

Cylindrical Inductive Proximity Sensors

PR Series (AC 2-wire)

INSTRUCTION MANUAL

TCD210243AC

Autonics

Thank you for choosing our Autonics product.

Read and understand the instruction manual and manual thoroughly before using the product.

For your safety, read and follow the below safety considerations before using.

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

Keep this instruction manual in a place where you can find easily.



Visit Autonics website (www.autonics.com or QR code) for the latest information. Manuals, CAD files, certifications, software, etc. are available. The dimensions, specifications, certifications, etc. are subject to change without notice for product improvement. Certain models may be discontinued without notice.

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 or store 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 or electric shock.

04. **Do not connect, repair, or inspect the unit while connected to a power source.**

Failure to follow this instruction may result in fire or electric shock.

05. **Check 'Connections' before wiring.**

Failure to follow this instruction may result in fire or electric shock.

**⚠ 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 or electric shock.

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.
- 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.
- Do not connect capacity load to the output terminal directly.
- 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.
- The waterproof function may be damaged if the product is subjected to impact from a hard object or bent excessively or repeatedly.
- 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.

|    |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|
| PR | ① | ② | ③ | ④ | - | ⑤ | ⑥ | ⑦ |
|----|---|---|---|---|---|---|---|---|

|                                                                                             |                                                                   |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| ① <b>Characteristic</b><br>No mark: General type<br>A: Spatter-resistant type               | ⑤ <b>Sensing distance</b><br>Number: Sensing distance (unit: mm)  |
| ② <b>Connection</b><br>No mark: Cable type<br>W: Cable connector type<br>CM: Connector type | ⑥ <b>Power supply</b><br>A: 100 - 240 VAC~                        |
| ③ <b>Body length</b><br>No mark: Normal<br>L: Long                                          | ⑦ <b>Control output</b><br>O: Normally Open<br>C: Normally Closed |
| ④ <b>DIA. of sensing side</b><br>Number: DIA. of sensing side (unit: mm)                    |                                                                   |

Product Components

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

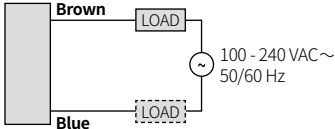
Sold Separately

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

Connections

- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.

■ Cable type



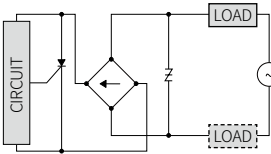
■ Cable connector type / Connector type

- 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   | -     | -                            |
| ②   | -     | -                            |
| ③   | Blue  | 100 - 240 VAC~<br>50 / 60 Hz |
| ④   | Brown |                              |

■ Inner circuit



Operation Timing Chart

|                           | Normally open       | Normally closed     |
|---------------------------|---------------------|---------------------|
| Sensing target            | Presence<br>Nothing | Presence<br>Nothing |
| Load                      | Operation<br>Return | Operation<br>Return |
| Operation indicator (red) | ON<br>OFF           | ON<br>OFF           |

Specifications

| Installation                      | Flush type                                                 |                |                |
|-----------------------------------|------------------------------------------------------------|----------------|----------------|
| General                           | PR□12-2A□                                                  | PR□18-5A□      | PR□30-10A□     |
| Spatter-resistant                 | PRA□12-2A□                                                 | PRA□18-5A□     | PRA□30-10A□    |
| DIA. of sensing side              | Ø 12 mm                                                    | Ø 18 mm        | Ø 30 mm        |
| Sensing distance                  | 2 mm                                                       | 5 mm           | 10 mm          |
| Setting distance                  | 0 to 1.4 mm                                                | 0 to 3.5 mm    | 0 to 7 mm      |
| Hysteresis                        | ≤ 10 % of sensing distance                                 |                |                |
| Standard sensing target: iron     | 12 × 12 × 1 mm                                             | 18 × 18 × 1 mm | 30 × 30 × 1 mm |
| Response frequency <sup>01)</sup> | 20 Hz                                                      |                |                |
| Affection by temperature          | ≤ ± 10 % for sensing distance at ambient temperature 20 °C |                |                |
| Indicator                         | Operation indicator (red)                                  |                |                |
| Certification                     | CE  ENEC                                                   |                |                |

| Installation                      | Non-flush type                                             |                |                |
|-----------------------------------|------------------------------------------------------------|----------------|----------------|
| General                           | PR□12-4A □                                                 | PR□18-8A □     | PR□30-15A □    |
| DIA. of sensing side              | Ø 12 mm                                                    | Ø 18 mm        | Ø 30 mm        |
| Sensing distance                  | 4 mm                                                       | 8 mm           | 15 mm          |
| Setting distance                  | 0 to 2.8 mm                                                | 0 to 5.6 mm    | 0 to 10.5 mm   |
| Hysteresis                        | ≤ 10 % of sensing distance                                 |                |                |
| Standard sensing target: iron     | 12 × 12 × 1 mm                                             | 25 × 25 × 1 mm | 45 × 45 × 1 mm |
| Response frequency <sup>01)</sup> | 20 Hz                                                      |                |                |
| Affection by temperature          | ≤ ± 10 % for sensing distance at ambient temperature 20 °C |                |                |
| Indicator                         | Operation indicator (red)                                  |                |                |
| Certification                     | CE  ENEC                                                   |                |                |

