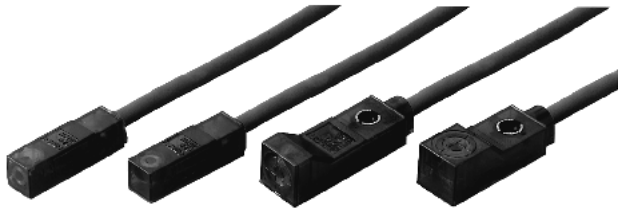
OMRON

Subminiature Rectangular Inductive Prox

E2S

World's Smallest Square Sensor with Built-in Amplifier



- 5.5 x 5.5 mm type allows smaller, space-saving machines and devices
- High response frequency (1 kHz) for fast machine processes
- Long sensing distance: (E2S-□1, 1.6 mm) (E2S-□2, 2.5 mm)
- Models with different oscillating frequency are available to reduce mutual interference

Ordering Information

■ DC 2-WIRE

Type	Sensing surface	Sensing distance	Part number	
			Operation status	
			NO (Normally open) See Note.	NC (Normally closed)
Unshielded 	Front face	1.6 mm (0.06 in)	**E2S-W11**	**E2S-W12**
	End face		**E2S-Q11**	**E2S-Q12**
	Front face	2.5 mm (0.10 in)	**E2S-W21**	**E2S-W22**
	End face		**E2S-Q21**	**E2S-Q22**

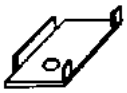
■ DC 3-WIRE

Type	Sensing surface	Sensing distance	Output configuration	Part number	
				Operation status	
				NO (Normally open) See Note.	NC (Normally closed)
Unshielded 	Front face	1.6 mm (0.06 in)	NPN	**E2S-W13**	**E2S-W14**
	End face			**E2S-Q13**	**E2S-Q14**
	Front face	2.5 mm (0.10 in)		**E2S-W23**	**E2S-W24**
	End face			**E2S-Q23**	**E2S-Q24**
	Front face	1.6 mm (0.06 in)	PNP	**E2S-W15**	**E2S-W16**
	End face			**E2S-Q15**	**E2S-Q16**
	Front face	2.5 mm (0.10 in)		**E2S-W25**	**E2S-W26**
	End face			**E2S-Q25**	**E2S-Q26**

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

■ ACCESSORIES

Mounting Brackets

Appearance	Part number	Note
	**Y92E-C1R6**	Provided with E2S-□1□□
	**Y92E-C2R5**	Provided with E2S-□2□□
	**Y92E-D1R6**	Optional bracket for E2S-□1□□
	**Y92E-D2R5**	Optional bracket for E2S-□2□□

Specifications

■ RATINGS/CHARACTERISTICS

DC 2-Wire Models

Part number		E2S-W11 E2S-W12	E2S-Q11 E2S-Q12	E2S-W21 E2S-W22	E2S-Q21 E2S-Q22
Sensor type		Inductive			
Sensing surface		Front face	End face	Front face	End face
Type		Unshielded			
Power supply voltage (operating voltage range)		12 to 24 V DC, ripple (p-p): 10% max., (10 to 30 V DC)			
Detectable object type		Ferrous metal (refer to *Engineering Data* for non-ferrous metals)			
Sensing distance		1.6 mm ± 15% (0.06 in)		2.5 mm ± 15% (0.10 in)	
Setting distance		0 to 1.2 mm (0.05 in)		0 to 1.9 mm (0.07 in)	
Standard target object		Iron, 12 x 12 x 1 mm		Iron, 15 x 15 x 1 mm	
Differential travel		10% max. of sensing distance			
Operating status (with target object approaching)		□□1 models: NO □□2 models: NC Refer to *Output Circuits* and *Timing Charts* for details			
Control output	Switching capacity	3 to 50 mA DC max.			
	Residual voltage	3.0 V max. with a load current of 50 mA and a cable length of 1 m			
Leakage current		0.8 mA max.			
Temperature influence		± 15% max. of sensing distance at 23°C (73.4°F) in temperature range of -25°C to 70°C (-13°F to 158°F)			
Voltage influence		± 2.5% max. of sensing distance in rated voltage range ± 10%			
Response frequency (See Note.)		1 kHz min.			
Circuit protection		Reverse polarity connection and surge absorber			
Indicator		□□1 models: Operation indicator (red) Setting indicator (green) □□2 models: Operation indicator (red)			
Material	Case	Polyallylate resin			
Mounting		Mounting bracket supplied			
Connection method		Pre-wired standard length: 1 m (39.37 in)			
Weight (packed state)		Approx. 10 g (0.35 oz)			
Enclosure rating		IEC60529 IP67			

(This table continues on the next page.)

