

Cylindrical Inductive Long-Distance Proximity Sensors



PRD Series (DC 2-wire) PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Spatter-resistant type
: PTFE coated for high heat resistance (prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)
- Strain relief cables
: improved flexural strength of cable connecting component
(except DIA. of sensing side \varnothing 8 mm)

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- \triangle symbol indicates caution due to special circumstances in which hazards may occur.

\triangle Warning Failure to follow instructions may result in serious injury or death.

- 01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- 05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

\triangle Caution Failure to follow instructions may result in injury or product damage.

- 01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
- 03. Do not supply power without load.**
Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 12 - 24 VDC power supply should be insulated and limited voltage / current or Class 2, SELV power supply device.
- Use the product, after 0.8 sec of supplying power.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
Do not use near the equipment which generates strong magnetic force or high frequency noise (transceiver, etc.).
In case installing the product near the equipment which generates strong surge (motor, welding machine, etc.), use diode or varistor to remove surge.
- If the surface is rubbed with a hard object, PTFE coating can be worn out.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II

Cautions for Installation

- Install the unit correctly with the usage environment, location, and the designated specifications.
- Do NOT impacts with a hard object or excessive bending of the wire lead-out. It may cause damage the water resistance.
- Do NOT pull the \varnothing 3.5 mm cable with a tensile strength of 25 N, the \varnothing 4 mm cable with a tensile strength of 30 N or over and the \varnothing 5 mm cable with a tensile strength of 50 N or over. It may result in fire due to the broken wire.
- When extending wire, use AWG 22 cable or over within 200 m.

Ordering Information

This is only for reference, the actual product does not support all combinations. For selecting the specified model, follow the Autonics website.

PRD ① ② ③ ④ ⑤ - ⑥ ⑦ ⑧ - ⑨

① Characteristic

No mark: General type
A: Spatter-resistant type

② Connection

No mark: Cable type
W: Cable connector type
CM: Connector type

③ Body length

No mark: Normal
L: Long

④ Wire connection

T: DC 2-wire

⑤ DIA. of sensing side

Number: DIA. of sensing side (unit: mm)

⑥ Sensing distance

Number: Sensing distance (unit: mm)

⑦ Power supply

D: 12 - 24 VDC=
X: 12 - 24 VDC=
(non-polarity)

⑧ Control output

O: Normally open
C: Normally closed

⑨ Cable

No mark: Standard type
I: Standard type (IEC standards)
V: Oil resistant cable type
IV: Oil resistant cable type (IEC standards)

Product Components

- Product × 1
- Instruction manual × 1
- Nut × 2
- Washer × 1

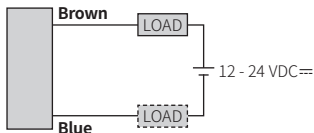
Sold Separately

- M12 Connector cable: C□D(H)2-□ (C□D(H)2-□-I)
- Spatter protection cover: P90-M□
- Fixing bracket: P90-R□

Connections

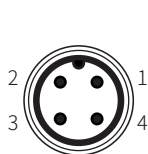
- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.
- No need to consider polarity for non-polarity type of power supply.

■ Cable type



■ Cable connector type / Connector type

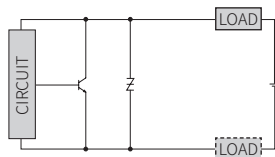
- For LOAD connection, follow the cable type connection.
- Fasten the connector not to shown the thread. (0.39 to 0.49 N m)
- Fasten the vibration part with PTFE tape.



Standard type		
Pin	Color	Func.
①	-	-
②	-	-
③	Blue	0V
④	Brown	+V

IEC standards					
Pin	Normally open		Normally close		
	Color	Func.	Color	Func.	
①	Brown	+V	Brown	+V	
②	-	-	Blue	0V	
③	-	-	-	-	
④	Blue	0V	-	-	

■ Inner circuit



Operation Timing Chart

	Normally open	Normally closed
Sensing target	Presence Nothing	Presence Nothing
Load	Operation Return	Operation Return
Operation indicator (red)	ON OFF	ON OFF

