Miniature Cylindrical Proximity Sensor

E2E

High performance in small sizes

- pre-wired and M8 connector models
- 3 mm, 4 mm, 5.4 mm and M5 sizes
- response frequency up to 3 kHz

Ordering Information

Size		Sensing Distance	Connection	Housing Material	Output	Operation mode NO	Operation mode NC
dia 3 mm	shielded	0.6 mm	pre-wired	stainless steel	PNP	E2E-CR6B1	E2E-CR6B2
					NPN	E2E-CR6C1	E2E-CR6C2
dia 4 mm		0.8 mm	pre-wired		PNP	E2E-CR8B1	E2E-CR8B2
					NPN	E2E-CR8C1	E2E-CR8C2
			M8 connector		PNP	E2E-CR8B1-M5	E2E-CR8B2-M5
					NPN	E2E-CR8C1-M5	E2E-CR8C2-M5
M5		1 mm	pre-wired	brass	PNP	E2E-X1B1	E2E-X1B2
					NPN	E2E-X1C1	E2E-X1C2
			M8 connector		PNP	E2E-X1B1-M5	E2E-X1B2-M5
					NPN	E2E-X1C1-M5	E2E-X1C2-M5
dia 5.4 mm			pre-wired		PNP	E2E-C1B1	E2E-C1B2
					NPN	E2E-C1C1	E2E-C1C2

Specifications

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

Item		3 dia.	4 dia.	M5	5.4 dia.
	Type	Shielded			
Item		E2E-CR6C□/B□	E2E-CR8C□/B□	E2E-X1C□/B□	E2E-C1C□/B□
Sensing distance		0.6 mm ±15%	0.8 mm ±15%	1 mm ±15%	
Set distance		0 to 0.4 mm	0 to 0.5 mm	0 to 0.7 mm	
Differential travel		15% max. of sensing distance			
Sensing object		Ferrous metal (The sensing distance decreases with non-ferrous metal, refer to ***Engineering Data***.)			
Standard sensing object		Iron: 3x3x1 mm	Iron: 5x5x1 mm		
Response speed (See note.)		2 kHz	3 kHz		
Power supply voltage (operating voltage range)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.			
Current consumption		10 mA max.	17 mA max.		
Control output	**Load current**	Open-collector output, 80 mA max. (at 30 VDC max.)	Open-collector output 100 mA max. (at 30 VDC max.)		
	Residual voltage	1 VDC max. (Load current: 80 mA, Cable length: 2 m)	2 VDC max. (Load current: 100 mA , Cable length: 2 m)		
Indicator		Operation indicator (red LED)			
Operation mode (with sensing object approaching)		C1/-B1 Models:NO C2/-B2 Models:NC For details, refer to ***Timing Charts***.			
Protection circuits		Power supply reverse polarity protection, surge suppressor			
Ambient temperature		Operating/Storage: –25°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating/Storage: 35% to 95%			
Temperature influence		±15% max. of sensing distance at 23°C in the temperature range of –25°C to 70°C			
Voltage influence		±5% max. of sensing distance in the rated voltage range ±10%	±2.5% max. of sensing distance in the rated voltage range ±15%		
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case			
Dielectric strength		500 VAC at 50/60 Hz for 1 min between current-carrying 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		500 m/s^2 10 times each in X, Y, and Z directions			
Degree of protection		IEC 60529: IP66	IEC 60529 IP67 (Pre-wired models: JEM standard IP67g (waterproof, oil-proof))		
Connection method		Pre-wired models (standard length 2 m), connector models			
Weight (packed state)	**Pre-wired models**	Approx. 60 g			
	Connector models	—	Approx. 12 g	Approx. 15 g	—
Material	**Case**	Stainless steel (SUS303)		Brass-nickel plated	
	Sensing surface	Heat-resistant ABS			
	Clamping nuts	Brass-nickel plated			
	Toothed washer	Iron-zinc plated			
Accessories		Instruction manual			

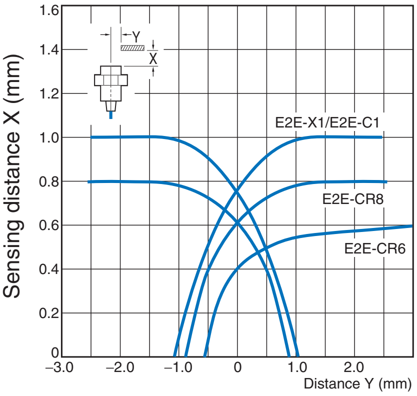
Note: The response speed is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

Engineering Data

Operating Range (Typical)

