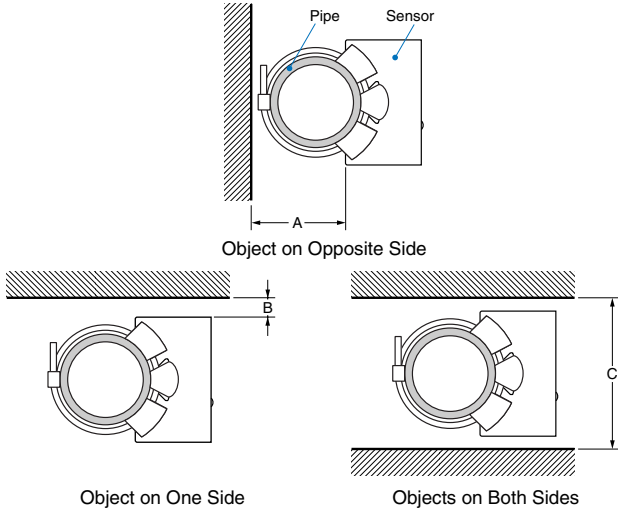
Precautions

Correct Use

Design

Influence of Surrounding Objects

Performance may be adversely affected by conductive objects (e.g., metals) in the vicinity of the Sensor. Ensure that any conductive objects are separated from the Sensor and set at a minimum distance as shown below.

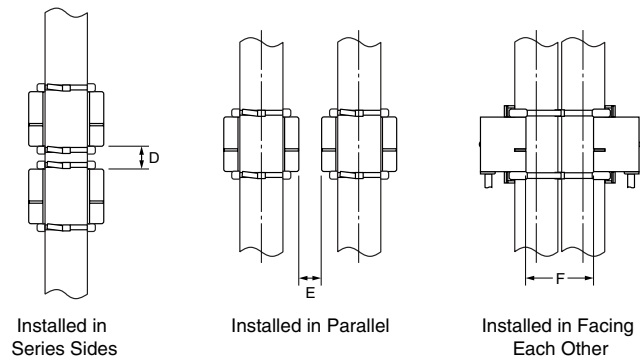


Influence of Surrounding Objects (Units: mm)

Shape	Length	A	B	C
E2K-L13MC1		25	5	45
E2K-L26MC1			0	40

Mutual Interference

When installing 2 or more Sensors in series, in parallel, or facing each other, be sure that they are separated by at least the distances shown below.



Mutual Interference (Unit: mm)

Shape	Length	D (see note)	E	F
E2K-L13MC1		10	10	25
E2K-L26MC1				30

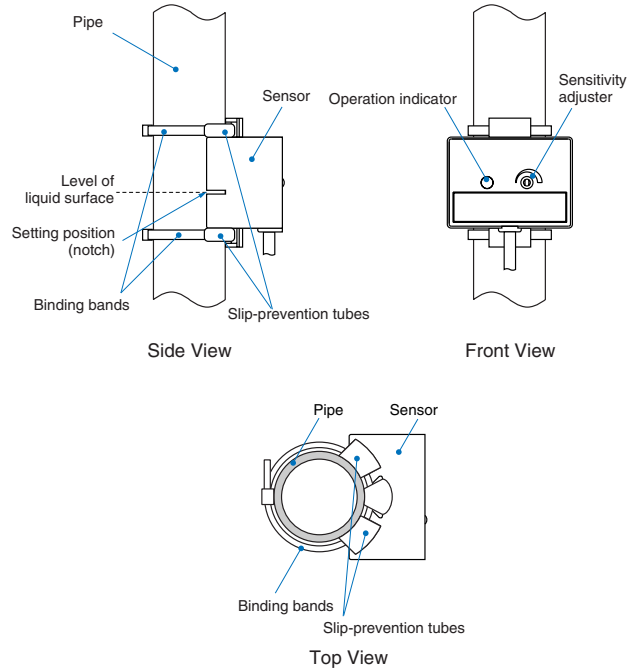
* The detection level for the top Sensor may change when the detection level for the bottom Sensor is set. Be sure to set the detection level for the bottom Sensor first.

Installation

Sensor installation

Attach the Sensor securely to the pipe using the 2 binding bands and the 4 nonskid tubes provided (2 tubes per band) in the way shown below.

Install the Sensor in such manner that the pipe is in contact with the entire sensing face of the Sensor with the pipe and Sensor in parallel.



Wiring Considerations

Power Supply

If separate power supplies are used for Sensor and load, be sure to turn on the Sensor power supply first. If a commercially available switching regulator is used, the Sensor may malfunction because of switching noise. Connect the frame ground and ground terminals to ground.

● Operating Environment

Ambient Conditions

Although this product has waterproof specifications, do not use it in locations where it may have a direct contact with liquids (e.g., water or cutting oil). Such locations can interfere with the electrostatic capacity method used by the Sensor.

Even if the Sensor is used within the specified temperature range, do not subject it to sudden changes in temperature because this will shorten the service life.

