



Compact Square Inductive Proximity Sensor

E2S

World's Smallest Square Sensor with Built-in Amplifier

- 5.5 x 5.5 mm type contributes to smaller, space-saving machines and devices.
- Comprehensive range; sensing direction, size, output configuration, operation status.
- Only 2/3 the wiring process required for DC 2-wire.
- Models with different response frequency are available.
- High response frequency (1 kHz).
- Long sensing distance: (E2S-□1, 1.6 mm)
(E2S-□2, 2.5 mm)



Ordering Information

DC 2-wire

Appearance	Sensing surface	Sensing distance	Model	
			Operation status	
			NO (Normally Open)	NC (Normally Closed)
	Front face	1.6mm	E2S-W11(See note)	E2S-W12
	End face		E2S-Q11(See note)	E2S-Q12
	Front face	2.5mm	E2S-W21(See note)	E2S-W22
	End face		E2S-Q21(See note)	E2S-Q22

DC 3-wire

Appearance	Sensing surface	Sensing distance	Output configuration	Model	
				Operation status	
				NO (Normally Open)	NC (Normally Closed)
	Front face	1.6mm	NPN	E2S-W13(See note)	E2S-W14
	End face			E2S-Q13(See note)	E2S-Q14
	Front face	2.5mm		E2S-W23(See note)	E2S-W24
	End face			E2S-Q23(See note)	E2S-Q24
	Front face	1.6mm	PNP	E2S-W15(See note)	E2S-W16
	End face			E2S-Q15(See note)	E2S-Q16
	Front face	2.5mm		E2S-W25(See note)	E2S-W26
	End face			E2S-Q25(See note)	E2S-Q26

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

Nomenclature

E2S - □ □ □ □

1 2 3 4 5

- Compact square series
- Sensing direction
W: Front face sensing
Q: End face sensing
- 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)
- 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
- Different response frequency
No: Standard
B: Different response frequency

Specifications

■ Ratings/Characteristics

DC 2-wire Models

Item		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 ± 15%		2.5 mm ± 15%	
Setting distance		0 to 1.2 mm		0 to 1.9 mm	
Differential travel		10% max. of sensing distance			
Sensing object		Ferrous metal (refer to <i>Engineering Data</i> for non-ferrous metal)			
Standard sensing object		Iron, 12 x 12 x 1 mm		Iron, 15 x 15 x 1 mm	
Response frequency (see note)		1 kHz min.			
Power supply voltage (operating voltage range)		12 to 24 VDC, ripple (p-p): 10% max., (10 to 30 VDC)			
Leakage current		0.8 mA max.			
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			
Indicator		<input type="checkbox"/> <input type="checkbox"/> 1 models: Operation indicator (red) Setting indicator (green) <input type="checkbox"/> <input type="checkbox"/> 2 models: Operation indicator (red)			
Operating status (with sensing object approaching)		<input type="checkbox"/> <input type="checkbox"/> 1 models: NO <input type="checkbox"/> <input type="checkbox"/> 2 models: NC Refer to <i>Output Circuits</i> and <i>Timing Charts</i> for details			
Circuit protection		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% Storage : 35% to 95% (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 in rated voltage range ± 10%			
Insulation resistance		50 MΩ min. (at 500 VDC) between current carry parts and case			
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min between current carry parts and case			
Vibration resistance		Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z direction			
Shock resistance		Destruction: 500 m/s ² 3 times each in X, Y, and Z direction			
Degree of protection		IEC60529 IP67			
Connection method		Pre-wired (standard length: 1 m)			
Weight (packed state)		Approx. 10 g			
Material	Case	Polyallylate resin.			
Accessories		Mounting bracket			