Specifications

Installation	Flush type			
General	PRD□T08-2□	PRD□T12-4□	PRD□T18-7□	PRD□T30-15□
Spatter-resistant	-	PRDA□T12-4□	PRDA□T18-7□	PRDA□T30-15□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	2 mm	4 mm	7 mm	15 mm
Setting distance	0 to 1.4 mm	0 to 2.8 mm	0 to 4.9 mm	0 to 10.5 mm
Hysteresis	≤ 15% of sensing distance	≤ 10% of sensing distance		
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	20 × 20 × 1 mm	45 × 45 × 1 mm
Response frequency ⁰¹⁾	1 kHz	450 Hz	250 Hz	100 Hz
Affection by temperature	≤ ± 10% for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15%)			
Indicator	Operation indicator (red)			
Approval	CE	CE	CE	CE

Installation	Non-flush type			
General	PRD□T08-4□	PRD□T12-8□	PRD□T18-14□	PRD□T30-25□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	4 mm	8 mm	14 mm	25 mm
Setting distance	0 to 2.8 mm	0 to 5.6 mm	0 to 9.8 mm	0 to 17.5 mm
Hysteresis	≤ 15% of sensing distance	≤ 10% of sensing distance		
Standard sensing target: iron	12 × 12 × 1 mm	25 × 25 × 1 mm	40 × 40 × 1 mm	75 × 75 × 1 mm
Response frequency ⁰¹⁾	800 Hz	400 Hz	200 Hz	100 Hz
Affection by temperature	≤ ± 10% for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15%)			
Indicator	Operation indicator (red)			
Approval	CE	CE	CE	CE

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Unit weight (package) ⁰¹⁾		Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	Normal	≈ 43 g (≈ 63 g)	≈ 62 g (≈ 74 g)	≈ 97 g (≈ 115 g)	≈ 143 g (≈ 180 g)
	Long	-	≈ 72 g (≈ 84 g)	≈ 122 g (≈ 134 g)	≈ 221 g (≈ 184 g)
Cable connector	Normal	≈ 25 g (≈ 45 g)	≈ 32 g (≈ 55 g)	≈ 62 g (≈ 80 g)	≈ 130 g (≈ 145 g)
	Long	-	≈ 42 g (≈ 54 g)	≈ 65 g (≈ 77 g)	≈ 143 g (≈ 155 g)
Connector	Normal	≈ 10 g (≈ 32 g)	≈ 20 g (≈ 50 g)	≈ 42 g (≈ 60 g)	≈ 110 g (≈ 150 g)
	Long	-	≈ 26 g (≈ 38 g)	≈ 49 g (≈ 61 g)	≈ 134 g (≈ 146 g)

01) In case of normal body length, it is written in General type. In case of long body length, it is only available general type.

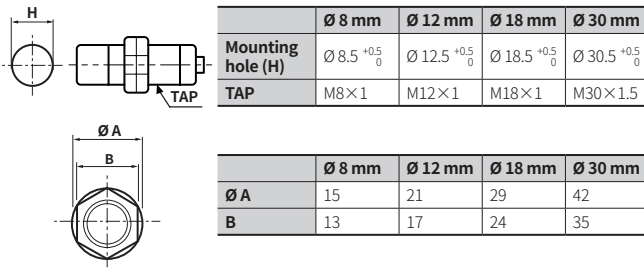
Power supply	12 - 24 VDC= (ripple P-P: ≤ 10%), operating voltage: 10 - 30 VDC= DIA. of sensing side Ø 8 mm: ≤ 0.8 mA DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: ≤ 0.6 mA
Leakage current	DIA. of sensing side Ø 8 mm: ≤ 0.8 mA DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: ≤ 0.6 mA
Control output	2 to 100 mA
Residual voltage ⁰¹⁾	≤ 3.5 V (Non-polarity: ≤ 5 V)
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	≥ 50 MΩ (500 VDC= megger)
Dielectric strength	DIA. of sensing side Ø 8 mm : 1,000 VAC ~ 50/60 Hz for 1 min (between the charging part and the case) (connector type: 1,500 VAC ~ 50/60 Hz for 1 min (between the charging part and the case)) DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm : 1,500 VAC ~ 50/60 Hz for 1 min (between the charging part and the case)
Vibration	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	500 m/s ² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
Protection structure	IP67 (IEC standards)
Connection	Cable type / Cable connector type / Connector type model
Cable spec. ⁰²⁾	DIA. of sensing side Ø 8 mm: Ø 3.5 mm, 2-wire DIA. of sensing side Ø 12 mm: Ø 4 mm, 2-wire DIA. of sensing side Ø 18 mm, Ø 30 mm: Ø 5 mm, 2-wire
Wire spec.	Ø 3.5 mm cable: AWG 24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm Ø 4 mm, Ø 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Connector spec.	M12 connector
Material	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC)
General	Case/Nut: nickel plated brass (DIA. of sensing side Ø 8 mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
Spatter-resistant	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Check the condition of connected device.