Specifications Table - continued from previous page

Part number		E2S-W11 E2S-W12	E2S-Q11 E2S-Q12	E2S-W21 E2S-W22	E2S-Q21 E2S-Q22
Ambient temperature	Operating	-25°C to 70°C (-13°F to 158°F) with no icing or condensation			
	Storage	-40°C to 85°C (-40°F to 185°F) with no icing or condensation			
Ambient humidity	Operating	35% to 90% (with no condensation)			
	Storage	35% to 95% (with no condensation)			
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 (1640 ft/s^2) 3 times each in X, Y, and Z direction			
Insulation resistance		50 MΩ min. (at 500 V DC) between current carry parts and case			
Dielectric strength		1,000 V AC, 50/60 Hz for 1 min between current carry parts and case			

Note: The response frequencies of the DC switching components are average values obtained by measuring in sequence a line-up of standard sensing objects. The space between any adjacent sensing objects was twice the width of a single sensing object and the setting distance was half the maximum sensing distance.

DC 3-Wire Models

Part number		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
Sensor type		Inductive							
Setting surface		Front face	End face	Front face	End face	Front face	End face	Front face	End face
Type		Unshielded							
Power supply voltage (operating voltage range)		12 to 24 V DC, ripple (p-p): 10% max., (10 to 30 V DC)							
Current consumption		13 mA max. at 24 VDC with no load							
Detectable object type		Ferrous metal (refer to *Engineering Data* for non-ferrous metals)							
Sensing distance		1.6 mm ± 15%		2.5 mm ± 15%		1.6 mm ± 15%		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	
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	
Differential travel		10% max. of sensing distance							
Operating status (with sensing object approaching)		□□3 models: NO □□4 models: NC Refer to *Output Circuits* and *Timing Charts* for details				□□3 models: NO □□4 models: NC Refer to *Output Circuits* and *Timing Charts* for details			
Control output	Switching capacity	NPN open collector output 50 mA max. (30 V DC max.)				PNP open collector output 50 mA max. (30 V DC max.)			
Control output	Residual voltage	1.0 V max. with a load current of 50 mA and a cable length of 1 m							
Temperature influence		± 15% max. of sensing distance at 23°C (73.4°F) in temperature range of -25°C to 70°C (-13°F to 158°F)							
Voltage influence		± 2.5% max. of sensing distance in rated voltage range ± 10%							
Response frequency (See Note.)		1 kHz min.							
Circuit protection		Reverse polarity connection and surge absorber							
Indicator		Operation indicator (orange)							
Material	Case	Polyallylate resin							
Mounting		Mounting bracket supplied							
Connection method		Pre-wired standard length: 1 m (39.37 in)							
Weight (packed state)		Approx. 10 g (0.35 oz)							
Degree of protection		IEC60529 IP67 [JEM IP67 (water-tight)]							

(This table continues on the next page.)

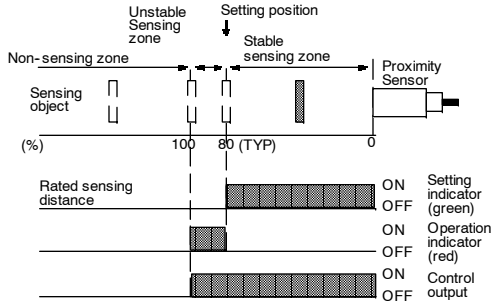
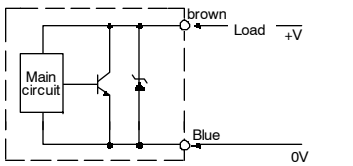
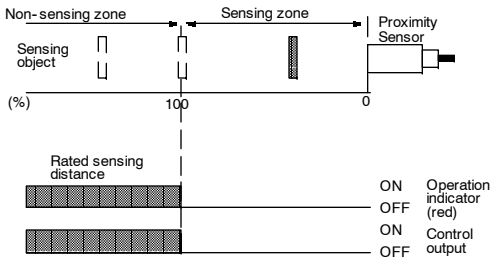
Part number		E2S-W13 E2S-W14	E2S-Q13 E2S-Q14	E2S-W23 E2S-W24	E2S-Q23 E2S-Q24	E2S-W15 E2S-W16	E2S-Q15 E2S-Q16	E2S-W25 E2S-W26	E2S-Q25 E2S-Q26
Ambient temperature	Operating	-25°C to 70°C (-13°F to 158°F) with no icing or condensation							
	Storage	-40°C to 85°C (-40°F to 185°F) with no icing or condensation							
Ambient humidity	Operating	35% to 90%							
	Storage	35% to 95% (with no condensation)							
Vibration resistance		Destruction: 10 to 50 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							
Shock resistance		Destruction: 500 m/s^2 (1640 ft/sec^2) 3 times each in X, Y, and Z direction							
Insulation resistance		50 MΩ min. (at 500 V DC) between current carry parts and case							
Dielectric strength		1,000 V AC, 50/60 Hz for 1 min. between current carry parts and case							