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

Item	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 ± 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					
Differential travel	10% max. of sensing distance											
Sensing object	Ferrous metal (refer to <i>Engineering Data</i> for non-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 (see note)	1 kHz min.											
Power supply voltage (operating voltage range)	12 to 24 VDC ,ripple (p-p): 10% max., (10 to 30 VDC)											
Current consumption	13 mA max. at 24 VDC with no load											
Control output	Switching capacity				NPN open collector output 50 mA max. (30 VDC max.)				PNP open collector output 50 mA max. (30 VDC max.)			
	Residual voltage				1.0 V max. with a load current of 50 mA and a cable length of 1 m							
Indicator	Operation indicator (orange)											
Operating status (with sensing object approaching)	Operation indicator (orange)											
Operating status (with sensing object approaching)	<input type="checkbox"/> <input type="checkbox"/> 3 models: NO <input type="checkbox"/> <input type="checkbox"/> 4 models: NC Refer to <i>Output Circuits and Timing Charts</i> for details				<input type="checkbox"/> <input type="checkbox"/> 3 models: NO <input type="checkbox"/> <input type="checkbox"/> 4 models: NC Refer to <i>Output Circuits and Timing Charts</i> for details							
Circuit protection	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% Storage : 35% to 95% (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 in rated voltage range ± 10%											
Insulation resistance	50 MΩ min. (at 500 VDC) between current carry parts and case											
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min. between current carry parts and case											
Vibration resistance	Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z direction											
Shock resistance	Destruction: 500 m/s ² 3 times each in X, Y, and Z direction											
Degree of protection	IEC60529 IP67											
Connection method	Pre-wired (standard length: 1 m)											
Weight (packed state)	Approx. 10 g											
Material	Polyallylate resin.											
Accessories	Mounting bracket											

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

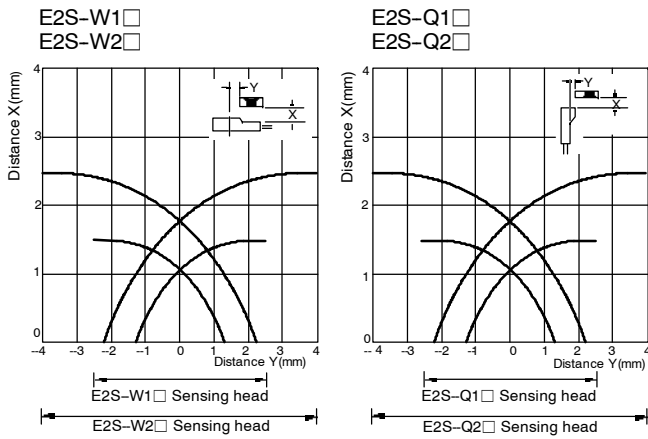
Operation status	Model	Timing charts	Output circuits
NO	E2S-W11 E2S-W21 E2S-Q11 E2S-Q21	<p>The timing chart for NO models shows a sensing object moving from a non-sensing zone through an unstable sensing zone to a stable sensing zone. The proximity sensor output is ON in the stable zone. The rated sensing distance is 80% (TYP) of the 100% distance. Output states: Setting indicator (green) is ON in the stable zone; Operation indicator (red) is ON in the stable zone; Control output is ON in the stable zone.</p>	<p>The output circuit diagram shows a main circuit with a transistor and a diode. The load is connected between the Brown (+V) and Blue (0V) terminals.</p> <p>The load can be connected both +V side and 0 V side</p>
NC	E2S-W12 E2S-W22 E2S-Q12 E2S-Q22	<p>The timing chart for NC models shows a sensing object moving from a non-sensing zone through a sensing zone. The proximity sensor output is ON in the sensing zone. The rated sensing distance is 100%. Output states: Operation indicator (red) is ON in the sensing zone; Control output is ON in the sensing zone.</p>	