02) Cable type: 2 m, Cable connector type: 300 mm

Cut-out Dimensions

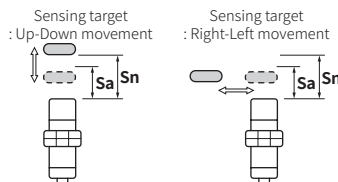
• Unit: mm, For the detailed drawings, follow the Autonics web site.



Setting Distance Formula

Detecting distance can be changed by the shape, size or material of the target. For stable sensing, install the unit within the 70% of sensing distance.

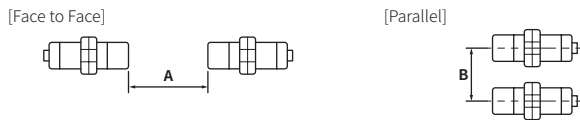
Setting distance (Sa)
= Sensing distance (Sn) × 70%



Mutual-interference & Influence by Surrounding Metals

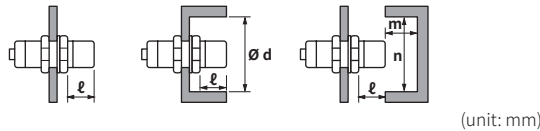
■ Mutual-interference

When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference. Therefore, be sure to provide a minimum distance between the two sensors, as below table.



■ Influence by surrounding metals

When sensors are mounted on metallic panel, it must be prevented sensors from being affected by any metallic object except target. Therefore, be sure to provide a minimum distance as below chart.



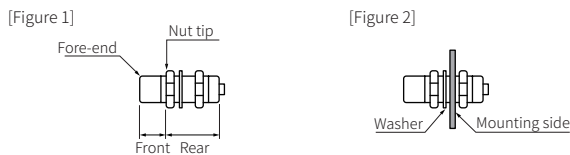
(unit: mm)

Sensing side	Ø 8 mm		Ø 12 mm		Ø 18 mm		Ø 30 mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
A	20	80	25	120	50	200	110	350
B	15	60	25	100	35	110	90	300
ℓ	0	12	2.5	15	3.5	14	6	20
Ø d	8	24	18	40	27	70	45	120
m	6	8	12	20	24	40	45	90
n	12	24	18	40	27	70	45	120

Tightening Torque

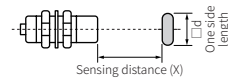
Use the provided washer to tighten the nuts.

The tightening torque of the nut varies with the distance from the fore-end. [Figure 1] If the nut tip is located at the front of the product, apply the front tightening torque. the allowable tightening torque table is for inserting the washer as [Figure 2].



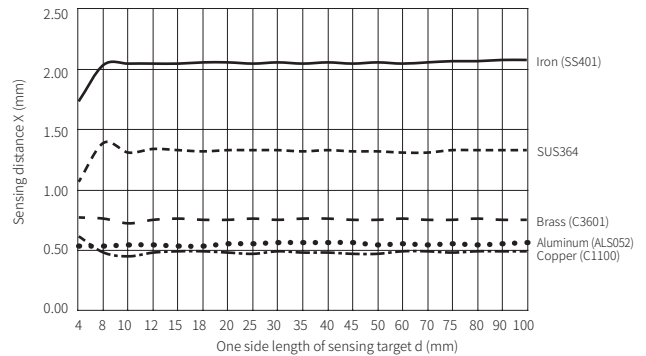
Sensing side	Ø 8 mm		Ø 12 mm		Ø 18 mm		Ø 30 mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
Strength								
Front size	7 mm	5 mm	13 mm	7 mm	-	-	26 mm	12 mm
Front torque	3.92 N m		6.37 N m		14.7 N m		49 N m	
Rear torque	8.82 N m		11.76 N m		14.7 N m		78.4 N m	