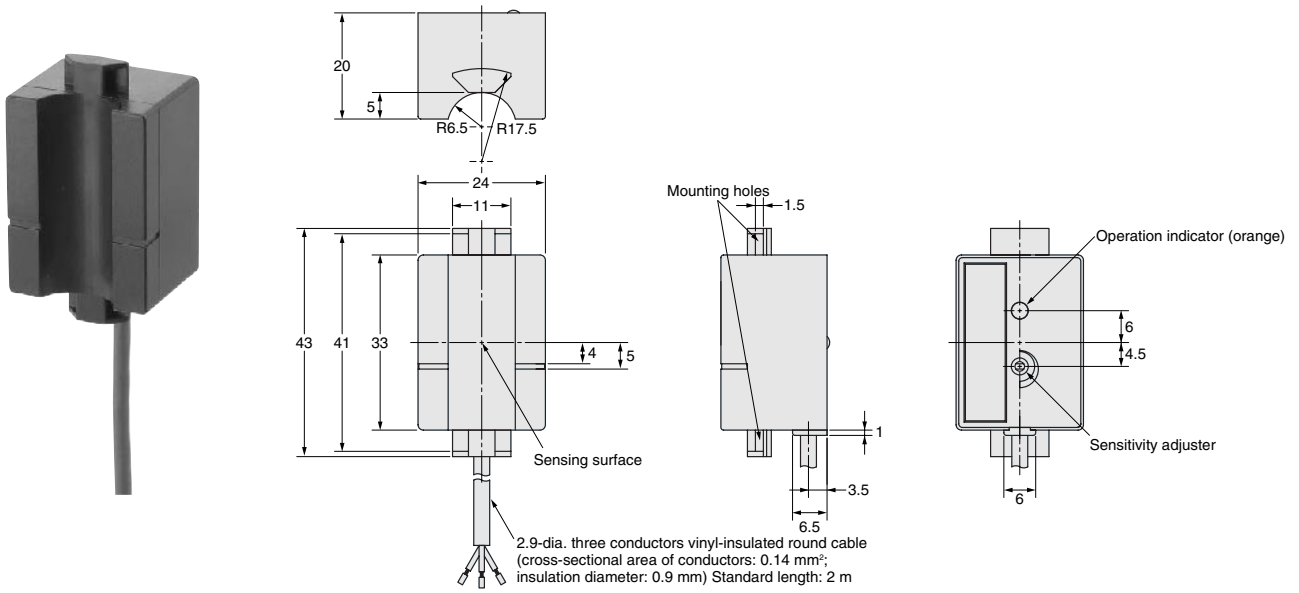
Miscellaneous

Drift may occur when the power supply is turned ON. If the dielectric constant of the liquid is low, the detection level of the liquid may be 2 to 3 mm higher than the set level for approximately 20 minutes after power is turned ON.

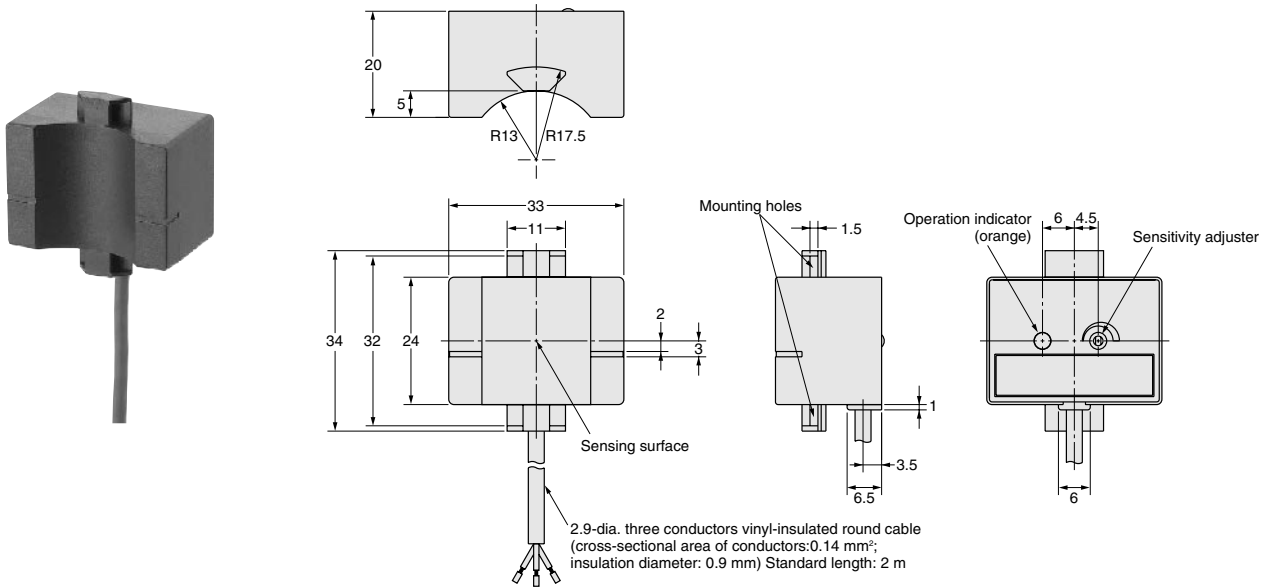
E2K-L

Dimensions (Unit: mm)

E2K-L13MC1



E2K-L26MC1



MEMO

A large grid of dashed blue lines for taking notes, consisting of 20 columns and 25 rows.