DC 3-wire Models

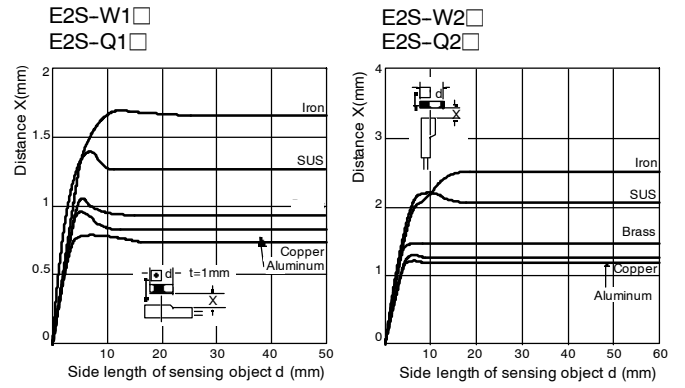
Operation status	Output configuration	Model	Timing charts	Output circuits
NO	NPN	E2S-W13 E2S-W23 E2S-Q13 E2S-Q23	<p>Sensing object: Yes (ON), No (OFF)</p> <p>Output transistor(load): ON (ON), OFF (OFF)</p> <p>Operation indicator(orange): ON (ON), OFF (OFF)</p>	<p>The output circuit diagram for NPN models shows the load connected between the Brown (+V) and Black (Output) terminals. The Blue terminal is 0V.</p> <p>Note: Maximum load current: 50 mA</p>
NC		E2S-W14 E2S-W24 E2S-Q14 E2S-Q24	<p>Sensing object: Yes (ON), No (OFF)</p> <p>Output transistor(load): ON (ON), OFF (OFF)</p> <p>Operation indicator(orange): ON (ON), OFF (OFF)</p>	
NO	PNP	E2S-W15 E2S-W25 E2S-Q15 E2S-Q25	<p>Sensing object: Yes (ON), No (OFF)</p> <p>Output transistor(load): ON (ON), OFF (OFF)</p> <p>Operation indicator(orange): ON (ON), OFF (OFF)</p>	<p>The output circuit diagram for PNP models shows the load connected between the Black (Output) and Blue (0V) terminals. The Brown terminal is +V.</p> <p>Note: Maximum load current: 50 mA</p>
NC		E2S-W16 E2S-W26 E2S-Q16 E2S-Q26	<p>Sensing object: Yes (ON), No (OFF)</p> <p>Output transistor(load): ON (ON), OFF (OFF)</p> <p>Operation indicator(orange): ON (ON), OFF (OFF)</p>	

Engineering Data

Operating Range(Typical)



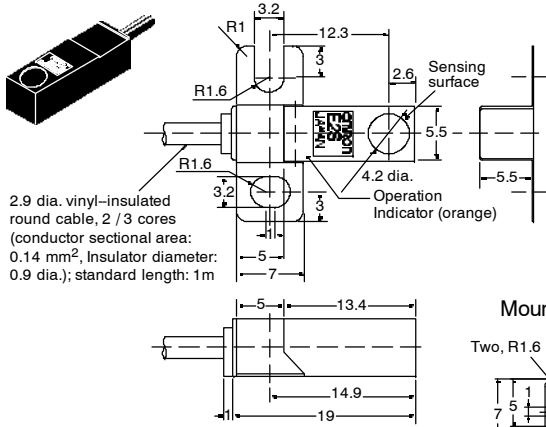
Sensing Object Size and Material vs. Sensing Distance(Typical)



Dimensions

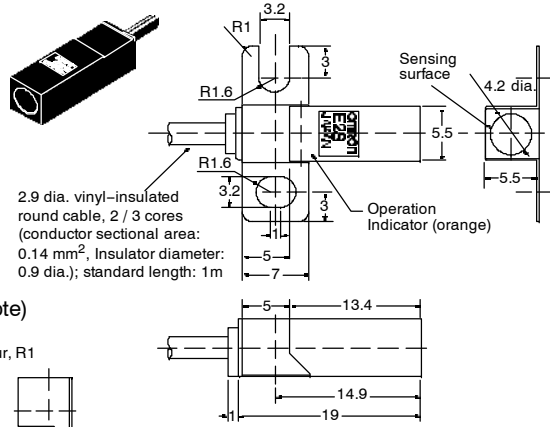
E2S-W1 □

With mounting bracket

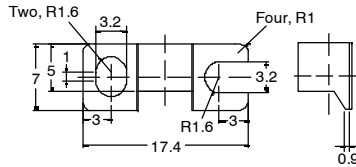


E2S-Q1 □

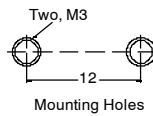
With mounting bracket



Mounting Bracket (see note)



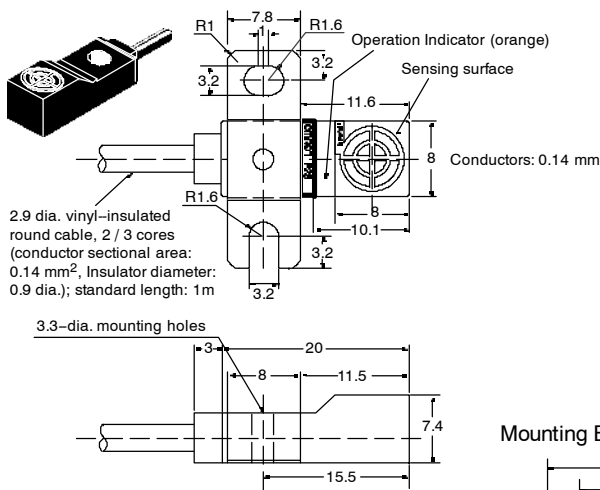
Material: Stainless steel (SUS304)