Sensing Distance Feature Data by Target Material and Size

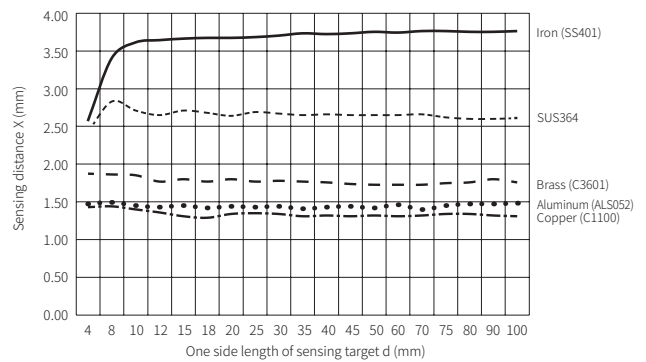


■ Flush + General type

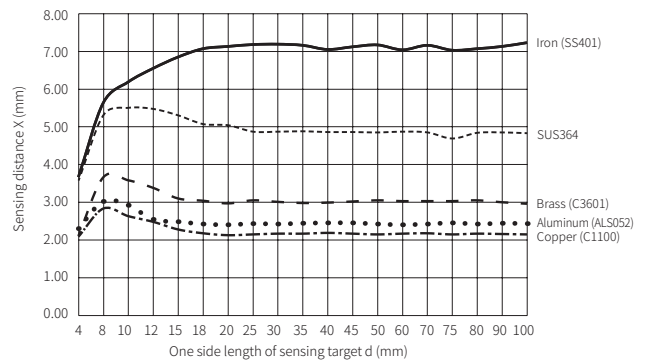
• Ø 8 mm



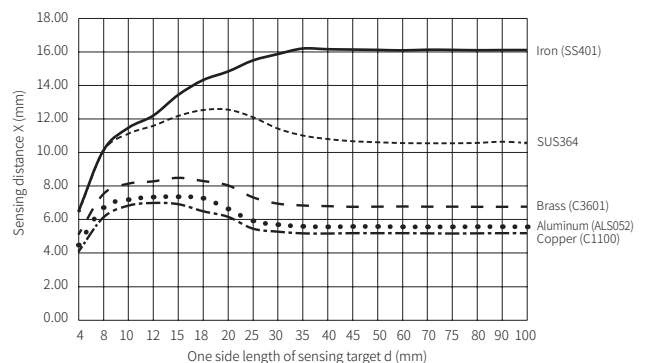
• Ø 12 mm



• Ø 18 mm

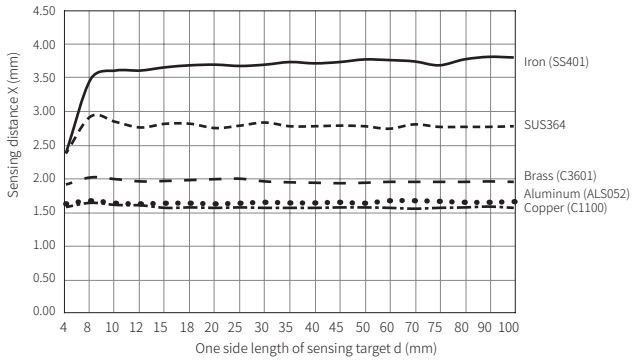


• Ø 30 mm

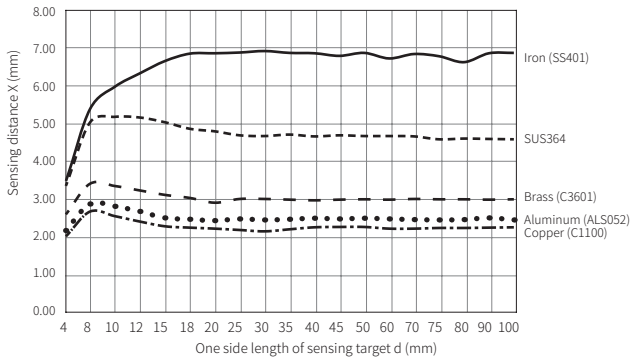


■ Flush + Spatter-resistant type

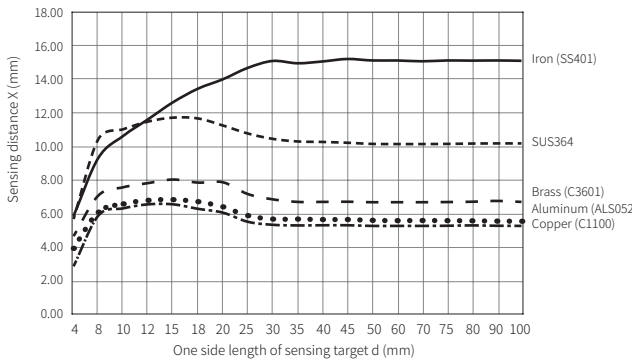
• Ø 12 mm