Long-distance capacitive proximity sensor

E2K-C



Capacitive Proximity Sensor with Adjustable Sensitivity

- Detects both metallic and non-metallic objects (glass, lumber, water, oil, plastic, etc.) without direct contact.
- DC models acquire CE marking




Ordering Information

Sensors

Shape	Sensing distance	Model		
		Output specifications	Operating status	
			NO	NC
Unshielded  34 dia.	 3 to 25mm	DC 3-wire NPN DC 3-wire PNP	E2K-C25ME1 E2-KC25MF1	E2K-C25ME2 E2K-C25MF2
		AC 2-wire Models	E2K-C25MY1	E2K-C25MY2

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	Y92E-A34	1	Supplied with the product.

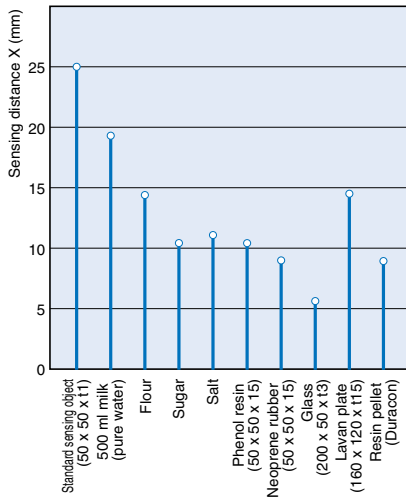
Rating/Performance

Item	Model	E2K-C25M□1	E2K-C25M□2	E2K-C25MY1	E2K-C25MY2
Sensing distance *		25 mm			
Sensing distance adjustable range		3 to 25 mm			
Sensing object		Conductors and dielectrics			
Standard sensing object		with grounded metal: 50 x 50 x 1t mm			
Differential distance		15% max. of sensing distance (when adjusted to 25 mm ±10% with standard object)			
Response frequency		70 Hz		10 Hz	
Power supply(Operating voltage range)		12 to 24 VDC, ripple (p-p): 10% max.,(10 to 40 VDC)		100 to 220 VAC (90 to 250 VAC) 50/60 Hz	
Current consumption		E models: 10 mA max. at 12 VDC, 16 mA max. at 24 VDC			
Leakage current		Y models: 1 mA max. at 100 VAC (50/60 Hz) with output turned OFF., 2 mA max. at 200 VAC (50/60 Hz) with output turned OFF.			
Control output	Switching capacity	200 mA max.		5 to 200 mA (resistive load)	
	Residual voltage	2 V max. (under load current of 200 mA with cable length of 2 m)			
Indicator lamp		Detection indicator (red LED)		Operation indicator (red LED)	
Operating status (with sensing object approaching)		E1, Y1 models: NO E2, Y2 models: NC			
Protective circuits		Reverse connection protection, surge absorber		Surge absorber	
Ambient temperature		Operating/Storage: -25°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)			
Temperature influence		±15%max. of sensing distance at 23° within temperature range -10°C to 55°C			
Voltage influence		±2% max. of sensing distance at a voltage between 85% and 115% of the rated power supply voltage		±2% max. sensing distance at a voltage ranging from 90% to 120% of a rated power voltage of 100 VAC and from 80% to 120% of a rated supply voltage of 200 VAC	
Insulation resistance		50 MΩ min. (at 500 VDC) between current carry parts and case			
Dielectric strength		1000 VAC 50/60 Hz for 1 min between energized part and case		1,500 VAC 50/60 Hz for 1min between energized part and case	
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 10 times each in X, Y, and Z directions			
Protective structure		IEC 60529 IP66			
Connection method		Pre-wired models (standard length: 2 m)			
Weight (Packed state)		Approx. 200 g			
Material	Case	Heat-resistant ABS resin			
	Sensing surface				
Accessories		Mounting bracket, instruction manual			

* The set distances are sensing distances applicable to standard sensing objects. Refer to Engineering Data for sensing distances applicable to other types of objects.

Characteristic data (typical)

Sensing Distance Change by Sensing Object (Typical)



Output Circuit Diagram

DC 3-wire Models

Operating status	Model	Timing chart	Output circuit
NO	E2K-C25ME1	<p>Sensing object: Yes (High), No (Low)</p> <p>Load (between brown and black): Operates (High), Releases (Low)</p> <p>Output voltage (between black and blue): H (High), L (Low)</p> <p>Operation indicator (red): ON (High), OFF (Low)</p>	<p>* 1. 200 mA max. (load current) * 2. When a transistor is connected</p>
NC	E2K-C25ME2	<p>Sensing object: Yes (High), No (Low)</p> <p>Load (between brown and black): Operates (Low), Releases (High)</p> <p>Output voltage (between black and blue): H (High), L (Low)</p> <p>Operation indicator (red): ON (High), OFF (Low)</p>	<p>* 1. 200 mA max. (load current) * 2. When a transistor is connected</p>
NO	E2K-C25MF1	<p>Sensing object: Yes (High), No (Low)</p> <p>Load (between brown and black): Operates (High), Releases (Low)</p> <p>Output voltage (between black and blue): H (High), L (Low)</p> <p>Operation indicator (red): ON (High), OFF (Low)</p>	<p>* 1. Maximum load current: 200 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p>
NC	E2K-C25MF2	<p>Sensing object: Yes (High), No (Low)</p> <p>Load (between brown and black): Operates (Low), Releases (High)</p> <p>Output voltage (between black and blue): H (High), L (Low)</p> <p>Operation indicator (red): ON (High), OFF (Low)</p>	<p>* 1. Maximum load current: 200 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p>

