# Cylindrical Inductive Long-Distance Proximity Sensors

## PRD Series (DC 3-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.

## Major 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 Ø 8 mm )

## Safety Considerations

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

**⚠ 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.

**⚠ 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.

## 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 Ø 3.5 mm cable with a tensile strength of 25 N, the Ø 4 mm cable with a tensile strength of 30 N or over and the Ø 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 ❶ ❷ ❸ ❹ - ❺ D ❻ - ❼

**❶ Characteristic**
No mark: General type
A: Spatter-resistant type

**❷ Connection**
No mark: Cable type
W: Cable connector type
CM: Connector type

**❸ Body length**
No mark: Normal
L: Long

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

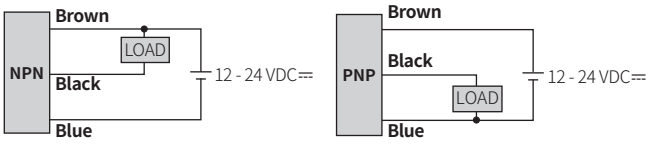
**❺ Sensing distance**
Number: Sensing distance (unit: mm)

**❻ Control output**
N: NPN Normally open
N2: NPN Normally closed
P: PNP Normally open
P2: PNP Normally closed

**❼ Cable**
No mark: Standard type
V: Oil resistant cable type

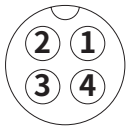
## Connections

### ■ Cable type



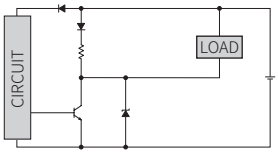

### ■ Cable connector type / Connector type

- 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.

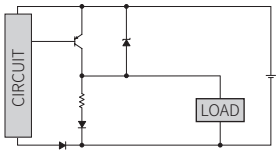



| Pin | Color | Function |
|---|---|---|
| ① | Brown | +V |
| ② | - | - |
| ③ | Blue | 0 V |
| ④ | Black | OUT |

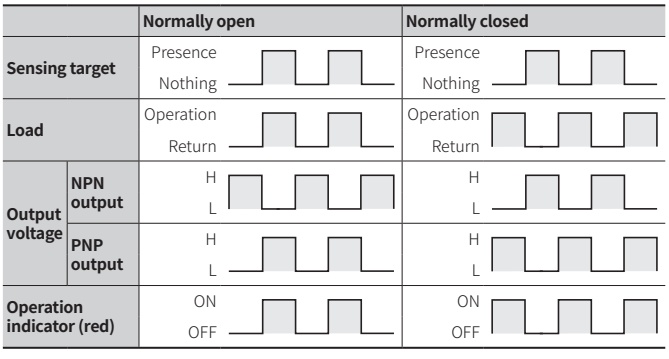
### ■ Inner circuit (NPN output)




### ■ Inner circuit (PNP output)




## Operation Timing Chart




## Sold Separately

- Connector cable, connector connection cable
- Transmission coupler
- Spatter protection cover
- Fixed bracket

## Specifications

| Installation | Flush type | | | |
|---|---|---|---|---|
| General | PRD□08-2D□ | PRD□12-4D□ | PRD□18-7D□ | PRD□30-15D□ |
| Spatter-resistant | - | PRDACM12-4D□ | PRDACM18-7D□ | PRDACM30-15D□ |
| 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 | 500 Hz | 300 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 EAC | CE EAC | CE EAC | CE EAC |

| Installation | Non-flush type | | | |
|---|---|---|---|---|
| General | PRD□08-4D□ | PRD□12-8D□ | PRD□18-14D□ | PRD□30-25D□ |
| DIA. of sensing side | Ø 8 mm | Ø 12 mm | Ø 18 mm | Ø 30 mm |
| Setting distance | 0 to 2.8 mm | 0 to 5.6 mm | 0 to 9.8 mm | 0 to 17.5 mm |
| Sensing distance | 4 mm | 8 mm | 14 mm | 25 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 EAC | CE EAC | CE EAC | CE EAC |

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.