• Ø 18 mm

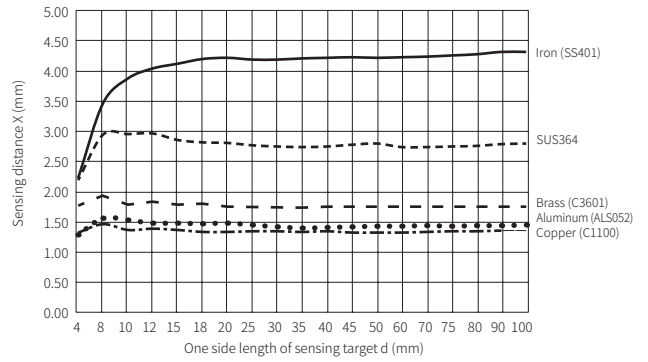


• Ø 30 mm

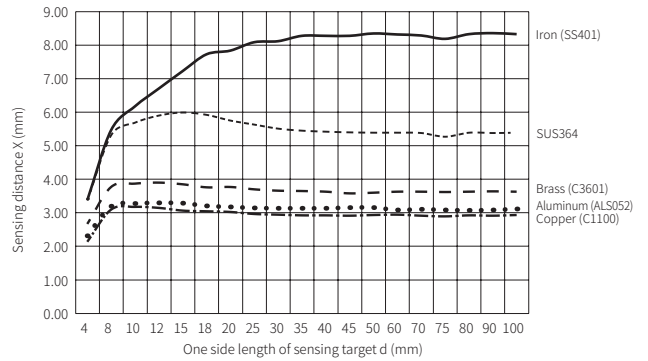


■ Non-flush + General type

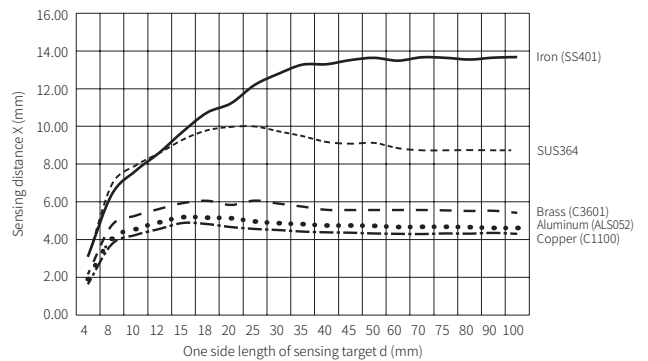
• Ø 8 mm



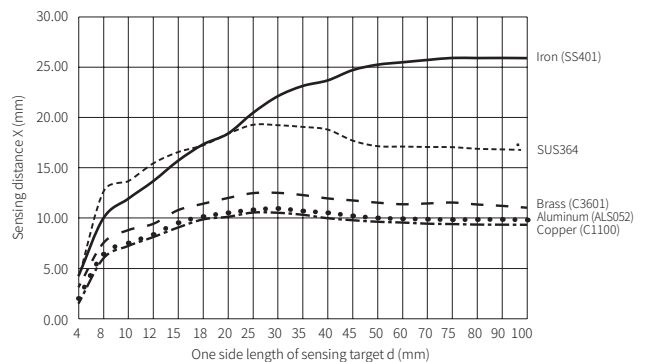
• Ø 12 mm



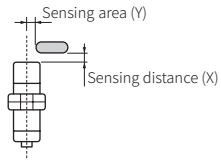
• Ø 18 mm



• Ø 30 mm



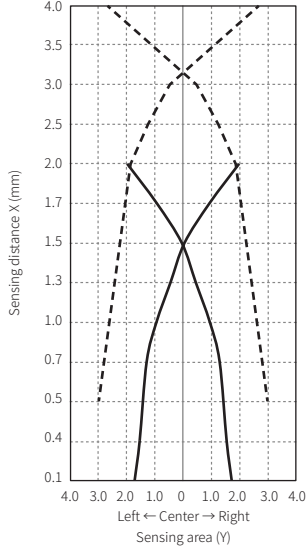
Sensing Distance Feature Data by Parallel (left/right) Movement