AC 2-wire Models

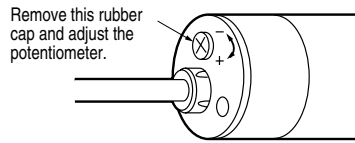
Operating status	Model	Timing chart	Output circuit
NO	E2K-C25MY1		
NC	E2K-C25MY2		

E2K-C

Operation

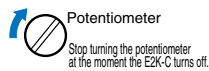
Sensitivity adjustment

Remove the rear rubber cap of the E2K-C and turn the potentiometer in the hole to adjust the sensitivity of the E2K-C.



The sensing distance increases by turning the potentiometer clockwise and decreases by turning the potentiometer counterclockwise. The potentiometer can make 15±3 valid turns and then make slip turns because the potentiometer does not have a stopper. The slip turns will not, however, damage the potentiometer.

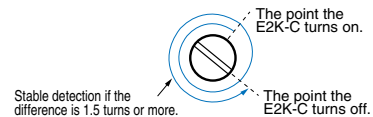
1. Slowly turn the potentiometer clockwise until the E2K-C turns on with no sensing object.



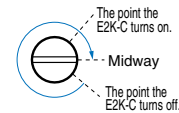
2. Turn the potentiometer counterclockwise until the E2K-C turns off with the sensing object located within the sensing distance.



3. The E2K-C will be in stable operation if there is a difference of 1.5 turns or more between the points the E2K-C is turned on and off, otherwise the E2K-C will not be in stable operation.



4. Set the potentiometer midway between the two points.



5. If the distance of each sensing object varies, take step 2 with the sensing object located at the farthest sensing distance to be applied.

Precautions

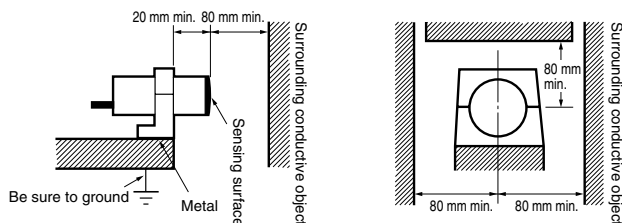
Correct Use

Design

Effects of Surrounding Metal

During Proximity Sensor installation provide a distance of 80 mm min. from the surrounding metal objects to prevent the Sensor from being affected by metal objects other than the sensing object.

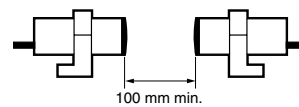
If installing the Sensor with the L-shaped mounting bracket, provide a distance of 20 mm min. between the face of the sensing head and the mounting bracket.



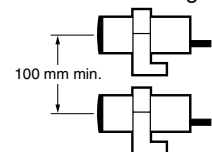
Mutual Interference

Space the two Sensors at a distance exceeding 100 mm to prevent mutual interference.

Face-to-face Mounting



Parallel Mounting



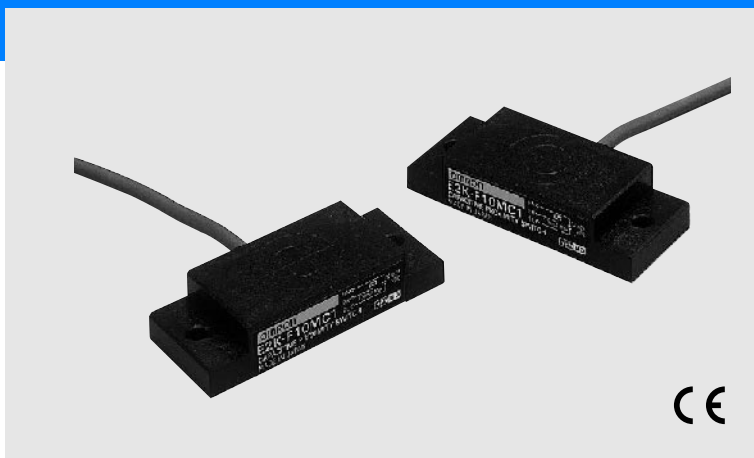
Effect of High-frequency Electro-magnetic Field

The E2K-C may malfunction if there is an ultrasonic washer, high-frequency generator, transceiver, or inverter nearby.