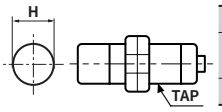
| Unit weight (package) | | Ø 8 mm | Ø 12 mm | Ø 18 mm | Ø 30 mm |
|---|---|---|---|---|---|
| Cable | Normal | ≈ 43 g (≈ 63 g) | ≈ 62 g (≈ 74 g) | ≈ 97 g (≈ 115 g) | ≈ 143 g (≈ 180 g) |
| | Long | - | ≈ 82 g (≈ 94 g) | ≈ 127 g (≈ 145 g) | ≈ 183 g (≈ 220 g) |
| Cable connector | Normal | ≈ 25 g (≈ 45 g) | ≈ 37 g (≈ 67 g) | ≈ 62 g (≈ 80 g) | ≈ 108 g (≈ 145 g) |
| | Long | - | ≈ 32 g (≈ 55 g) | ≈ 92 g (≈ 110 g) | ≈ 130 g (≈ 203 g) |
| Connector | Normal | ≈ 12 g (≈ 32 g) | ≈ 20g (≈ 49 g) | ≈ 41 g (≈ 81 g) | ≈ 138 g (≈ 197 g) |
| | Long | - | ≈ 24 g (≈ 54 g) | ≈ 60 g (≈ 78 g) | ≈ 193 g (≈ 252 g) |

| | |
|---|---|
| Power supply | 12 - 24 VDC⎓ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC⎓ |
| Current consumption | ≤ 10 mA |
| Control output | ≤ 200 mA |
| Residual voltage | DIA. of sensing side Ø 8mm: ≤ 2 V<br>DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: ≤ 1.5 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 8mm<br>: 1,000 VAC~ 50/60 Hz for 1 min (between all terminals and case)<br>(connector type: 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case))<br>DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm<br>: 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case) |
| Vibration | 1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours |
| Shock | 500 m/s² (≈ 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 01) / Cable connector type 01) / Connector type model |
| Cable spec. 02) | DIA. of sensing side Ø 8 mm: Ø 3.5 mm, 3-wire<br>DIA. of sensing side Ø 12 mm: Ø 4 mm, 3-wire<br>DIA. of sensing side Ø 18 mm, Ø 30 mm: Ø 5 mm, 3-wire |
| Wire spec. | Ø 3.5 mm cable : AWG 24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm<br>Ø 4 mm, Ø 5 mm cable<br>: 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)<br>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 |

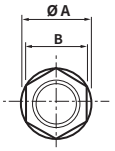
01) Except spatter-resistant type
02) Cable type: 2 m, Cable connector type: 300 mm

## Cut-out Dimensions

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




| | Ø 8 mm | Ø 12 mm | Ø 18 mm | Ø 30 mm |
|---|---|---|---|---|
| Mounting hole (H) | Ø 8.5 $^{+0.5}_{0}$ | Ø 12.5 $^{+0.5}_{0}$ | Ø 18.5 $^{+0.5}_{0}$ | Ø 30.5 $^{+0.5}_{0}$ |
| TAP | M8×1 | M12×1 | M18×1 | M30×1.5 |

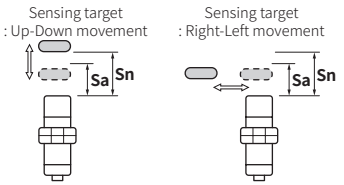



| | Ø 8 mm | Ø 12 mm | Ø 18 mm | Ø 30 mm |
|---|---|---|---|---|
| Ø A | 15 | 21 | 29 | 42 |
| B | 13 | 17 | 24 | 35 |

## 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%**



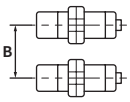

## Mutual-interference & Influence by Surrounding Metals

### ■ 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.

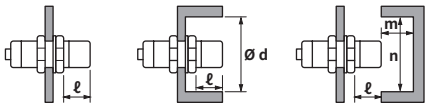
[Face to Face]


[Parallel]




### ■ 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.



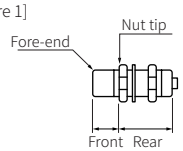

(unit: mm)

| Item \ 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 | 9 | 12 | 12 | 24 | 30 | 48 | 60 | 90 |
| B | 16 | 24 | 24 | 36 | 36 | 54 | 60 | 90 |
| ℓ | 0 | 8 | 0 | 11 | 0 | 14 | 0 | 15 |
| Ø d | 8 | 24 | 12 | 36 | 18 | 54 | 30 | 90 |
| m | 4.5 | 6 | 6 | 12 | 15 | 24 | 30 | 45 |
| n | 12 | 24 | 18 | 36 | 27 | 54 | 45 | 90 |

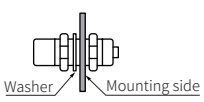
## Tightening Torque

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].