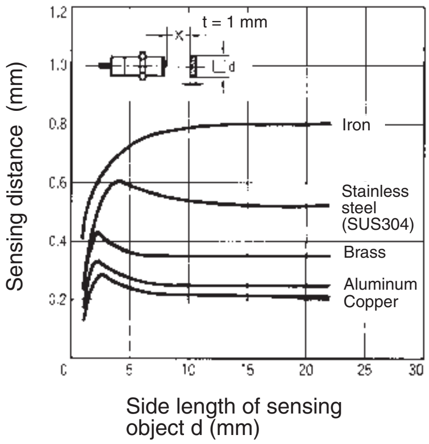
Shielded Models

E2E-C□C□/B□
E2E-X□C□/B□

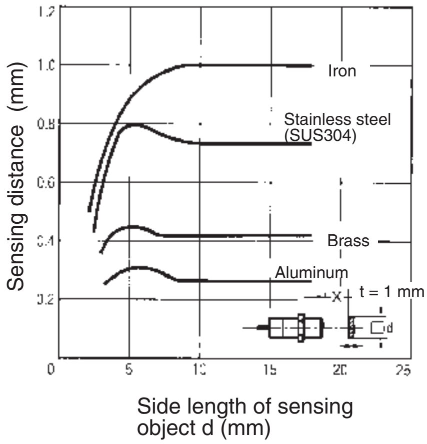


Sensing Distance vs. Sensing Object (Typical)

E2E-CR8□□



E2E-X1□□
E2E-C1□□

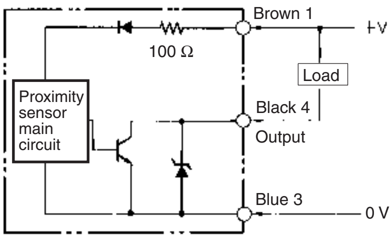


Output Circuits and Timing Charts

Output Circuits

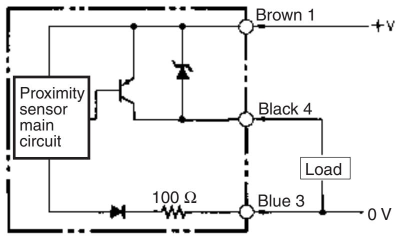
DC 3-wire Models

E2E-C/X□C□
NPN Open-collector Output



* Pin 4 is an NO contact, and pin 2 is an NC contact.

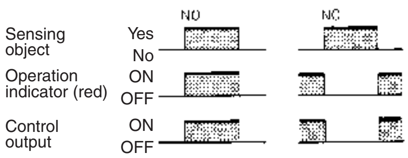
E2E-C/X□B□
PNP Open-collector Output



* Pin 4 is an NO contact, and pin 2 is an NC contact.

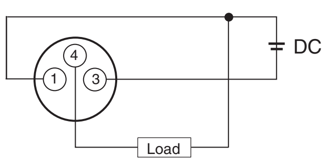
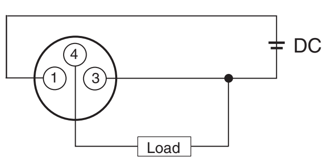
Timing Charts

E2E-C/X□C□/B□
NPN/PNP Open-collector Output



Pin Arrangement

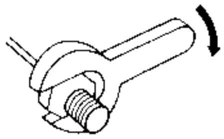
E2E-CR8C□/CR8B□/X1C□/X1B□-M5 DC 3-wire Models

Connector	Operation mode	Applicable models	Pin arrangement
M8-3pin	NO/NC	E2E-CR8C□-M5 E2E-X1C□-M5	
	NO/NC	E2E-CR8B□-M5 E2E-X1B□-M5	

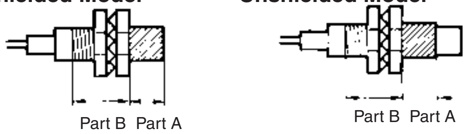
Precautions

Mounting

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



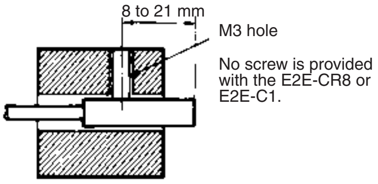
Shielded Model **Unshielded Model**



Note: 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.

Model	Part A		Part B
	Length	Torque	Torque
M5	1 N·m		

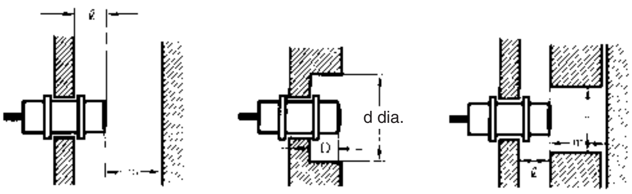
Refer to the following to mount the E2E-CR8 and E2E-C1 non-screw models.