Note: The response frequencies of the DC switching components are average values obtained by measuring in sequence a line-up of standard sensing objects. The space between any adjacent sensing objects was twice the width of a single sensing object and the setting distance was half the maximum sensing distance.

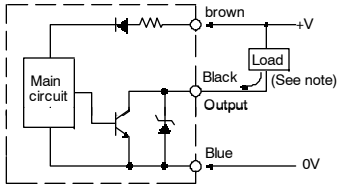
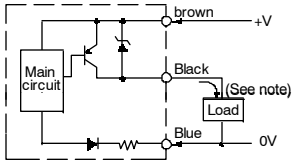
Operation

■ OUTPUT CIRCUITS AND TIMING CHARTS

DC 2-Wire Models

Operation status	Part number	Timing charts	Output circuits
NO	E2S-W11 E2S-W21 E2S-Q11 E2S-Q22		 The load can be connected both +V side and 0 V side
NC	E2S-W12 E2S-W22 E2S-Q12 E2S-Q22		

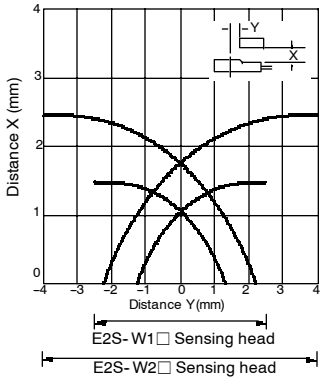
DC 3-Wire Models

Operation status	Output configuration	Part number	Timing charts	Output circuits
NO	NPN	E2S-W13 E2S-W23 E2S-Q13 E2S-Q23	Target object: Yes / No Output transistor(load): ON / OFF Output transistor(orange): ON / OFF	 Note: Maximum load current: 50 mA
NC		E2S-W14 E2S-W24 E2S-Q14 E2S-Q24	Target object: Yes / No Output transistor(load): ON / OFF Output transistor(orange): ON / OFF	
NO	PNP	E2S W15 E2S-W25 E2S-Q15 E2S-Q25	Target object: Yes / No Output transistor(load): ON / OFF Output transistor(orange): ON / OFF	 Note: Maximum load current: 50 mA
NC		E2S-W16 E2S-W26 E2S-Q16 E2S-Q26	Target object: Yes / No Output transistor(load): ON / OFF Output transistor(orange): ON / OFF	

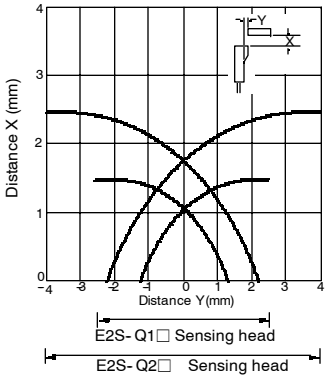
Engineering Data

■ OPERATING RANGE (TYPICAL)

E2S-W1□
E2S-W2□

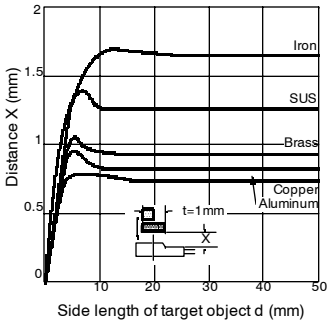


E2S-Q1□
E2S-Q2□

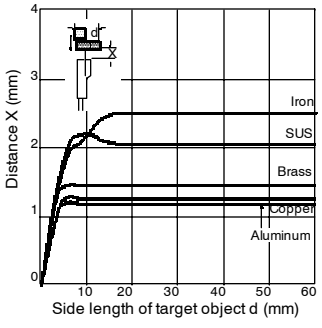


■ SENSING OBJECT SIZE AND MATERIAL VS. SENSING DISTANCE (TYPICAL)