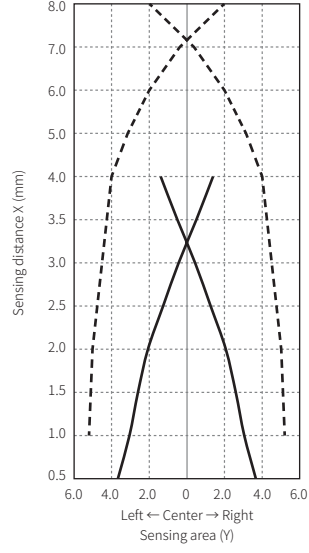
—	Flush type
- - -	Non-flush type

General type

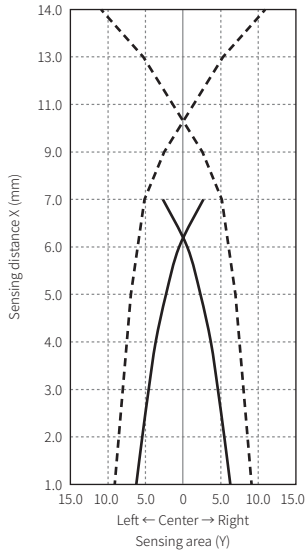
• Ø 8 mm



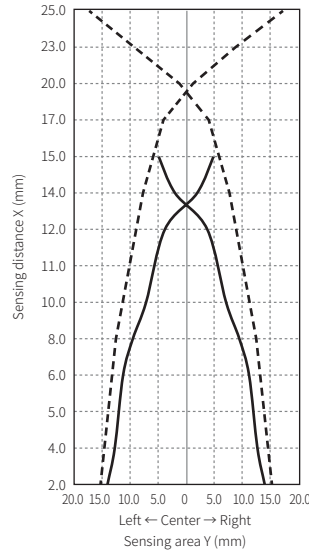
• Ø 12 mm



• Ø 18 mm

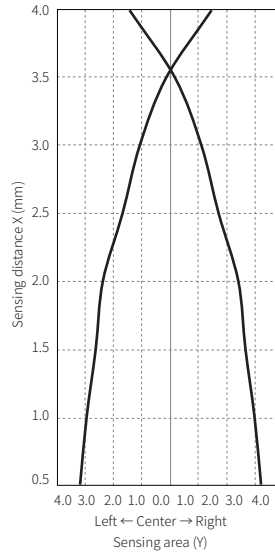


• Ø 30 mm

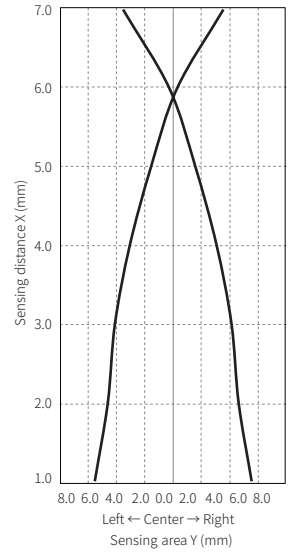


Spatter-resistant type

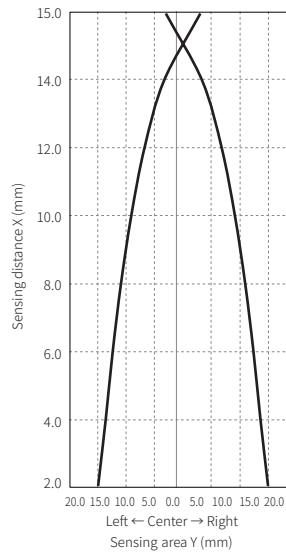
• Ø 12 mm



• Ø 18 mm



• Ø 30 mm



Sold Separately: M12 Connector Cable

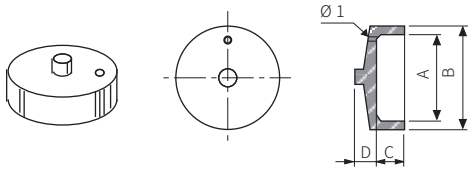
• For detailed information, refer to the 'M8/M12 Connector Cable' manual.

Appearance	Power	Connector 1	Connector 2	Length	Feature	Model
	DC	M12 (Socket-Female) 4-pin	2-wire	2 m	PVC	CID2-2
				5 m		CID2-2-1
	DC	M12 (Socket-Female) 4-pin	2-wire	2 m	Oil resistant PVC	CIDH2-2
				5 m		CIDH2-2-1
	DC	M12 (Socket-Female) 4-pin, L type	2-wire	2 m	PVC	CLD-2-2
				5 m		CLD-2-2-1
	DC	M12 (Socket-Female) 4-pin, L type	2-wire	2 m	Oil resistant PVC	CLD-2-5
				5 m		CLD-2-5-1
	DC	M12 (Socket-Female) 4-pin, L type	2-wire	2 m	Oil resistant PVC	CLDH2-2
				5 m		CLDH2-2-1
	DC	M12 (Socket-Female) 4-pin, L type	2-wire	2 m	Oil resistant PVC	CLDH2-5