Tighten the screw to a torque of 0.2 N·m maximum to secure the E2E-CR8 and a torque of 0.4 N·m maximum to secure the E2E-C1.

Effects of Surrounding Metal

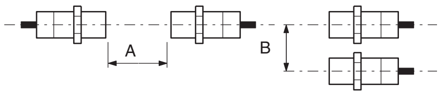
When mounting the E2E within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the sensor.



Model		Item	3 dia.	4 dia.	M5	5.4 dia.
E2E-X☐C☐ E2E-X☐B☐ E2E-C☐C☐ E2E-C☐B☐ DC 3-wire	Shielded	l	0 mm	0 mm	0 mm	0 mm
		d	3 mm	4 mm	5 mm	5.4 mm
		D	0 mm	0 mm	0 mm	0 mm
		m	2 mm	2.4 mm	3 mm	3 mm
		n	6 mm	6 mm	8 mm	8 mm

Mutual Interference

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



Model		Item	3 dia.	4 dia.	M5	5.4 dia.
E2E-X☐B☐ E2E-X☐C☐ E2E-C☐B☐ E2E-C☐C☐ DC 3-wire	Shielded	A	20 mm			
		B	15 mm			

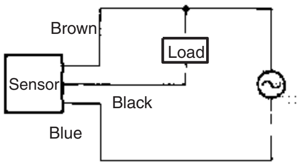
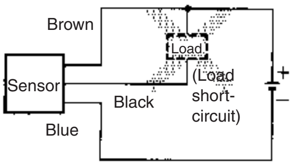
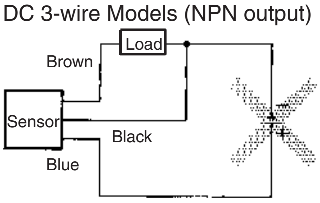
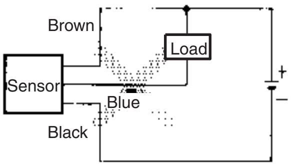
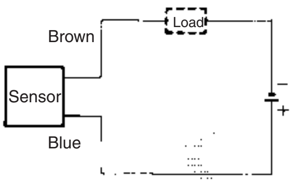
Note: Values in parentheses apply to Sensors operating at different frequencies.

⚠ WARNING

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

Precautions for Safe Use

The colors in parentheses are previous wire colors.

Item	Examples
Power supply Do not impose an excessive voltage on the E2E, otherwise it may explode or burn. Do not impose 100 VAC on any E2E DC Model, otherwise it may explode or burn.	DC 3-wire Models  **Incorrect**
Load short-circuit Do not short-circuit the load, or the E2E may explode or burn. The E2E's short-circuit protection function is valid if the polarity of the supply voltage imposed is correct and within the rated voltage range.	DC 3-wire Models (NPN output)  **Incorrect**
Wiring Be sure to wire the E2E and load correctly, otherwise it may explode or burn.	DC 3-wire Models (NPN output)  **Incorrect**  **Incorrect**
Connection with no load Make sure to connect a proper load to the E2E in operation, otherwise it may explode or burn.	DC 3-wire Models  **Incorrect**

Precautions for Correct Use

Installation

Power Reset Time

The Proximity Sensor is ready to operate within 100 ms after power is supplied. If power supplies are connected to the Proximity Sensor and load respectively, be sure to supply power to the Proximity Sensor before supplying power to the load.

Power OFF

The Proximity Sensor may output a pulse signal when it is turned OFF. Therefore, it is recommended to turn OFF the load before turning OFF the Proximity Sensor.

Power Supply Transformer

When using a DC power supply, make sure that the DC power supply has an insulated transformer. Do not use a DC power supply with an auto-transformer.

Sensing Object

Metal Coating:
The sensing distances of the Proximity Sensor vary with the metal coating on sensing objects.

Wiring

High-tension Lines

Wiring through Metal Conduit
If there is a power or high-tension line near the cable of the Proximity Sensor, wire the cable through an independent metal conduit to prevent against Proximity Sensor damage or malfunctioning.

Cable Tractive Force

Do not pull on cables with tractive forces exceeding the following.

Diameter	Tractive force
4 dia. max.	30 N max.
4 dia. min.	50 N max.