[Figure 1]

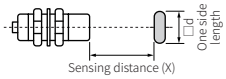



[Figure 2]



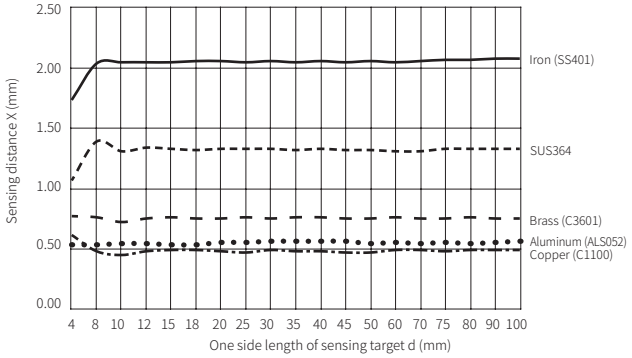

| Strength \ Sensing side | Ø 8 mm | | Ø 12 mm | | Ø 18 mm | | Ø 30 mm | |
|---|---|---|---|---|---|---|---|---|
| | Flush | Non-flush | Flush | Non-flush | Flush | Non-flush | Flush | Non-flush |
| Front size | 7 mm | 5 mm | 13 mm | 7 mm | - | - | 26 mm | 12 mm |
| Front torque | 3.92 N m | | 6.37 N 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