				5 m		CLDH2-5-1

Sold Separately: Protection Cover (P90-M□)

The welding tip (spatter) generated during arc welding has a property of sticking to plastics and metals. If several welding tips are attached to the front or body of the proximity sensor, it may be difficult to replace the body or cause a malfunction.

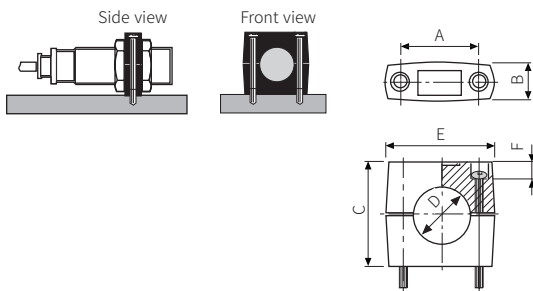
When using a general type proximity sensor, use a silicone protective cover (sold separately). Only for flush (shield) type.



Item (mm)	Model	P90-M12	P90-M18	P90-M30
A		Ø 11	Ø 17	Ø 28.5
B		Ø 14	Ø 21	Ø 33
C		5.0	6.0	8.0
D		1.0	3.0	6.0
Applied sensing side size		M12	M18	M30

Sold Separately: Fixing Bracket (P90-R□)

If fixing holes are not made for cylindrical proximity sensor, use a cylindrical fixing bracket as below. For Non-flush (non-shield) type, be sure effect by ambient material.



Item (mm)	Model	P90-R12	P90-R18	P90-R30
A		24 ± 0.2	32 ± 0.2	45 ± 0.2
B		≤ 11.5	≤ 16	≤ 16
C		20	30	50
D		Ø 12	Ø 18	Ø 30
E		≤ 34.4	≤ 47	≤ 60
F		6.0	10	10
Fixing bolt		M4 × 20	M5 × 30	M5 × 50
Applied sensing side size		M12	M18	M30