Mounting

The Proximity Sensor must not be subjected to excessive shock with a hammer when it is installed, otherwise the Proximity Sensor may be damaged or lose its water-resistivity.

Environment

Water Resistivity

Do not use the Proximity Sensor underwater, outdoors, or in the rain.

Operating Environment

Be sure to use the Proximity Sensor within its operating ambient temperature range and do not use the Proximity Sensor outdoors so that its reliability and life expectancy can be maintained. Although the Proximity Sensor is water resistive, a cover to protect the Proximity Sensor from water or water soluble machining oil is recommended so that its reliability and life expectancy can be maintained.

Do not use the Proximity Sensor in an environment with chemical gas (e.g., strong alkaline or acid gasses including nitric, chromic, and concentrated sulfuric acid gases).

Connection to a PLC

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 is not listed in the specifications, take it to be 1.3 mA.)
3. The ON current of the PLC and the control output (I_{OUT}) of the Proximity Sensor must satisfy the following.
   $I_{OUT(min)} \leq I_{ON} \leq I_{OUT(max)}$
   The ON current of the PLC will vary, however, with the power supply voltage and the input impedance used as shown in the following equation.
   $I_{ON} = (V_{CC} - V_R - V_{PC})/R_{IN}$

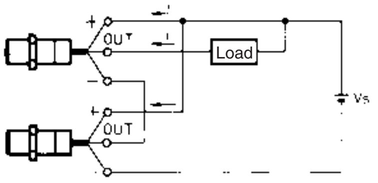
Example

In this example, the above conditions are checked for when the PLC model is the C200H-ID212, the Proximity Sensor model is the E2E-X7D1-N, and the power supply voltage is 24 V.

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} (0.8 mA): OK
3. I_{ON} = [V_{CC} (20.4 V) – V_R (3 V) – V_{PC} (4 V)]/R_{IN} (3 kΩ)
   ≈ 4.5 mA
   Therefore,
   $I_{OUT(min)}$ (3 mA) $\leq$ I_{ON} (4.5 mA): OK

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

Note: please refer to complete E2E/E2E2 datasheet for details on E2E-X7D1-N

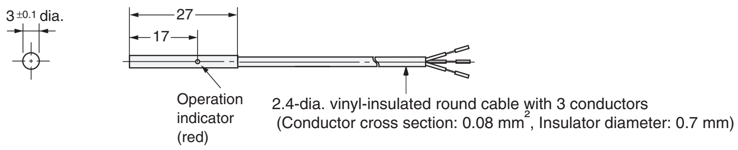
Model	Connection type	Method	Description
DC 3-wire	AND (serial connection)	**Correct** 	The Sensors connected together must satisfy the following conditions. i_L + (N –1) x i ≤ Upper-limit of control output of each Sensor V_S – N x V_R ≥ Load operating voltage N: No. of Sensors V_R: Residual voltage of each Sensor V_S: Supply voltage i: Current consumption of the Sensor i_L: Load current If the MY Relay, which operates at 24 VDC, is used as a load for example, a maximum of two Proximity Sensors can be connected to the load.

Dimensions

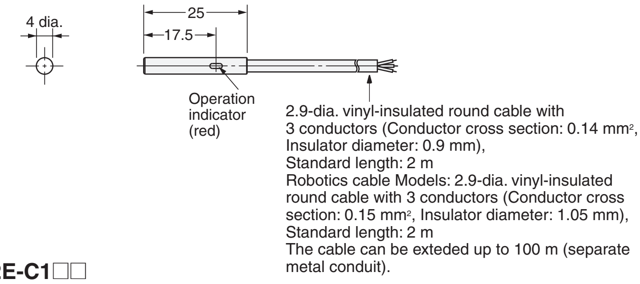
Note: All units are in millimeters unless otherwise indicated.

Pre-wired Models (Shielded)