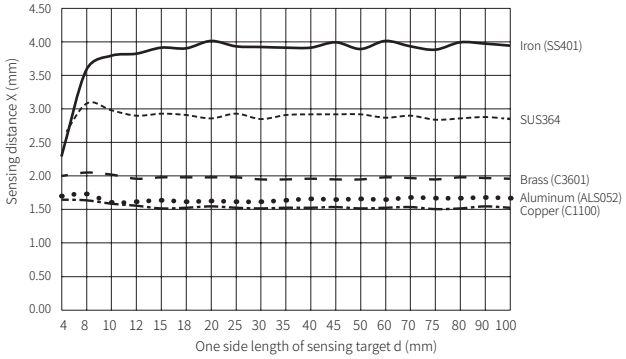



### ■ Flush + General type

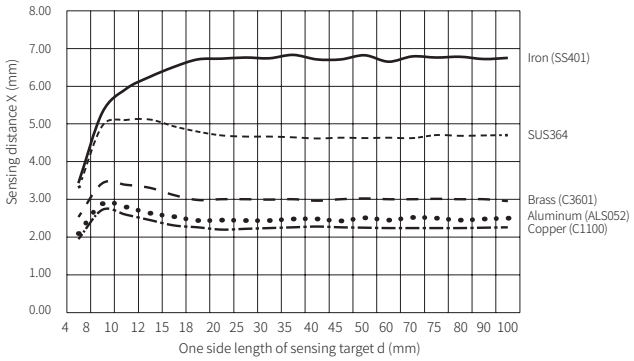
• Ø 8 mm



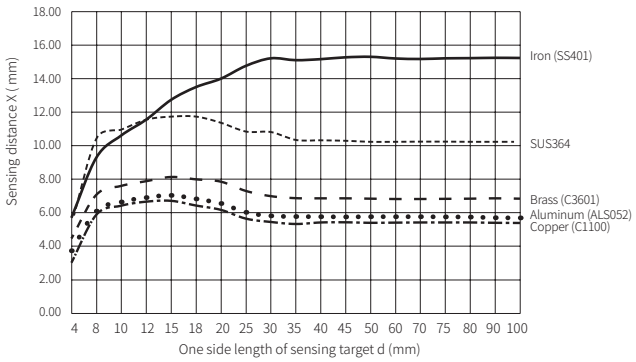

• Ø 12 mm




• Ø 18 mm

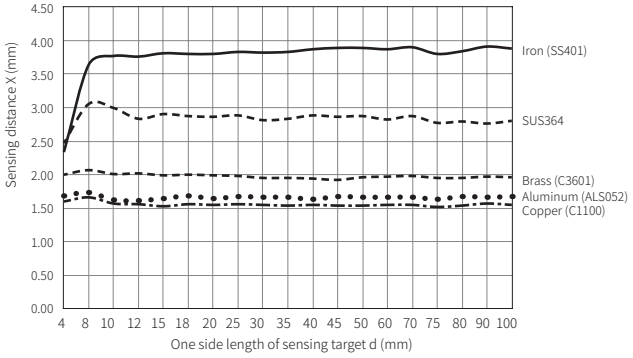



• Ø 30 mm

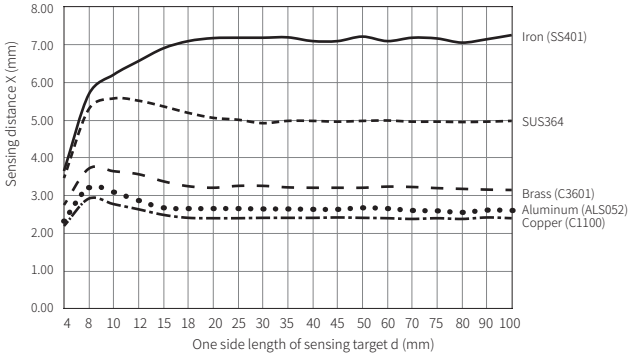


## ■ Flush + Spatter-resistant type

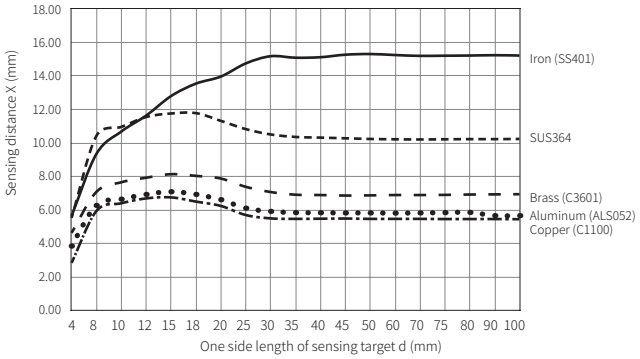
• Ø 12 mm




• Ø 18 mm

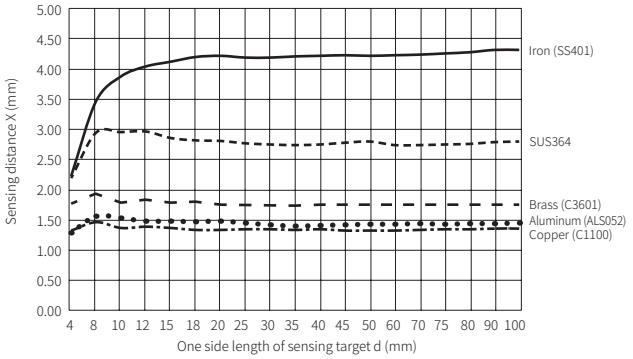



• Ø 30 mm

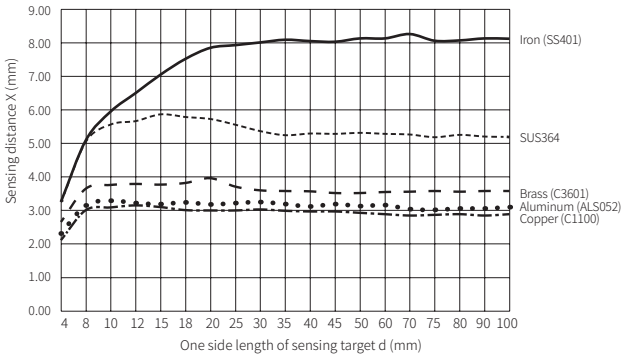



## ■ Non-flush + General type

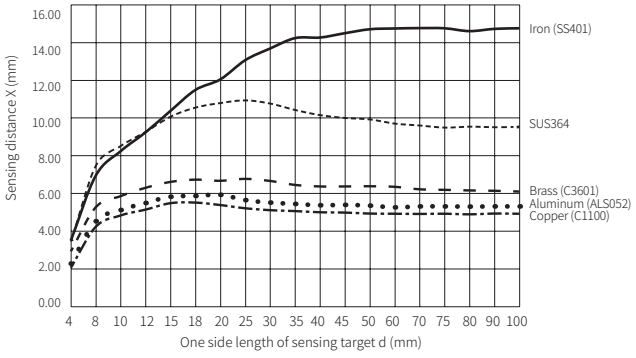
• Ø 8 mm



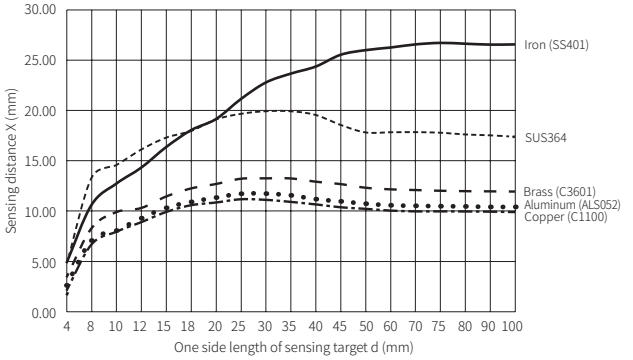