Note: Provided with E2S-W1 □, Q1 □

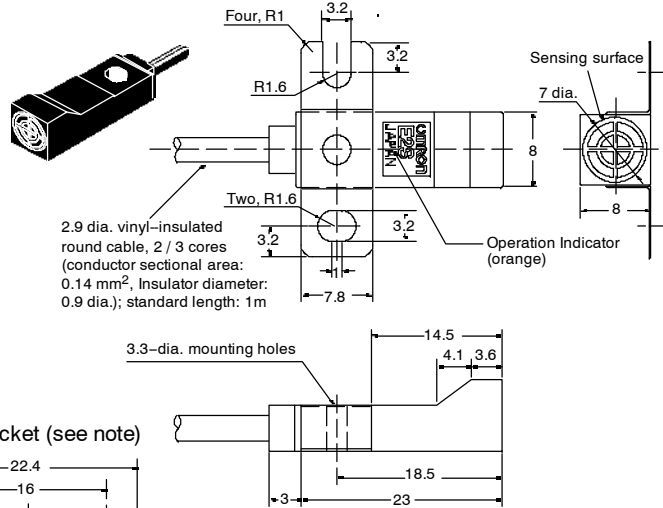
E2S-W2 □

With mounting bracket

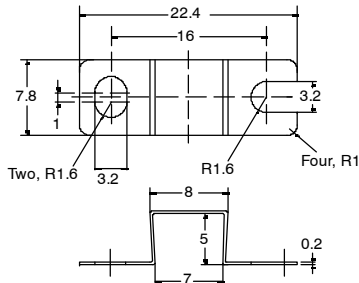


E2S-Q2 □

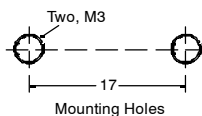
With mounting bracket



Mounting Bracket (see note)



Material: Stainless steel (SUS304)



Note: Provided with E2S-W2 □, Q2 □

Precautions

Be sure to heed the following precautions to fully utilize the capabilities of the Sensor.

General

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

Correct Use

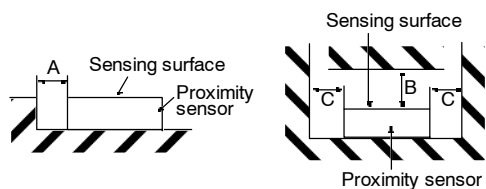
Installation

Effects of Surrounding Metals

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

Front face Sensing Type

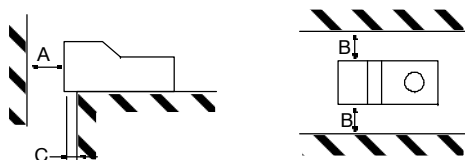
(Not Exceeding The Height of The Sensor Head)



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

(mm)

End face Sensing Type



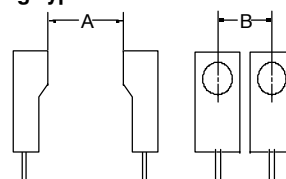
Model	A	B	C
E2S-Q1	8	3	2
E2S-Q2	15	10	3

(mm)

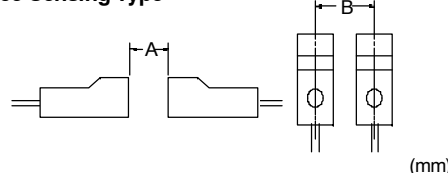
Mutual Interference

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

Front face Sensing Type



End face Sensing Type



Model	A	B
E2S-W(Q)1□	50 (40)	20 (5.5)
E2S-W(Q)2□	75 (50)	25 (8)

(mm)

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

Power Reset Time

The Sensor is ready to detect objects within 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 be 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.

Mounting

Mounting Conditions

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

Torque Exceeding

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

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.

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

Never disassemble or repair the sensor.

Environment

Water Resistivity

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

Operating Atmosphere

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-resistive construction, 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 (nitric acid, chromic acid, hot concentrated sulfuric acid).


ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E 902-E 1-1 In the interest of product improvement, specifications are subject to change without notice.

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