

# Cylindrical Inductive General / Spatter-Resistant Proximity Sensors PR / PRA Series (DC 3-wire)

## INSTRUCTION MANUAL

DRW200025AB

**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.

### 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  $\varnothing 3.5$  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.

For selecting the specific model, follow the Autonics web site.

PR ① ② ③ ④ - ⑤ D ⑥ - ⑦

#### 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  
S: Short  
L: Long

#### ④ DIA. of sensing side

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

#### ⑤ Sensing distance

Number: Sensing distance (unit: mm)

#### ⑥ Control output

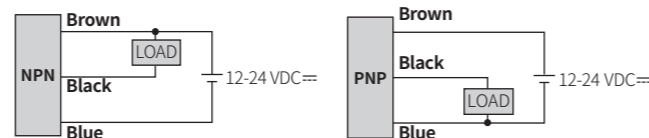
N: NPN Normally open  
N2: NPN Normally closed  
P: PNP Normally open  
P2: PNP Normally closed

#### ⑦ Cable

No mark: Standard type  
V: Oil resistant cable type

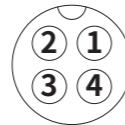
### Connections

#### ■ Cable type



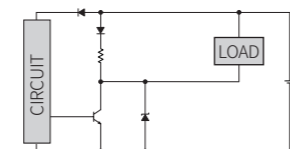
#### ■ Cable connector type / Connector type

- 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.

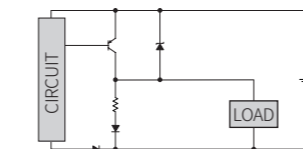


Pin	Color	Function
①	Brown	+V
②	-	-
③	Blue	0V
④	Black	OUT

#### ■ Inner circuit (NPN output)



#### ■ Inner circuit (PNP output)



### Operation Timing Chart

	Normally open	Normally closed
Sensing target	Presence	Presence
	Nothing	Nothing
Load	Operation	Operation
	Return	Return
Output voltage	NPN output	H
	L	L
PNP output	H	H
	L	L
Operation indicator (red)	ON	ON
	OFF	OFF

### Sold Separately

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

### Specifications

Installation	Flush type			
General	PR□08-1.5D □	PR□12-2D □	PR□18-5D □	PR□30-10D □
Spatter-resistant	-	PRA□12-2D □	PRA□18-5D □	PRA□30-10D □
DIA. of sensing side	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ 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	$\leq 10\%$ of sensing distance (DIA. of sensing side $\varnothing 8$ mm connector type: $\leq 15\%$ )			
Standard sensing target: iron	$8 \times 8 \times 1$ mm	$12 \times 12 \times 1$ mm	$18 \times 18 \times 1$ mm	$30 \times 30 \times 1$ mm
Response frequency <sup>(01)</sup>	1.5 kHz	1.5 kHz	500 Hz	400 Hz
Affection by temperature	$\leq \pm 10\%$ for sensing distance at ambient temperature 20 °C (DIA. of sensing side $\varnothing 8$ mm: $\leq \pm 20\%$ )			
Indicator	Operation indicator (red)			
Approval	CE ENEC	CE ENEC	CE ENEC	CE ENEC

Installation	Non-flush type			
General	PR□08-2D □	PR□12-4D □	PR□18-8D □	PR□30-15D □
DIA. of sensing side	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Sensing distance	2 mm	4 mm	8 mm	15 mm
Setting distance	0 to 1.4 mm	0 to 2.8 mm	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	$\leq 10\%$ of sensing distance (DIA. of sensing side $\varnothing 8$ mm connector type: $\leq 15\%$ )			
Standard sensing target: iron	$8 \times 8 \times 1$ mm	$12 \times 12 \times 1$ mm	$25 \times 25 \times 1$ mm	$45 \times 45 \times 1$ mm
Response frequency <sup>(01)</sup>	1.0 kHz	500 Hz	350 Hz	200 Hz
Affection by temperature	$\leq \pm 10\%$ for sensing distance at ambient temperature 20 °C (DIA. of sensing side $\varnothing 8$ mm: $\leq \pm 20\%$ )			
Indicator	Operation indicator (red)			
Approval	CE ENEC	CE ENEC	CE ENEC	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)	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm	
Cable	Normal	$\approx 52$ g ( $\approx 64$ g)	$\approx 72$ g ( $\approx 84$ g)	$\approx 110$ g ( $\approx 122$ g)	$\approx 170$ g ( $\approx 207$ g)
	Short	-	$\approx 70$ g ( $\approx 82$ g)	-	-
	Long	$\approx 54$ g ( $\approx 66$ g)	$\approx 76$ g ( $\approx 88$ g)	$\approx 130$ g ( $\approx 142$ g)	$\approx 210$ g ( $\approx 247$ g)
Cable connector	Normal	$\approx 32$ g ( $\approx 44$ g)	$\approx 42$ g ( $\approx 54$ g)	$\approx 58$ g ( $\approx 70$ g)	$\approx 122$ g ( $\approx 134$ g)
	Long	$\approx 34$ g ( $\approx 46$ g)	-	$\approx 78$ g ( $\approx 90$ g)	$\approx 158$ g ( $\approx 195$ g)
Connector	Normal	$\approx 10$ g ( $\approx 32$ g)	$\approx 26$ g ( $\approx 38$ g)	$\approx 49$ g ( $\approx 61$ g)	$\approx 134$ g ( $\approx 146$ g)
	Long	-	-	$\approx 73$ g ( $\approx 85$ g)	$\approx 169$ g ( $\approx 181$ g)