Flat type

E2K-F

Low-profiled Capacitive Proximity Sensor providing Flexible Installation



Ordering Information

Shape	Sensing distance	Output specifications	Operating status	Model
Flat type Unshielded	10 mm	DC 3-wire NPN	NO *	E2K-F10MC1

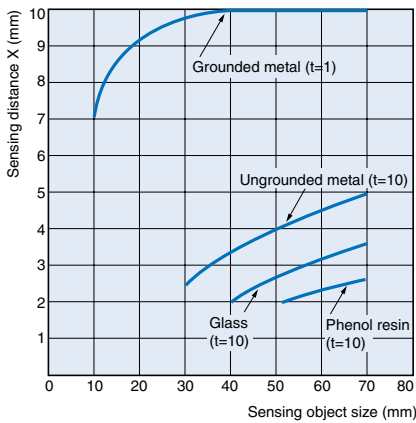
* NC models available (E2K-F10MC2)

Rating/Performance

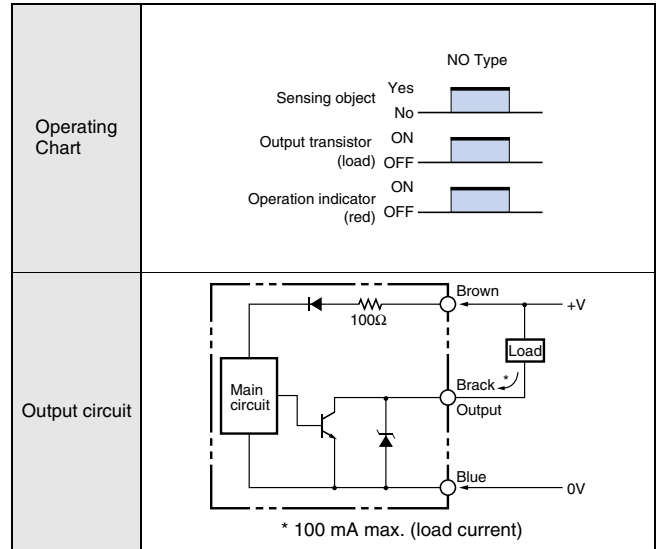
Item	E2K-F10MC1	
Sensing distance	10 mm ±10%	
Setting distance	0 to 7.5 mm	
Differential distance	15% max. sensing distance	
Sensing object	Conductors and dielectrics	
Standard sensing object	with grounded metal: 50 x 50 x 1 mm	
Response frequency	100 Hz	
Rated supply voltage (operating voltage)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.	
Current consumption	10 mA max. (24VDC)	
Control output	Switching capacity	NPN open collector 100 mA max. (under 30 VDC)
	Residual voltage	1.5 V max. (under load current of 100 mA with cable length of 2 m)
Indicator lamp	Detection indicator (red LED)	
Operating status (with sensing object approaching)	NO	
Protective circuits	Reverse connection protection, surge absorber	
Ambient temperature	Operating/Storage: -10°C to 55°C (with no icing or condensation)	
Ambient humidity	Operating/Storage: 35% to 95%RH	
Temperature influence	±15% max. of sensing distance at 23°C within the temperature range of -10°C and 55°C	
Voltage influence	±2.5% max. of sensing distance within a range of ±10% of rated supply voltage	
Insulation resistance	50 MΩ min. (at 500 VDC) between energized parts and case	
Dielectric strength	500 VAC 50/60 Hz for 1 min between energized part and case	
Vibration resistance	Malfunction: 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 IP66	
Connection method	Pre-wired models (standard length: 2 m)	
Weight (Packed state)	Approx. 35 g	
Material	Case	Heat-resistant ABS resin
	Sensing surface	
Accessories	Instruction manual	

Characteristic data (typical)

Sensing Distance vs. Sensing Object



Output Circuit Diagram



Precautions

Correct Use

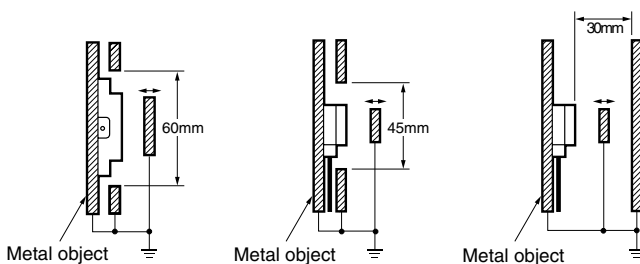
Design

Sensing Object Material

E2K-F can detect almost any type of object. The sensing distance of E2K-F, however, will vary with the electrical characteristics of the object, such as the conductance and inductance of the object, as well as the water content and capacity of the object. The maximum sensing distance of E2K-F will be available if the object is made of grounded metal. There are objects that cannot be detected indirectly. Therefore test E2K-F in a trial operation with the objects before using E2K-F in actual applications.

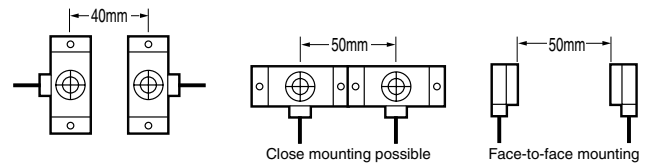
Effects of Surrounding Metal

Separate E2K-F from ambient metals as shown below.