E2S-W1□
E2S-Q1□



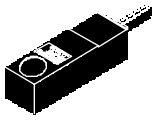
E2S-W2□
E2S-Q2□



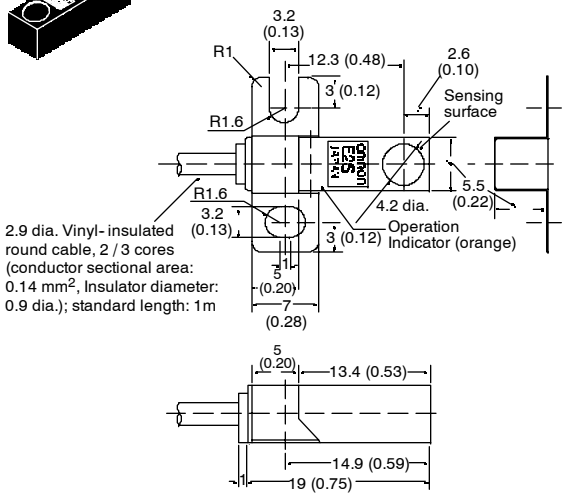
Dimensions

Unit: mm (inch)

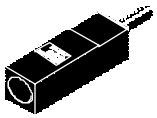
■ E2S-W1□



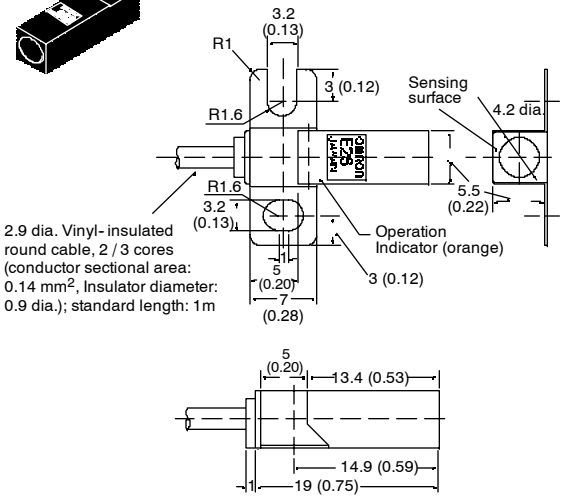
With Mounting Bracket



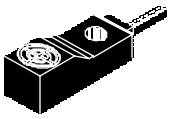
■ E2S-Q1□



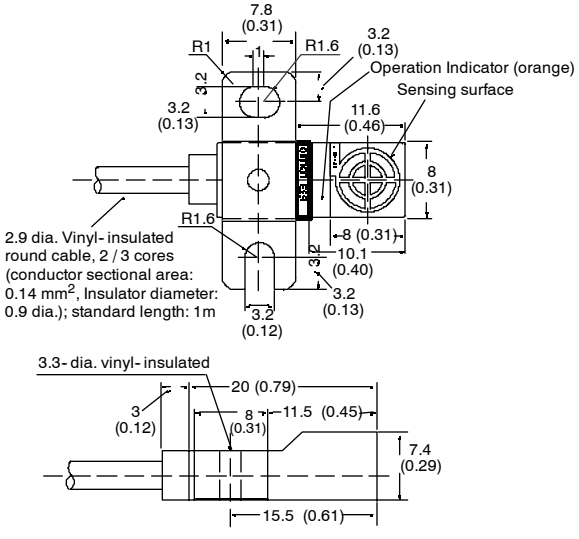
With Mounting Bracket



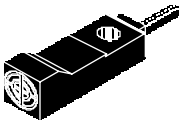
■ E2S-W2□



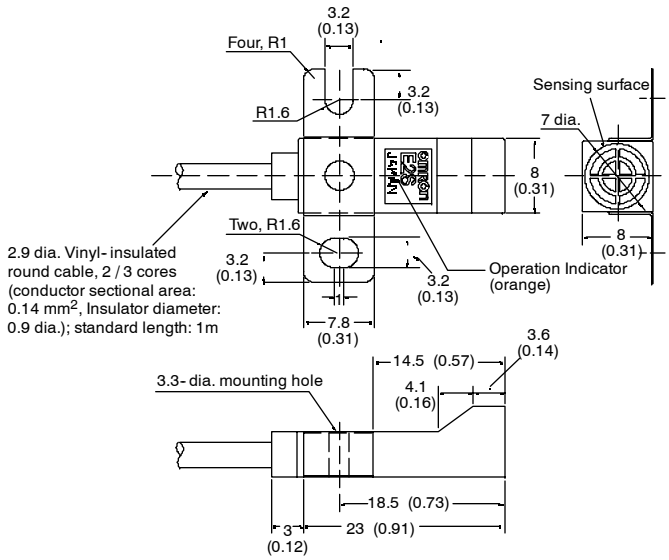
With Mounting Bracket



■ E2S-Q2□

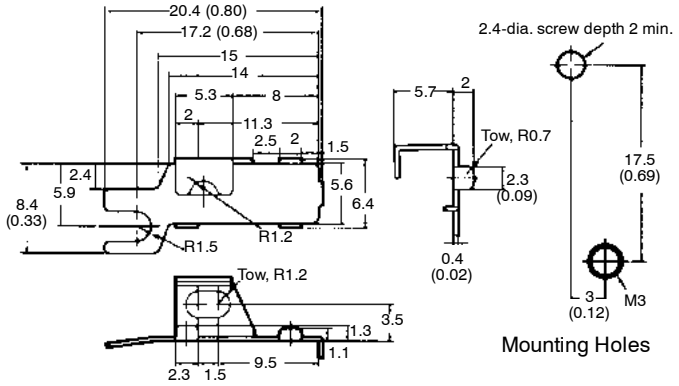


With Mounting Bracket



■ MOUNTING BRACKET

Y92E-C1R6

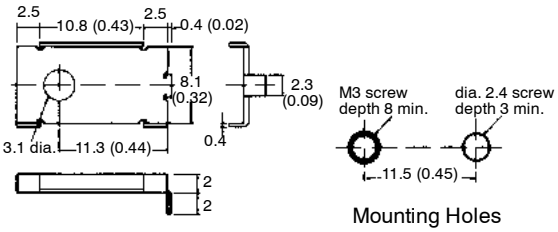


Mounting Holes

Material: Stainless steel (SUS304)

Note: Provided with E2S-□1□□

Y92E-C2R5

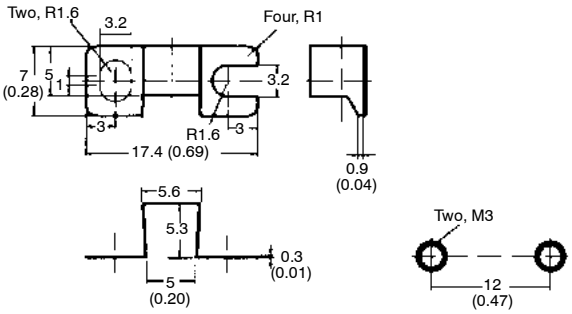


Mounting Holes

Material: Stainless steel (SUS304)

Note: Provided with E2S-□2□□