Power supply	12-24 VDC (ripple P-P: $\leq 10\%$ ), operating voltage: 10-30 VDC
Current consumption	$\leq 10$ mA
Control output	$\leq 200$ mA
Residual voltage	DIA. of sensing side $\varnothing 8$ mm: $\leq 2.0$ V DIA. of sensing side $\varnothing 12$ mm, $\varnothing 18$ mm, $\varnothing 30$ mm: $\leq 1.5$ 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	1,500 VAC ~ 50/60Hz for 1 min (between all terminals and case)
Vibration	1 mm amplitude at frequency 10 to 55 Hz (for 1 min) 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 (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 / Cable connector type <sup>(01)</sup> / Connector type model
Cable spec. <sup>(02)</sup>	DIA. of sensing side $\varnothing 8$ mm: $\varnothing 3.5$ mm, 3-wire DIA. of sensing side $\varnothing 12$ mm: $\varnothing 4$ mm, 3-wire DIA. of sensing side $\varnothing 18$ mm, $\varnothing 30$ mm: $\varnothing 5$ mm, 3-wire
Wire spec.	$\varnothing 3.5$ mm cable: AWG 24 (0.08 mm, 40-wire), insulator DIA.: $\varnothing 1$ mm $\varnothing 4$ mm, $\varnothing 5$ mm cable : AWG 22 (0.08 mm, 60-wire), insulator DIA.: $\varnothing 1.25$ mm
Connector spec.	M12 connector
Material	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC)
General	Case/Nut: nickel plated brass (DIA. of sensing side $\varnothing 8$ 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.

	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
Mounting hole (H)	$\varnothing 8.5^{+0.5}_0$	$\varnothing 12.5^{+0.5}_0$	$\varnothing 18.5^{+0.5}_0$	$\varnothing 30.5^{+0.5}_0$
TAP	M8×1	M12×1	M18×1	M30×1.5

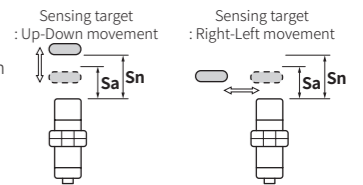
  

	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
$\varnothing A$	15	21	29	42
B	13	17	24	35

### 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%

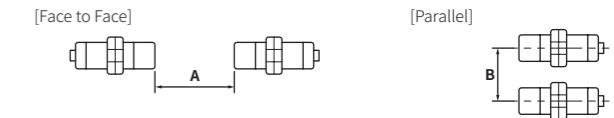


### Mutual-interference & Influence by Surrounding Metals

#### ■ Mutual-interference

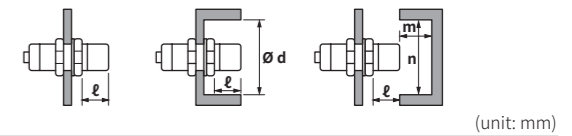
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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.

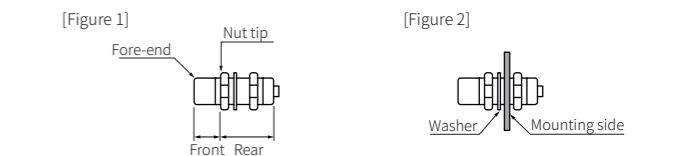


Sensing side	$\varnothing 8$ mm		$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
A	9	12	12	24	30	48	60	90
B	16	24	24	36	36	54	60	90
ℓ	0	8	0	11	0	14	0	15
$\varnothing d$	8	24	12	36	18	54	30	90
m	4.5	6	6	12	15	24	30	45
n	12	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].