• Ø 12 mm



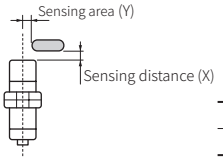

• Ø 18 mm




• Ø 30 mm



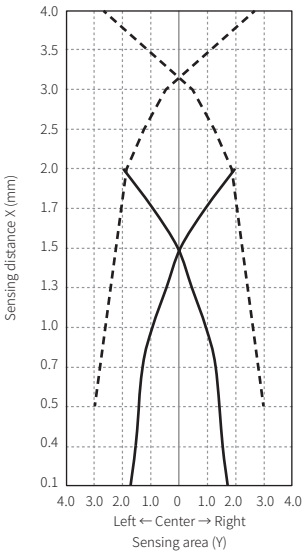
## Sensing Distance Feature Data by Parallel (left/right) Movement



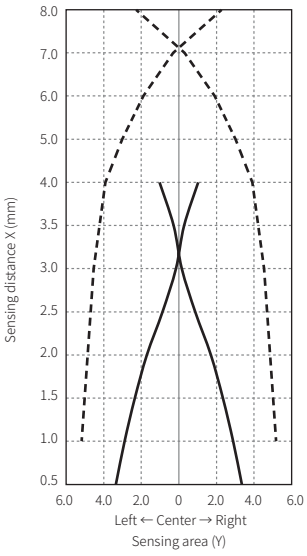

| | |
|---|---|
| ——— | Flush type |
| - - - - | Non-flush type |

### ■ General type

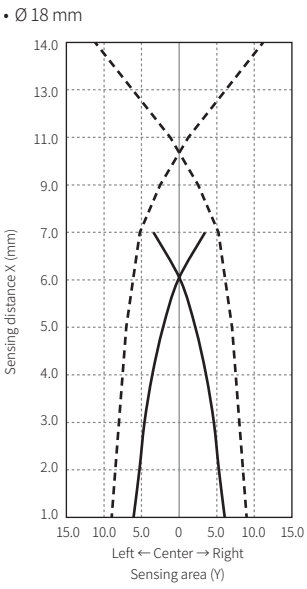
• Ø 8 mm



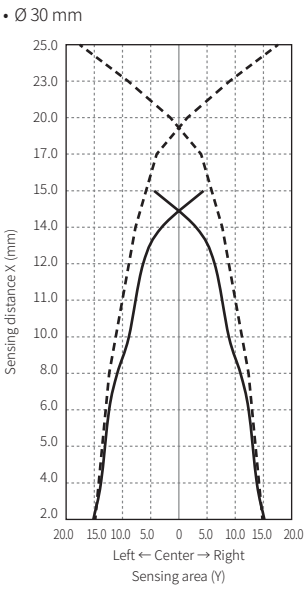

• Ø 12 mm




• Ø 18 mm

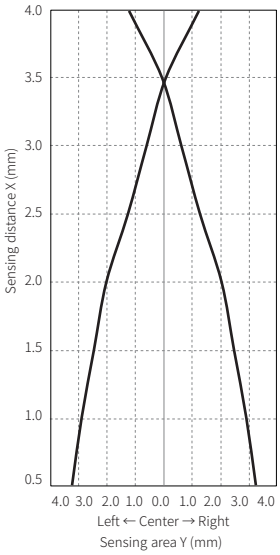



• Ø 30 mm

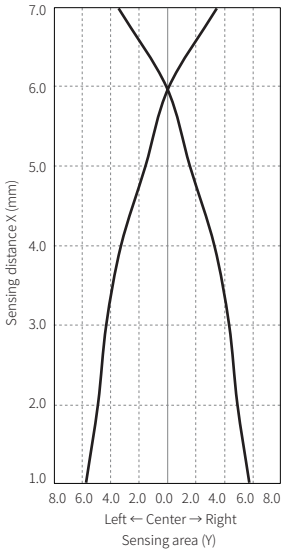



### ■ Spatter-resistant type

• Ø 12 mm




• Ø 18 mm




• Ø 30 mm