

Cylindrical Inductive Full-Metal Long-Distance Proximity Sensors

PRFD Series (DC 2-wire) INSTRUCTION MANUAL

TCD210249AB

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.

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.

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 (UL Type I Enclosure)
- Altitude max. 2,000 m
- Pollution degree 3
- 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.

PRFD ① ② ③ ④ - ⑤ ⑥ ⑦ - ⑧

① Characteristic

No-mark: General type
A: Spatter-resistant type

② Connection

No-mark: Cable type
W: Cable connector type

③ Wire connection

T: DC 2-wire

④ DIA. of sensing side

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

⑤ Sensing distance

Number: Sensing distance (unit: mm)

⑥ Power supply

D: 12 - 24 VDC

⑦ Control output

O: Normally open

⑧ Cable

V: Oil resistant cable type
IV: Oil resistant cable type (IEC standards)

Product Components

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

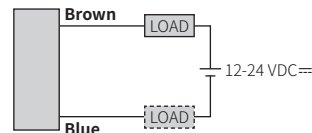
Sold Separately

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

Connections

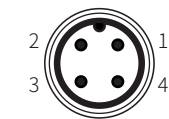
- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.

■ Cable type



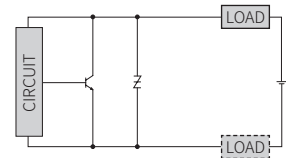
■ Cable connector type

- 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.

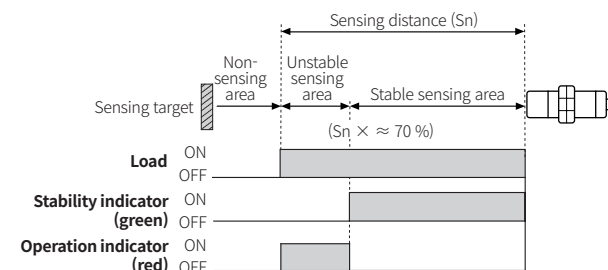


Pin	Normally open	
	Color	Func.
①	Brown	+V
②	-	-
③	-	-
④	Blue	0V

■ Inner circuit



Operation Timing Chart



Specifications

Installation	Flush type			
General	PRFD□T08-2DO-□	PRFD□T12-3DO-□	PRFD□T18-7DO-□	PRFD□T30-12DO-□
Spatter-resistant	PRFDA□T08-2DO-□	PRFDA□T12-3DO-□	PRFDA□T18-7DO-□	PRFDA□T30-12DO-□
DIA. of sensing side	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Sensing distance ⁰¹⁾	2 mm	3 mm	7 mm	12 mm
Setting distance	0 to 1.4 mm	0 to 2.1 mm	0 to 4.9 mm	0 to 8.4 mm
Hysteresis	≤ 15 % of sensing distance			
Standard sensing target: iron	12 × 12 × 1 mm	12 × 12 × 1 mm	30 × 30 × 1 mm	54 × 54 × 1 mm
Response frequency ⁰²⁾	150 Hz	80 Hz	80 Hz	50 Hz
Affection by temperature	≤ ± 20 % for sensing distance at ambient temperature 20 °C			
Indicator	Stability indicator (green), operation indicator (red)			
Approval	CE, RoHS, ENEC, ETL	CE, RoHS, ENEC, ETL	CE, RoHS, ENEC, ETL	CE, RoHS, ENEC, ETL
Unit weight (package)	≈ 55 g (≈ 80 g)	≈ 83 g (≈ 110 g)	≈ 97 g (≈ 132 g)	≈ 170 g (≈ 225 g)

01) Use accessories (nut, washer) made of SUS. Or, sensing distance cannot be guaranteed.

02) 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.