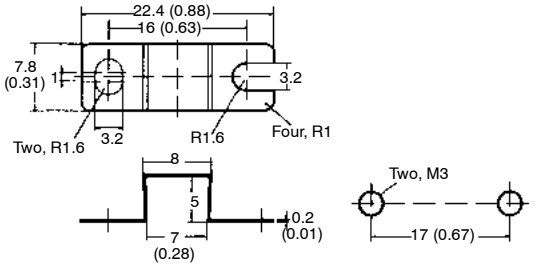
Y92E-E1R6



Material: Stainless steel (SUS304)

Mounting Holes

Y92E-D2R5



Material: Stainless steel (SUS304)

Mounting Holes

Precautions

■ TO AVOID DAMAGE TO THE SENSOR

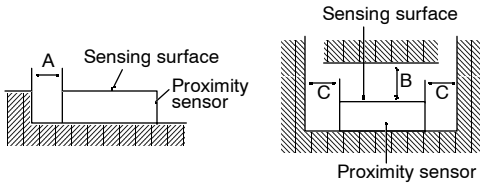
- Do not impose any voltage exceeding the rated voltage on the Sensor. Do not impose AC voltage on models that operate with DC.
- Do not short-circuit the load connected to the Sensor. Load short-circuit protection operates with correct power-supply and polarity in the rated voltage range.
- The load must be connected to the Sensor in operation.
- When supplying power to the Sensor, make sure that the polarity of the power is correct.
- Make sure to connect a proper load to the Sensor in operation, or it may be damaged.
- Do not use the Sensor in explosive or ignitable gas environments.
- Do not disassemble, repair, or modify the product.