Sensing side	$\varnothing 8$ mm		$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
Strength								
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	

# Cylindrical Inductive General / Spatter-Resistant Proximity Sensors PR / PRA Series (DC 2-wire)

## INSTRUCTION MANUAL

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**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 (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  $\varnothing 3.5$  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.

For selecting the specific model, follow the Autonics web site.

PR	①	②	T	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 DIA. of sensing side

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

#### ④ Sensing distance

Number: Sensing distance (unit: mm)

#### ⑤ Power supply

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

#### ⑥ Control output

O: Normally open  
C: Normally closed

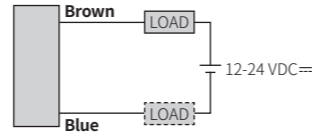
#### ⑦ Cable

No mark: Standard type  
I: Standard type (IEC standards)  
V: Oil resistant cable type  
IV: Oil resistant cable type (IEC standards)

### Connections

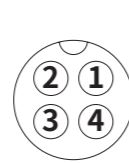
- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.
- No need to consider polarity for non-polarity type of power supply.

#### ■ Cable type



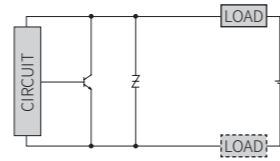
#### ■ Cable connector type / Connector type

- 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.



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

#### ■ Inner circuit



### Operation Timing Chart

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

### Sold Separately

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

### Specifications

Installation	Flush type			
<b>General</b>	PR□T08-1.5□	PR□T12-2□	PR□T18-5□	PR□T30-10□
<b>Spatter-resistant</b>	-	PRA□T12-2□	PRA□T18-5□	PRA□T30-10□
<b>DIA. of sensing side</b>	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Sensing distance</b>	1.5 mm	2 mm	5 mm	10 mm
<b>Setting distance</b>	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
<b>Hysteresis</b>	$\leq 10\%$ of sensing distance (DIA. of sensing side $\varnothing 8$ mm connector type: $\leq 15\%$ )			
<b>Standard sensing target: iron</b>	$8 \times 8 \times 1$ mm	$12 \times 12 \times 1$ mm	$18 \times 18 \times 1$ mm	$30 \times 30 \times 1$ mm
<b>Response frequency<sup>01)</sup></b>	1.5 kHz	1.5 kHz	500 Hz	400 Hz
<b>Affection by temperature</b>	$\leq \pm 10\%$ for sensing distance at ambient temperature 20 °C (DIA. of sensing side $\varnothing 8$ mm: $\leq \pm 20\%$ )			
<b>Indicator</b>	Operation indicator (red)			
<b>Approval</b>	CE ENEC	CE ENEC	CE ENEC	CE ENEC

Installation	Non-flush type			
<b>General</b>	PR□T08-2□	PR□T12-4□	PR□T18-8□	PR□T30-15□
<b>DIA. of sensing side</b>	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Sensing distance</b>	2 mm	4 mm	8 mm	15 mm
<b>Setting distance</b>	0 to 1.4 mm	0 to 2.8 mm	0 to 5.6 mm	0 to 10.5 mm
<b>Hysteresis</b>	$\leq 10\%$ of sensing distance (DIA. of sensing side $\varnothing 8$ mm connector type: $\leq 15\%$ )			
<b>Standard sensing target: iron</b>	$8 \times 8 \times 1$ mm	$12 \times 12 \times 1$ mm	$25 \times 25 \times 1$ mm	$45 \times 45 \times 1$ mm
<b>Response frequency<sup>01)</sup></b>	1.0 kHz	500 Hz	350 Hz	200 Hz
<b>Affection by temperature</b>	$\leq \pm 10\%$ for sensing distance at ambient temperature 20 °C (DIA. of sensing side $\varnothing 8$ mm: $\leq \pm 20\%$ )			
<b>Indicator</b>	Operation indicator (red)			
<b>Approval</b>	CE ENEC	CE ENEC	CE ENEC	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)	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Cable</b>	$\approx 52$ g ( $\approx 64$ g)	$\approx 72$ g ( $\approx 84$ g)	$\approx 110$ g ( $\approx 122$ g)	$\approx 170$ g ( $\approx 207$ g)
<b>Cable connector</b>	$\approx 32$ g ( $\approx 44$ g)	$\approx 42$ g ( $\approx 54$ g)	$\approx 58$ g ( $\approx 70$ g)	$\approx 122$ g ( $\approx 134$ g)
<b>Connector</b>	$\approx 10$ g ( $\approx 32$ g)	$\approx 26$ g ( $\approx 38$ g)	$\approx 49$ g ( $\approx 61$ g)	$\approx 142$ g ( $\approx 154$ g) <sup>01)</sup>