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 12 mm                        | Ø 18 mm                          | Ø 30 mm           |
|-----------------------|--------|--------------------------------|----------------------------------|-------------------|
| Cable                 | Normal | ≈ 72 g (≈ 84 g) <sup>01)</sup> | ≈ 118 g (≈ 130 g) <sup>02)</sup> | ≈ 170 g (≈ 207 g) |
|                       | Long   | -                              | ≈ 130 g (≈ 142 g)                | ≈ 208 g (≈ 245 g) |
| Cable connector       | Normal | ≈ 42 g (≈ 54 g)                | ≈ 66 g (≈ 78 g)                  | ≈ 122 g (≈ 134 g) |
|                       | Long   | -                              | ≈ 78 g (≈ 90 g)                  | ≈ 158 g (≈ 195 g) |
| Connector             | Normal | ≈ 30 g (≈ 42 g)                | ≈ 54 g (≈ 66 g)                  | ≈ 142 g (≈ 154 g) |
|                       | Long   | -                              | ≈ 66 g (≈ 78 g)                  | ≈ 182 g (≈ 194 g) |

01) Spatter-resistant type: ≈ 66 g (≈ 78 g)

02) Spatter-resistant type: ≈ 106 g (≈ 118 g)

|                            |                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply               | 100 - 240 VAC~ 50 / 60 Hz, operating voltage: 85 - 264 VAC~                                                                                                                                    |
| Leakage current            | ≤ 2.5 mA                                                                                                                                                                                       |
| Control output             | DIA. of sensing side Ø 12 mm: 5 to 150 mA<br>DIA. of sensing side Ø 18 mm, Ø 30 mm: 5 to 200 mA                                                                                                |
| Residual voltage           | ≤ 10 V                                                                                                                                                                                         |
| Protection circuit         | Surge protection circuit                                                                                                                                                                       |
| Insulation resistance      | ≥ 50 M Ω (500 VDC≡ megger)                                                                                                                                                                     |
| Insulation type            | Double insulation or reinforced insulation (symbol: )<br>dielectric strength between the measuring input part and the power part: general type 1 kV, spatter-resistant type 1.5 kV             |
| Dielectric strength        | General type<br>: 2,500 VAC~ 50/60 Hz for 1 min (between the charging part and the case)<br>Spatter-resistant type<br>: 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/s² (≈ 50 G) in each X, Y, Z direction for 3 times                                                                                                                                        |
| Ambient temperature        | -25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)                                                                                                                              |
| Ambient humidity           | 35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)                                                                                                                              |
| Protection structure       | IP67 (IEC standards)                                                                                                                                                                           |
| Connection                 | Cable type / Cable connector type <sup>01)</sup> / Connector type <sup>01)</sup> model                                                                                                         |
| Cable spec. <sup>02)</sup> | DIA. of sensing side Ø 12 mm: Ø 4 mm, 2-wire<br>DIA. of sensing side Ø 18 mm, Ø 30 mm: Ø 5 mm, 2-wire                                                                                          |
| Wire spec.                 | 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)                                                                                                                                          |
| General                    | Case/Nut: nickel plated brass, 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, Refer to the dimension in the product manual or on the Autonics website.

|                   | Ø 12 mm                             | Ø 18 mm                             | Ø 30 mm                             |
|-------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Mounting hole (H) | Ø 12.5 <sup>+0.5</sup> <sub>0</sub> | Ø 18.5 <sup>+0.5</sup> <sub>0</sub> | Ø 30.5 <sup>+0.5</sup> <sub>0</sub> |
| TAP               | M12×1                               | M18×1                               | M30×1.5                             |

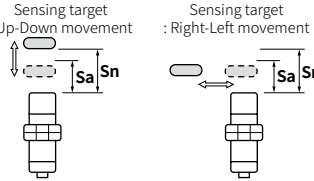
|     | Ø 12 mm | Ø 18 mm | Ø 30 mm |
|-----|---------|---------|---------|
| Ø A | 21      | 29      | 42      |
| B   | 17      | 24      | 35      |

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 %**

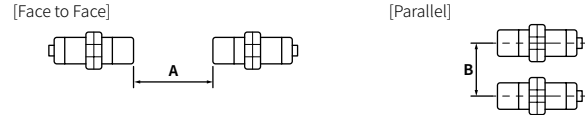


Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

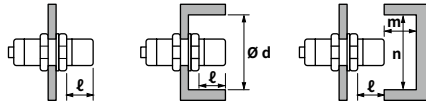
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

Therefore, be sure to provide a minimum distance between the two sensors, as below table.



■ 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.



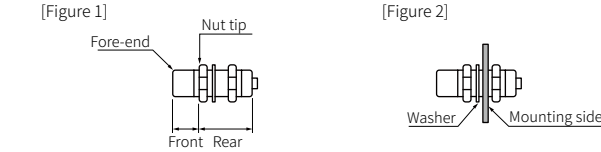
(unit: mm)

| Sensing side | Ø 12 mm |           | Ø 18 mm |           | Ø 30 mm |           |
|--------------|---------|-----------|---------|-----------|---------|-----------|
| Item         | Flush   | Non-flush | Flush   | Non-flush | Flush   | Non-flush |
| A            | 12      | 24        | 30      | 48        | 60      | 90        |
| B            | 24      | 36        | 36      | 54        | 60      | 90        |
| ℓ            | 0       | 11        | 0       | 14        | 0       | 15        |
| Ø d          | 12      | 36        | 18      | 54        | 30      | 90        |
| m            | 6       | 12        | 15      | 24        | 30      | 45        |
| n            | 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].



| Strength     | Ø 12 mm   |           | Ø 18 mm  |           | Ø 30 mm  |           |
|--------------|-----------|-----------|----------|-----------|----------|-----------|
|              | Flush     | Non-flush | Flush    | Non-flush | Flush    | Non-flush |
| Front size   | 13 mm     | 7 mm      | -        | -         | 26 mm    | 12 mm     |
| Front torque | 6.37 N m  |           | 14.7 N m |           | 49 N m   |           |
| Rear torque  | 11.76 N m |           | 14.7 N m |           | 78.4 N m |           |