Mutual Interference

If installing more than one E2K-F face to face or side by side, separate them as shown below.



Effect of High-frequency Electro-magnetic Field

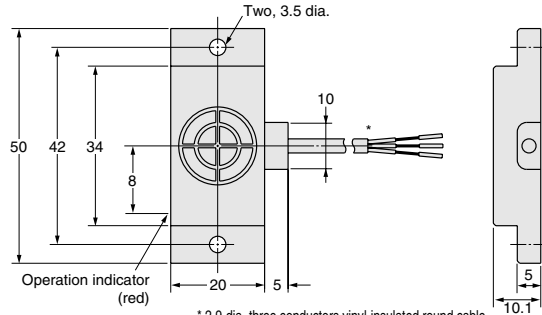
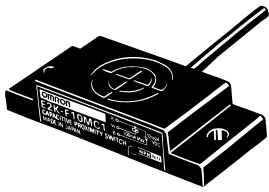
E2K-F may malfunction if an ultrasonic washer, high-frequency generator, transceiver, or inverter are nearby. For a typical measure, refer to the "Noise" with Common precautions of a photoelectric sensor in Rear B-page.

Wiring Considerations

The characteristics of E2K-F will not change if the cord is extended. Keep in mind that voltage drops may occur due to the cord extension, thus, ensure that the total cord length does not exceed 200 m.

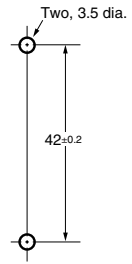
Dimensions (Unit: mm)

E2K-F



* 2.9-dia. three conductors vinyl-insulated round cable
 (cross-sectional area of conductors: 0.14 mm²;
 insulation diameter: 0.9 mm)
 Standard length: 2 m

Mounting Holes



CAD file E2K_02

MEMO

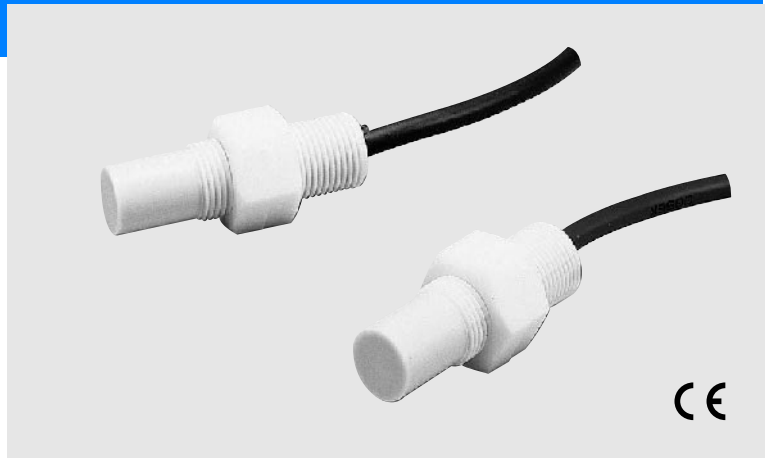
A large grid of dashed lines for writing notes, consisting of 20 columns and 25 rows of squares.

E2K-F

Inductive Proximity Sensor E2KQ-X



*Proximity Sensor with Easy Sensing Distance Adjustment and Teflon * Coating Effective Oil and Chemical Resistance*

- Oil and chemical-resistant Teflon case.
- Sensitivity adjuster ensures easy sensing distance adjustment according to the sensing object.
- Incorporates a cord connector with an indicator providing high visibility.



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

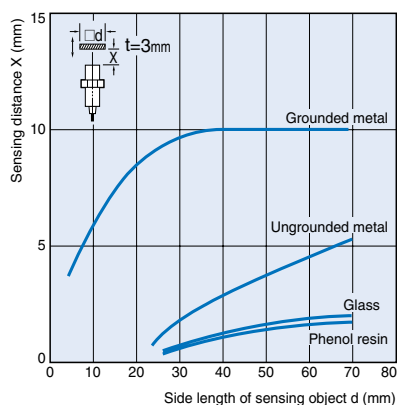
Ordering Information

Shape	Sensing distance	Output	Operating status	Model
 Unshielded M18	 6 to 10 mm	DC 3-wire NPN	NO *	E2KQ-X10ME1

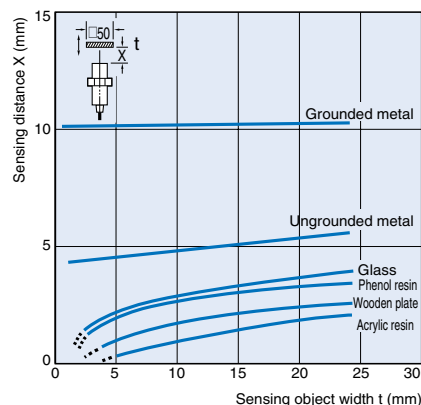
* NC models available (E2KQ-X10ME2)

Characteristic data (typical)