Power supply	12 - 24 VDC (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC
Leakage current	≤ 0.8 mA
Control output	3 to 100 mA
Residual voltage	≤ 3.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	≥ 50 M Ω (500 VDC megger)
Dielectric strength	Between the charging part and the case: 1,000 VAC ~ 50 / 60Hz for 1 minute
Vibration	1.5 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	1,000 m/s ² (≈ 100 G) in each X, Y, Z direction for 10 times (DIA. of sensing side $\varnothing 8$ mm) : 500 m/s ² (≈ 50 G) in each X, Y, Z direction for 10 times
Ambient temp. ⁰¹⁾	-25 to 70 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humi.	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection	IP67 (IEC standards)
Connection	Cable type / Cable connector type model
Cable spec. ⁰²⁾	DIA. of sensing side $\varnothing 8$ mm: $\varnothing 4$ mm, 2-wire DIA. of sensing side $\varnothing 12$ mm, $\varnothing 18$ mm, $\varnothing 30$ mm: $\varnothing 5$ mm, 2-wire
Wire spec.	AWG 22 (0.08 mm, 60-wire), insulator diameter: $\varnothing 1.25$ mm
Connector	M12 connector
Material	Oil resistant cable (dark gray): oil resistant polyvinyl chloride (PVC)
General	Case / Nut: stainless steel 303 (SUS303), washer: stainless steel 304 (SUS304), sensing side ⁰³⁾ : stainless steel 303 (SUS303)
Spatter-resistant	Case / Nut: stainless steel 303 (SUS303, PTFE coated), washer: stainless steel 304 (SUS304), sensing side ⁰³⁾ : stainless steel 303 (SUS303, PTFE coated)

01) UL approved surrounding air temperature 40 °C

02) Cable type: 2 m (option: 5 m), cable connector type: 300 mm

03) Thickness: DIA. of sensing side $\varnothing 8$ mm: 0.2 mm / DIA. of sensing side $\varnothing 12$ mm, $\varnothing 18$ mm: 0.4 mm / DIA. of sensing side $\varnothing 30$ mm: 0.5 mm

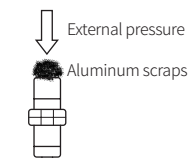
Effect of Aluminum Scraps

When aluminum scraps are attached or stacked at sensing side, the proximity sensor does not detect and sensing signal is OFF.

However, the below cases may occur to sensing signal. In this case, remove the scraps.

- When the size of aluminum scraps (d) is bigger than 2/3 of the sensing side size (D)
- When aluminum scraps are attached on the sensing side by external pressure

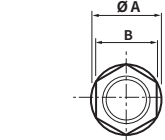
Sensing side	Size	
	d	D (mm)
$\varnothing 8$ mm	6	6
$\varnothing 12$ mm	10	10
$\varnothing 18$ mm	16	16
$\varnothing 30$ mm	28	28



Cut-out Dimensions

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

	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Mounting hole (H)	$\varnothing 8.5^{+0.05}_0$	$\varnothing 12.5^{+0.05}_0$	$\varnothing 18.5^{+0.05}_0$	$\varnothing 30.5^{+0.05}_0$
TAP	M8×1	M12×1	M18×1	M30×1.5



	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
$\varnothing A$	15	21	29	42
B	13	17	24	36

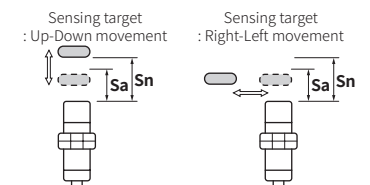
Setting Distance Formula

- 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 %

- When the sensing target is placed over approx. 70% of sensing distance (Sn), the operation indicator (red) turns ON. When the target is placed within approx. 70 % of sensing distance (Sn), the stability indicator (green) turns ON.

Use the sensor at the position where the stability indicator turns ON.

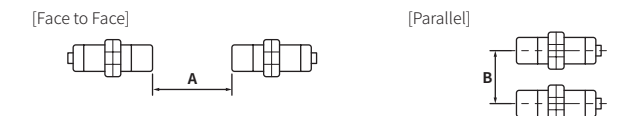


Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

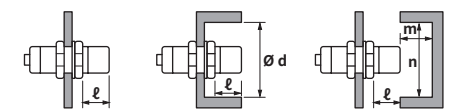
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Item				
A	35	40	65	110
B	35	35	60	100
ℓ	0	0	0	0
∅ d	8	12	18	30
m	8	12	28	48
n	30	40	60	100

Tightening Torque

Use the provided washer to tighten the nuts.

The allowable tightening torque table is for inserting the washer as below.

Sensing side	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Strength				
Tightening torque	3.5 N m	25 N m	70 N m	180 N m