01) Spatter-resistant type:  $\approx 134$  g ( $\approx 146$  g)

<b>Power supply</b>	12-24 VDC== (ripple P-P: $\leq 10\%$ ), operating voltage: 10-30 VDC==
<b>Leakage current</b>	$\leq 0.6$ mA
<b>Control output</b>	2 to 100 mA
<b>Residual voltage</b>	$\leq 3.5$ V (non-polarity <sup>01)</sup> : $\leq 5$ V)
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	$\geq 50$ M $\Omega$ (500 VDC== megger)
<b>Dielectric strength</b>	1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm amplitude at frequency 10 to 55 Hz (for 1 min) 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 (non-freezing or non-condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type / Connector type model
<b>Cable spec.<sup>02)</sup></b>	DIA. of sensing side $\varnothing 8$ mm: $\varnothing 3.5$ mm, 2-wire 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>	$\varnothing 3.5$ mm cable: AWG 24 (0.08 mm, 40-wire), insulator diameter: $\varnothing 1$ mm $\varnothing 4$ mm, $\varnothing 5$ mm cable : AWG 22 (0.08 mm, 60-wire), insulator diameter: $\varnothing 1.25$ mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable type cable (gray): polyvinyl chloride (oil resistant PVC)
<b>General</b>	Case/Nut: nickel plated brass (DIA. of sensing side $\varnothing 8$ mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	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.

	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Mounting hole (H)</b>	$\varnothing 8.5^{+0.5}_0$	$\varnothing 12.5^{+0.5}_0$	$\varnothing 18.5^{+0.5}_0$	$\varnothing 30.5^{+0.5}_0$
<b>TAP</b>	M8×1	M12×1	M18×1	M30×1.5

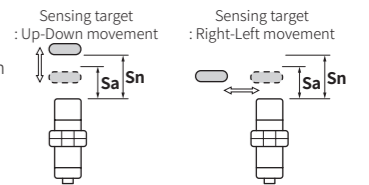
	$\varnothing 8$ mm	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b><math>\varnothing A</math></b>	15	21	29	42
<b>B</b>	13	17	24	35

### 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%

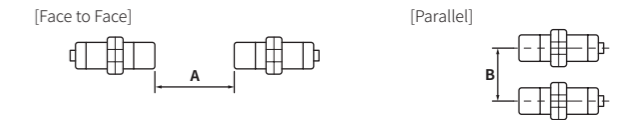


### Mutual-interference & Influence by Surrounding Metals

#### ■ Mutual-interference

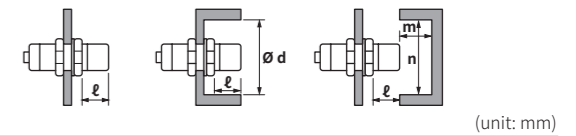
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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



#### ■ 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.



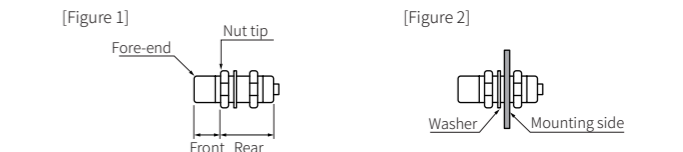
Sensing side / Item	$\varnothing 8$ mm		$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
<b>A</b>	9	12	12	24	30	48	60	90
<b>B</b>	16	24	24	36	36	54	60	90
<b>l</b>	0	8	0	11	0	14	0	15
<b><math>\varnothing d</math></b>	8	24	12	36	18	54	30	90
<b>m</b>	4.5	6	6	12	15	24	30	45
<b>n</b>	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 side / Strength	$\varnothing 8$ mm		$\varnothing 12$ mm		$\varnothing 18$ mm		$\varnothing 30$ mm	
	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush	Flush	Non-flush
<b>Front size</b>	7 mm	5 mm	13 mm	7 mm	-	-	26 mm	12 mm
<b>Front torque</b>	3.92 N m		6.37 N m		14.7 N m		49 N m	
<b>Rear torque</b>	8.82 N m		11.76 N m		14.7 N m		78.4 N m	

# Cylindrical Inductive General / Spatter-Resistant Proximity Sensors PR / PRA Series (AC 2-wire)

## INSTRUCTION MANUAL

DRW200026AA

**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 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.

For selecting the specific model, follow the Autonics web site.