Sensing Distance vs. Sensing Object



Sensing Object Thickness and Material vs. Sensing Distance



Output Circuit Diagram

DC 3-wire Models

Operating status	Model	Timing chart	Output circuit
NO	E2KQ-X10ME1	<p>Sensing object: Yes (High pulse), No (Low)</p> <p>Load (between brown and black): Operates (High pulse), Releases (Low)</p> <p>Output voltage (between black and blue): H (High pulse), L (Low)</p> <p>Operation indicator (red): ON (High pulse), OFF (Low)</p>	<p>The diagram shows a main circuit connected to a transistor. The transistor's emitter is connected to 0V (Blue wire). The collector is connected to a load between the Brown (+V) and Black (*1) wires. A 4.7kΩ resistor is connected between the Black (*1) and Blue wires. The transistor is controlled by the main circuit. A red LED (Tr) is connected between the Black (*1) and Blue wires.</p> <p>* 1. 100 mA max. (load current) * 2. When a transistor is connected</p>

Rating/Performance

Item	Model	E2KQ-X
Sensing distance *		10 mm
Sensing distance adjustable range		6 to 10 mm
Differential distance		4% to 20% of sensing distance
Sensing object		Conductors and dielectrics
Standard sensing object		with grounded metal: 50 x 50 x 1t mm
Response frequency		35 Hz
Rated supply voltage (operating voltage)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.
Current consumption		15 mA max.
Control output	Switching capacity	100 mA
	Residual voltage	1.5 V max. (under load current of 100 mA with cable length of 2 m)
Indicator lamp		Detection indicator (red LED)
Operating status (with sensing object approaching)		Refer to previous pages for details of operating chart of output circuits.
Protective circuits		Reverse connection protection, surge absorber
Ambient temperature		Operating: -10°C to 55°C, Storage: -25°C to 55°C (with no icing or condensation)
Ambient humidity		Operating/Storage: 35% to 85%RH (with no condensation)
Temperature influence		±15% max. of sensing distance at 23°C in the temperature range of -10°C and 55°C
Voltage influence		2% max. sensing distance within a range of 80% to 120% of the rated supply voltage.
Insulation resistance		50 MΩ min. (at 500 VDC) between energized parts and case
Dielectric strength		500 VAC 50/60 Hz for 1 min between energized part and case
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 IP66
Connection method		Pre-wired models (standard length: 2 m)
Weight (Packed state)		Approx. 150 g
Material	Case, Sensing surface	Fluororesin
	Clamping nut	
Accessories		Instruction sheet and screwdriver for adjustment

* This sensing distance is possible with a standard sensing object. Refer to Engineering Data for sensing distances of other materials.

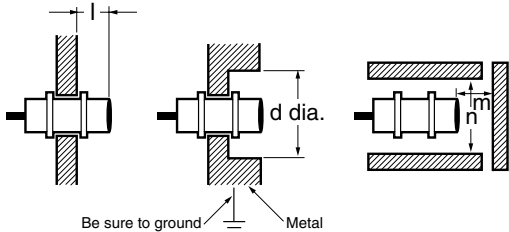
Precautions

Correct Use

Design

Effects of Surrounding Metals

If E2K-X is embedded in metal, maintain at least the following distances between E2K-X and the metal.



* Ensure to ground the metal object, otherwise E2K-X will not be in stable operation.

Effects of Surrounding Metal

(Unit: mm)

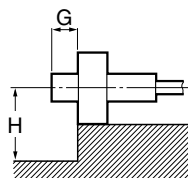
Model	Length	l	d	m	n
E2KQ-X10ME1		30	75	18	90

If a mounting bracket is used, be sure that at least the following distances are maintained.

Effects of Surrounding Metal

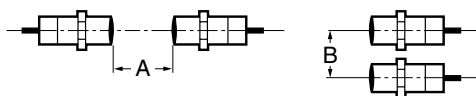
(Unit: mm)

Model	Length	G	H
E2KQ-X10ME1		30	35



Mutual Interference

If more than one Sensor is located face to face or in parallel, provide sufficient space between adjacent Sensors to suppress mutual interference as indicated in the following diagram.



Mutual Interference

(Unit: mm)

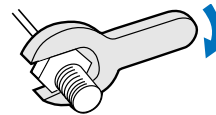
Model	Length	A	B
E2KQ-X10ME1		200	32

Effect of High-frequency Electro-magnetic Field

E2KQ-X may malfunction if there is an ultrasonic washer, high-frequency generator, transceiver, or inverter nearby. For a typical measure refer to the "Noise" with Common precautions of a photoelectric sensor in Rear B-page.

Installation

The tightening torque must not exceed the following value.



Model	Tensile strength (torque)
E2KQ-X10ME1	0.6 Nm

● Adjustment

Sensing object

The maximum sensing distance will decrease if the sensing object is a metal or dielectric object that is not grounded.

- Sensing Object Material E2K-C can detect almost any type of object. The sensing distance of E2K-C, however, will vary with the electrical characteristics of the object, such as the conductance and inductance of the object, and the water content and capacity of the object. The maximum sensing distance of E2K-C will be available if the object is made of grounded metal.

Ensure a constant ambient operating temperature during the indirect detection of objects.