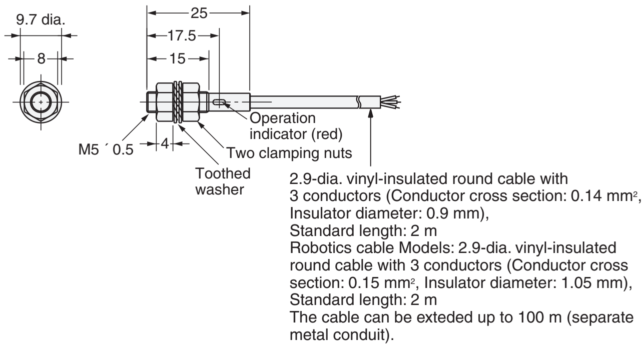
E2E-CR6□□



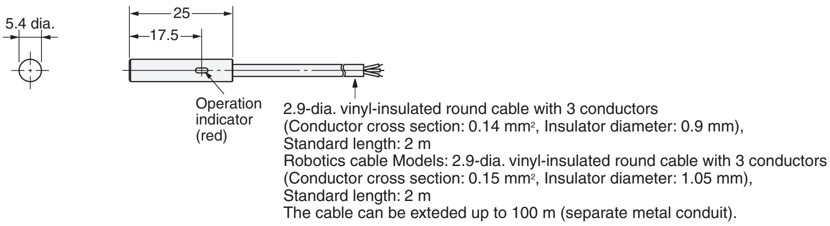
E2E-CR8□□



E2E-X1□□

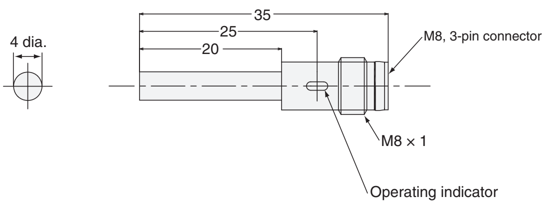


E2E-C1□□

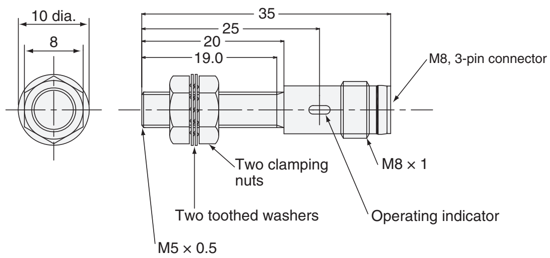


M8 (3 pin) Connector Models (Shielded)

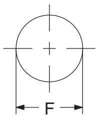
E2E-CR8□□-M5



E2E-X1□□-M5



Mounting Holes



Dimensions	3 dia.	4 dia.	M5	5.4 dia.
F (mm)	$3.3^{+0.3}_{0}$ dia.	$4.2^{+0.5}_{0}$ dia.	$5.5^{+0.5}_{0}$ dia.	$5.7^{+0.5}_{0}$ dia.

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Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

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

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. D11E-EN-02A In the interest of product improvement, specifications are subject to change without notice.

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To access the product, click on the green button.

Product	Code	Reference	Product link
Proximity sensor, inductive, 4mm dia, shielded, 0.8mm, DC, 3-wire, NPN-NO, 2m cable	103844	E2E-CR8C1	Buy on EAN
Proximity sensor	133304	E2E-X1C2	Buy on EAN
Proximity sensor, inductive, 4mm dia, shielded, 0.8mm, DC, 3-wire, PNP-NO, 2m cable	133325	E2E-CR8B1	Buy on EAN
Proximity sensor, inductive, M5, shielded, 1mm, DC, 3-wire, PNP-NO, 2m cable	133327	E2E-X1B1	Buy on EAN
Proximity sensor, inductive, 5.4mm dia, shielded, 1mm, DC, 3-wire, PNP-NO, 2m cable	133328	E2E-C1B1	Buy on EAN
Proximity sensor	149280	E2E-X1B2	Buy on EAN
Proximity sensor, inductive, 5.4mm dia, shielded, 1mm, DC, 3-wire, NPN-NO, 2m cable	150350	E2E-C1C1	Buy on EAN
Proximity sensor, inductive, M5, shielded, 1mm, DC, 3-wire, NPN-NO, 2m cable	157043	E2E-X1C1	Buy on EAN
Proximity sensor, inductive, 4mm dia, shielded, 0.8mm, DC, 3-wire, PNP-NO, M8 connector	183173	E2E-CR8B1-M5	Buy on EAN
Proximity sensor, inductive, M5, shielded, 1mm, DC, 3-wire, PNP-NO, M8 connector (3 pin)	183177	E2E-X1B1-M5	Buy on EAN
Proximity sensor, inductive, M5, shielded, 1mm, DC, 3-wire, NPN-NO, M8 connector (3 pin)	183178	E2E-X1C1-M5	Buy on EAN
Proximity sensor, inductive, M5, shielded, 1mm, DC, 3-wire, PNP-NC, M8 connector	183179	E2E-X1B2-M5	Buy on EAN
Proximity sensor	183175	E2E-CR8B2-M5	Buy on EAN
	133303	E2E-CR8C2	Buy on EAN

	133326	E2E-CR8B2	Buy on EAN
Proximity sensor, inductive	183180	E2E-X1C2-M5	Buy on EAN