**Cylindrical Inductive Proximity Sensors** 

# PR Series (DC 2-wire)

# **INSTRUCTION MANUAL**

TCD210244AB

**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.) ailure 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

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.

ailure 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. ailure 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
- 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, velding 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
- 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

PR	0	2	3	4	-		6		-	8
Cha	racteri	stic			•	Sensi	ng dist	ance		

Characteristic

No mark: General type A: Spatter-resistant type

**2**Connection

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

Wire connection

T: DC 2-wire

O DIA. of sensing side

C: Normally closed

Cable Number: DIA. of sensing side (unit: mm) No mark: Standard type

> I: Standard type (IEC standards) V: Oil resistant cable type IV: Oil resistant cable type (IEC standards)

Number: Sensing distance (unit: mm)

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

O Power supply

Control output

O: Normally open

D: 12 - 24 VDC==

# **Product Components**

- Product  $\times$  1 Instruction manual × 1
- Nut  $\times$  2 • Washer × 1

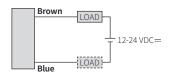
# **Sold Separately**

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

# Connections

- LOAD can be wired to any direction.
- Connect LOAD before suppling 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.

ON

OFF —

indicator

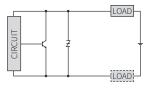
(red)



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

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

#### ■ Inner circuit



# **Operation Timing Chart** Normally open Normally closed target Nothing Operation Load

#### **Specifications**

nstallation	Flush type					
General	PR□T08-1.5 □	PR□T12-2 □	PR□T18-5 □	PR□T30-10 □		
Spatter- resistant	-	PRA T12-2	PRA T18-5	PRA□T30-10 □		
DIA. of sensing side	Ø8mm	Ø 12 mm	Ø 18 mm	Ø 30 mm		
Sensing distance	1.5 mm 2 mm		5 mm	10 mm		
Setting distance	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm		
Hysteresis	≤ 10 % of sensing di	istance (DIA. of sensing	g side Ø 8 mm connec	tor type: ≤ 15 %)		
Standard sensing target iron	8 × 8 × 1 mm	12 × 12 × 1 mm	18 × 18 × 1 mm	30 × 30 × 1 mm		
Response frequency <sup>01)</sup>			500 Hz	400 Hz		
Affection by temperature	$\leq$ $\pm$ 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: $\leq$ $\pm$ 20 %)					
ndicator	Operation indicator	(red)				
Approval	C € ĽK ENI					

Installation	Non-flush type							
General	PR□T08-2 □	PR□T12-4 □	PR□T18-8 □	PR□T30-15 □				
DIA. of sensing side	Ø8mm	Ø 12 mm	Ø 18 mm	Ø 30 mm				
Sensing distance	2 mm	4 mm	8 mm	15 mm				
Setting distance			0 to 5.6 mm	0 to 10.5 mm				
Hysteresis	≤ 10 % of sensing distance (DIA. of sensing side Ø 8 mm connector type: ≤ 15 %)							
Standard sensing target : iron	$8 \times 8 \times 1 \text{mm}$	$12 \times 12 \times 1 \text{mm}$ $25 \times 25 \times 1 \text{mm}$		45 × 45 × 1 mm				
Response frequency 01)			350 Hz	200 Hz				
Affection by temperature	$\leq$ $\pm$ 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: $\leq$ $\pm$ 20 %)							
Indicator	Operation indicator	(red)						
Approval	C € ĽK EMI							

<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)	Ø8mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	≈ 52 g (≈ 64 g)	≈ 72 g (≈ 84 g)	≈ 110 g (≈ 122 g)	≈ 170 g (≈ 207 g)
Cable connector	≈ 32 g (≈ 44 g)	≈ 42 g (≈ 54 g)	≈ 58 g (≈ 70 g)	≈ 122 g (≈ 134 g)
Connector	≈ 10 g (≈ 32 g)	≈ 26 g (≈ 38 g)	≈ 49 g (≈ 61 g)	$pprox$ 142 g ( $pprox$ 154 g) $^{01)}$

<sup>01)</sup> Spatter-resistant type: ≈ 134 g (≈ 146 g)

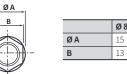
Power supply	12 - 24 VDC== (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC==
Leakage current	≤ 0.6 mA
Control output	2 to 100 mA
Residual voltage	$\leq$ 3.5 V (non-polarity $^{01)}$ : $\leq$ 5 V)
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	$\geq$ 50 M $\Omega$ (500 VDC== megger)
Dielectric strength	Between the charging part and the case: 1,500 VAC $\sim$ 50 $/$ 60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> ( $\approx$ 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 / Connector type model
Cable spec. <sup>02)</sup>	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 type 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.





	Ø8mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
ØA	15	21	29	42
В	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

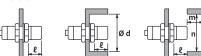
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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



#### ■ 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.



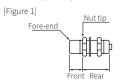
(unit: mm)

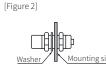
Sensing	Ø8mm		Ø 12 mm	1	Ø 18 mm	1	Ø 30 mm		
ltem side	Flush	Non- flush	Flush	Non- flush	Flush	Non- flush	Flush	Non- flush	
Α	9	12	12	24	30	48	60	90	
В	16	24	24	36	36	54	60	90	
٤	0	8	0	11	0	14	0	15	
Ød	8	24	12	36	18	54	30	90	
m	4.5	6	6	12	15	24	30	45	
n	12	24	18	36	27	54	45	90	

#### **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].





Sensing			Ø 12 mn	1	Ø 18 mn	1	Ø 30 mm		
side Strength	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 n	n	14.7 N m		78.4 N m		

18. Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002 www.autonics.com | +82-2-2048-1577 | sales@autonics.com