Miscellaneous

Ambient Conditions

Ensure that the E2K-X is free from sprayed water, oil, chemical, or condensation, otherwise E2K-X may malfunction by detecting them as sensing objects.

Environment

E2KQ-X has a water-resistant design. To increase the reliability of E2KQ-X in operation, however, it is recommended that E2KQ-X is free from sprayed water or machining oil.

The cord is not coated with Teflon, which must be taken into consideration when installing the E2KQ-X.

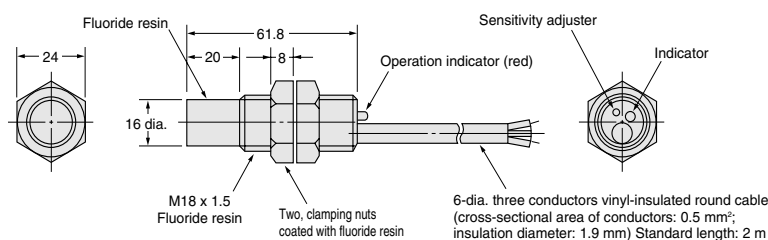
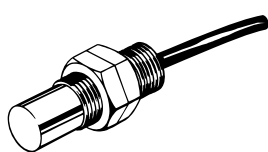
Dimensions

(Unit: mm)

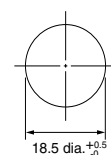
E2KQ-X10ME1

CAD file

E2KQ_01



Mounting Dimensions



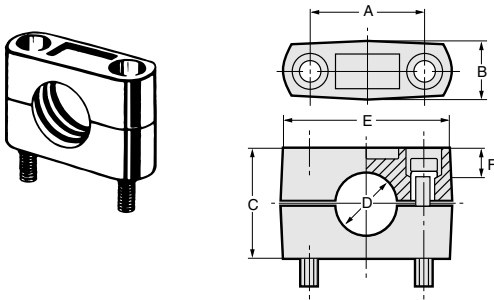
Accessories

Y92

Mounting Bracket

Four kinds of resin mounting brackets are available.

Choose an appropriate one depending on external dimensions.



Mounting Holes Dimensions

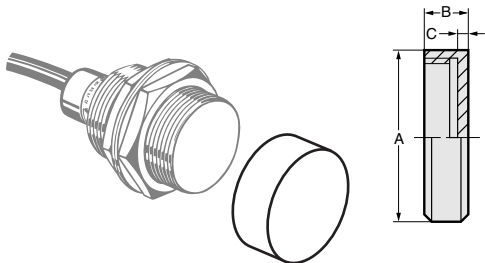
Model	Item	Length (mm)						Use hexagonal bolts	Applicable diameter of sensors
		A	B	C	D	E	F		
Y92E-B8		18 ± 0.2	10 max.	18	8-mm dia.	28 max.	6	M4 x 20	M8
Y92E-B12		24 ± 0.2	12.5 max.	20	12-mm dia.	37 max.	6	M4 x 25	M12
Y92E-B18		32 ± 0.2	17 max.	30	18-mm dia.	47 max.	7	M5 x 32	M18
Y92E-B30		45 ± 0.2	17 max.	50	30-mm dia.	60 max.	10	M5 x 50	M30

Note: If using the Mounting Brackets for Non-shielded models, pay attention to the influence of surrounding metals. (For dimensions of Sensors, refer to the dimensions shown for each model.)

Accessories

A cover is available for sensor head protection.

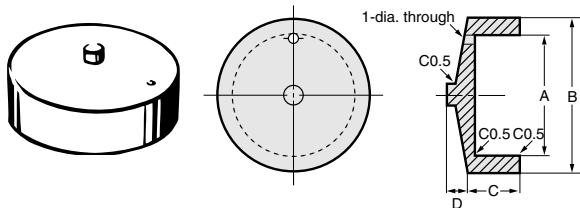
Choose an appropriate one depending on external dimensions.



Protective Covers Dimensions

Model	Item	Length (mm)			Material	Applicable sensor diameter
		A	B	C		
Y92E-E12		14-mm dia.	5	0.5 ^{+0.2} _{-0.1}	Polyallylate resin	M12 Shielded
Y92E-E18		21-mm dia.	6	1 ± 0.2		M18 Shielded
Y92E-E30		33-mm dia.	8	1.5 ± 0.2		M30 Shielded
Y92E-E12M		14-mm dia.	12	0.5 ^{+0.2} _{-0.1}		M12 Unshielded
Y92E-E18M		21-mm dia.	16	1 ± 0.2		M18 Unshielded
Y92E-E30M		33-mm dia.	21	1.5 ± 0.2		M30 Unshielded

Sputter Protection Covers



Sputter Protection Covers Dimensions

Model	Item	Length (mm)				Material	Applicable sensor diameter
		A	B	C	D		
Y92E-E12-2		11.0 mm-dia.	14.0 mm-dia.	5.0	1.0	Silicone rubber	M12 Shielded
Y92E-E18-2		17.0 dia.	21.0 dia.	6.0	3.0		M18 Shielded
Y92E-E30-2		28.5 dia.	33.0 dia.	8.0	6.0		M30 Shielded