<b>PR</b>	<b>①</b>	<b>②</b>	<b>③</b>	<b>④</b>	<b>-</b>	<b>⑤</b>	<b>A</b>	<b>⑥</b>
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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)

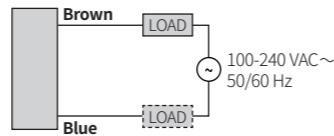
#### ⑥ Control output

O: Normally open  
C: Normally closed

### Connections

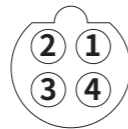
- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.

#### ■ Cable type



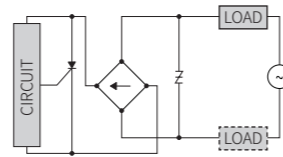
#### ■ Cable connector type / Connector type

- 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 Nothing	Presence Nothing
<b>Load</b>	Operation Return	Operation Return
<b>Operation indicator (red)</b>	ON OFF	ON OFF

### Sold Separately

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

### 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>	≤ 10 % of sensing distance		
<b>Standard sensing target: iron</b>	12 × 12 × 1 mm	18 × 18 × 1 mm	30 × 30 × 1 mm
<b>Response frequency <sup>01)</sup></b>	20 Hz		
<b>Affection by temperature</b>	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
<b>Indicator</b>	Operation indicator (red)		
<b>Approval</b>	CE ENEC	CE ENEC	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>	≤ 10 % of sensing distance		
<b>Standard sensing target: iron</b>	12 × 12 × 1 mm	25 × 25 × 1 mm	45 × 45 × 1 mm
<b>Response frequency <sup>01)</sup></b>	20 Hz		
<b>Affection by temperature</b>	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
<b>Indicator</b>	Operation indicator (red)		
<b>Approval</b>	CE ENEC	CE ENEC	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)	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b>Cable</b>	<b>Normal</b> ≈ 72 g (≈ 84 g) <sup>01)</sup>	≈ 118 g (≈ 130 g) <sup>02)</sup>	≈ 170 g (≈ 207 g)
	<b>Long</b> -	≈ 130 g (≈ 142 g)	≈ 208 g (≈ 245 g)
<b>Cable connector</b>	<b>Normal</b> ≈ 42 g (≈ 54 g)	≈ 66 g (≈ 78 g)	≈ 122 g (≈ 134 g)
	<b>Long</b> -	≈ 78 g (≈ 90 g)	≈ 158 g (≈ 195 g)
<b>Connector</b>	<b>Normal</b> ≈ 30 g (≈ 42 g)	≈ 54 g (≈ 66 g)	≈ 142 g (≈ 154 g)
	<b>Long</b> -	≈ 66 g (≈ 78 g)	≈ 182 g (≈ 194 g)

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

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

<b>Power supply</b>	100-240 VAC~ 50/60 Hz, operating voltage: 85-264 VAC~
<b>Leakage current</b>	≤ 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>	≤ 10 V
<b>Protection circuit</b>	Surge protection circuit
<b>Insulation resistance</b>	≥ 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 all terminals and case) Spatter-resistant type : 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type <sup>01)</sup> / Connector type <sup>02)</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-wire), 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

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.

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

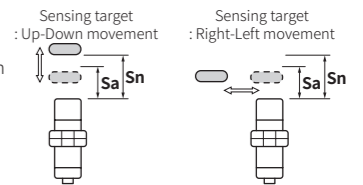
  

	$\varnothing 12$ mm	$\varnothing 18$ mm	$\varnothing 30$ mm
<b><math>\varnothing A</math></b>	21	29	42
<b>B</b>	17	24	35

### 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%

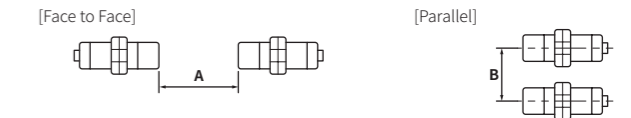


### Mutual-interference & Influence by Surrounding Metals

#### ■ Mutual-interference

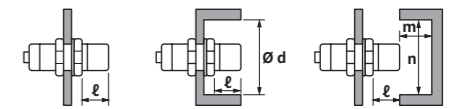
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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.



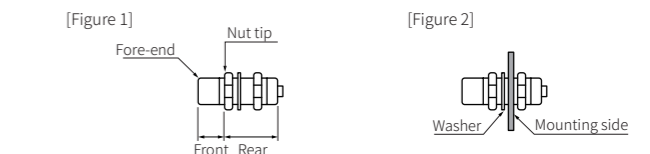
(unit: mm)

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>						
<b>Front size</b>	13 mm	7 mm	-	-	26 mm	12 mm
<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	