

## Cylindrical Inductive Proximity Sensors

# PR Series (AC 2-wire)

## INSTRUCTION MANUAL

TCD210243AB

**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.

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

Follow Autonics website for the latest information.

### 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 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.
- Do NOT impact 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.

PR	①	②	③	④	-	⑤	⑥	⑦
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#### 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 DIA. of sensing side

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

#### ⑤ Sensing distance

Number: Sensing distance (unit: mm)

#### ⑥ Power supply

A: 100 - 240 VAC~

#### ⑦ Control output

O: Normally Open  
C: Normally Closed

### Product Components

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

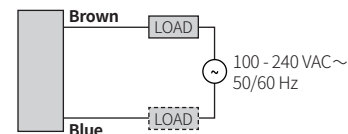
### Sold Separately

- 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

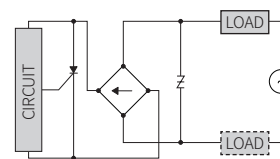


#### ■ Cable connector type / Connector type

- 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~ 50 / 60 Hz
④	Brown	-

#### ■ Inner circuit



### Operation Timing Chart

	Normally open	Normally closed
<b>Sensing target</b>	Presence: High pulse Nothing: Low	Presence: Low pulse Nothing: High
<b>Load</b>	Operation: High pulse Return: Low	Operation: Low pulse Return: High
<b>Operation indicator (red)</b>	ON: High pulse OFF: Low	ON: Low pulse OFF: High

### Specifications

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

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

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

<sup>01)</sup> Spatter-resistant type:  $\approx 66$  g ( $\approx 78$  g)

<sup>02)</sup> Spatter-resistant type:  $\approx 106$  g ( $\approx 118$  g)

<b>Power supply</b>	100 - 240 VAC~ 50 / 60 Hz, operating voltage: 85 - 264 VAC~
<b>Leakage current</b>	$\leq 2.5$ mA
<b>Control output</b>	DIA. of sensing side $\varnothing 12$ mm: 5 to 150 mA DIA. of sensing side $\varnothing 18$ mm, $\varnothing 30$ mm: 5 to 200 mA
<b>Residual voltage</b>	$\leq 10$ V
<b>Protection circuit</b>	Surge protection circuit
<b>Insulation resistance</b>	$\geq 50$ M $\Omega$ (500 VDC= megger)
<b>Insulation type</b>	Double insulation or reinforced insulation (symbol: ) dielectric strength between the measuring input part and the power part: general type 1 kV, spatter-resistant type 1.5 kV
<b>Dielectric strength</b>	General type : 2,500 VAC~ 50/60 Hz for 1 min (between the charging part and the case) Spatter-resistant type : 1,500 VAC~ 50/60 Hz for 1 min (between the charging part and the case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> ( $\approx 50$ G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type <sup>01)</sup> / Connector type <sup>01)</sup> model
<b>Cable spec. <sup>02)</sup></b>	DIA. of sensing side $\varnothing 12$ mm: $\varnothing 4$ mm, 2-wire DIA. of sensing side $\varnothing 18$ mm, $\varnothing 30$ mm: $\varnothing 5$ mm, 2-wire
<b>Wire spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: $\varnothing 1.25$ mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC)
<b>General</b>	Case/Nut: nickel plated brass, washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

<sup>01)</sup> Except spatter-resistant type

<sup>02)</sup> Cable type: 2 m, cable connector type: 300 mm

### Cut-out Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.

	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Mounting hole (H)</b>	$\varnothing 12.5^{+0.5}_0$	$\varnothing 18.5^{+0.5}_0$	$\varnothing 30.5^{+0.5}_0$
<b>TAP</b>	M12×1	M18×1	M30×1.5

	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b><math>\varnothing A</math></b>	21	29	42
<b>B</b>	17	24	35

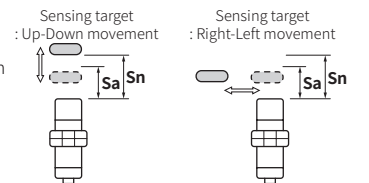
### Setting Distance Formula

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%

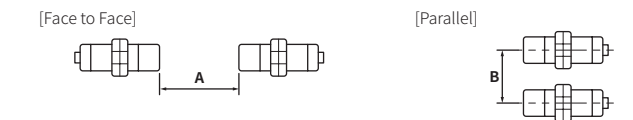


### Mutual-interference & Influence by Surrounding Metals

#### ■ Mutual-interference

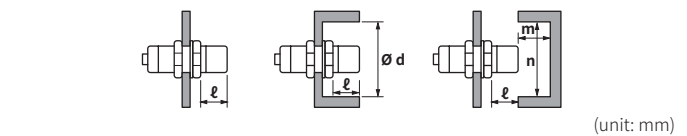
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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.

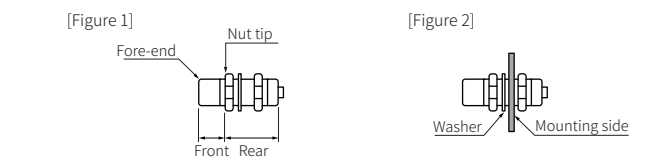


Sensing side	$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
<b>A</b>	12	24	30	48	60	90
<b>B</b>	24	36	36	54	60	90
<b>l</b>	0	11	0	14	0	15
<b><math>\varnothing d</math></b>	12	36	18	54	30	90
<b>m</b>	6	12	15	24	30	45
<b>n</b>	18	36	27	54	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].



Sensing side	$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
<b>Strength</b>	13 mm	7 mm	-	-	26 mm	12 mm
<b>Front size</b>	-		-		-	
<b>Front torque</b>	6.37 N m		14.7 N m		49 N m	
<b>Rear torque</b>	11.76 N m		14.7 N m		78.4 N m	