■ EFFECTS OF SURROUNDING METALS

Unit: mm (inch)

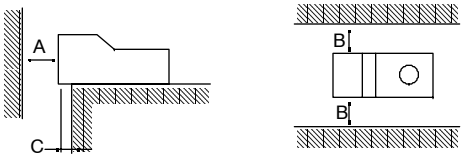
Provide a minimum distance as shown in the table below between the Sensor and the surrounding metal.

Front Surface Sensing Type (Not Exceeding The Height of The Sensor Head)



Model	A	B	C
E2S-W1□	0	8 (0.31)	2 (0.079)
E2S-W2□		15 (0.59)	10 (0.39)

Top End Surface Sensing Type



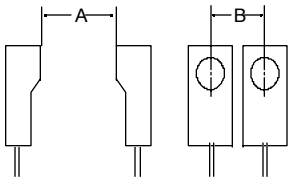
Model	A	B	C
E2S-Q1□	8 (0.31)	3 (0.12)	2 (0.079)
E2S-Q2□	15 (0.59)	10 (0.39)	3 (0.12)

If a standard switching regulator is used, be sure to ground the FG (frame ground) and G (ground) terminals to prevent Sensor malfunction due to the switching noise of the regulator.

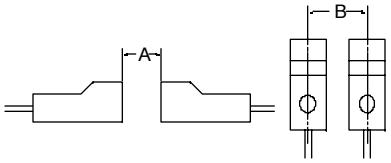
■ MUTUAL INTERFERENCE

Be sure to space the two sensors at a distance greater then that shown in the table to prevent mutual interference.

Front Surface Sensing Type



End Surface Sensing Type



Two Sensors with the Same Frequency

Model	A	B
E2S-W(Q)1□	50 (1.97)	20 (0.79)
E2S-W(Q)2□	75 (2.95)	25 (0.98)

Two Sensors with Different Frequencies

Model	A	B
E2S-W(Q)1□	40 (1.57)	55 (0.22)
E2S-W(Q)2□	50 (1.97)	8 (0.31)

Power Reset Time

The Sensor is ready to detect objects in 100 ms after the Sensor is turned on. If the Sensor is connected to an independent power supply separately from the load, be sure to turn on the sensor first.

Power OFF

A single pulse may output from the Sensor when the power supply is turned off. It is recommended that the load and load line are turned off first.

Power Transformer

Use only an insulated transformer for the DC power supply. Do not use an autotransformer (single-winding variable-voltage).

■ WIRING

Separating from High-Tension Lines

Use Metal Conduit.
Pass cable through separate metal conduits to prevent malfunctioning and damage due to positioning proximity-sensor leads alongside power lines or motor lines. The same precaution applies to the DC type.
Do not pull cables with tensile strength exceeding 30 N (6.7 lbf).

■ MOUNTING

Mounting Conditions

Do not stride the Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistant properties.

Tightening Torque

Do not tighten the E2S-W(Q)□2 mounting screws to a torque exceeding 0.7 N•m (0.52 ft/lbf).

■ MAINTENANCE AND INSPECTION

To ensure long-term stable operation, periodically subject the proximity sensor to the same checks as all other control instruments.
Conduct the following checks.

- Check the mounting position of the sensor relative to the detected object. Check for displacement, looseness, and deformation.
- Check for looseness, defective contact, and discontinuities in the wiring and terminals.
- Check for attached or accumulated metal powder.
- Check for abnormal operating temperature and ambient temperature.
- If the sensor has a setting display lamp, check that the lamp operates correctly.

Never disassemble or repair the sensor.

■ ENVIRONMENT

Water Resistance

Do not use the Sensor in water, in the rain, or outdoors.

To ensure stable operation and long sensor life, do not operate the sensor outside the rated temperature range or in outside conditions.
Although the proximity sensor has a water-resistant conditions, reliability and product life can be further enhanced by installing a cover to prevent water splashing directly on the sensor. Avoid operating the sensor in an atmosphere containing chemical reagents, strong alkalis, or acids (citric acid, chromic acid, hot concentrated sulfuric acid).

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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