Autonics

INDUCTIVE PROXIMITY SENSOR (SPATTER RESISTANT TYPE)
PRA SERIES

M A N U A L

CE

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

■ Caution for your safety

※Please keep these instructions and review them before using this unit.
※Please observe the cautions that follow;
⚠ **Warning** Serious injury may result if instructions are not followed.
⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.
※The following is an explanation of the symbols used in the operation manual.
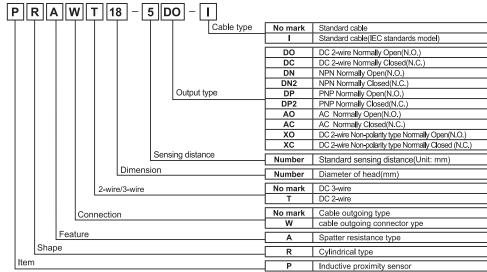⚠ **Caution**: Injury or danger may occur under special conditions.

⚠Warning

1. In case of using this unit with machinery(Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.
   It may cause a fire, human injury or damage to property.
2. Do not connect power directly without load.
   It may cause damage to inner components or burn them out.

⚠Caution

1. Do not use this unit in place where there are flammable, explosive gas, chemical or strong alkalis, acids.
   It may cause a fire or explosion.
2. Do not impact on this unit.
   It may cause malfunction or damage to the product.
3. Do not apply AC power and observe the rated specifications.
   It may cause serious damage to the product.

■ Ordering information

P R A W T 18 - 5 DO - I

Cable type	No mark	Standard cable
	I	Standard cable(IEC standards model)
Output type	DO	DC 2-wire Normally Open(N.O.)
	DC	DC 2-wire Normally Closed(N.C.)
	DN	NPN Normally Open(N.O.)
	DN2	NPN Normally Closed(N.C.)
	DP	PNP Normally Open(N.O.)
	DP2	PNP Normally Closed(N.C.)
	AO	AC Normally Open(N.O.)
	AC	AC Normally Closed(N.C.)
	XO	DC 2-wire Non-polarity type Normally Open(N.O.)
	XC	DC 2-wire Non-polarity type Normally Closed (N.C.)
Sensing distance	Number	Standard sensing distance(Unit: mm)
Dimension	Number	Diameter of head(mm)
2-wire/3-wire	No mark	DC 3-wire
	T	DC 2-wire
Connection	No mark	Cable outgoing type
	W	cable outgoing connector ype
Feature	A	Spatter resistance type
Shape	R	Cylindrical type
Item	P	Inductive proximity sensor

■ Dimensions

(Unit:mm)

Type	Cable outgoing type PRA/PRAT(M12, M18, M30)	Cable outgoing connector type PRAWT(M12, M18, M30)	Nut, Washer
Flush			

Type		A	B	C	D	F	G	H	J
DC type	M12 PRA	M12×1	43	32	4	4	17	21	2,000
	PRAT								2,000
	PRAWT								300
	M18 PRA	M18×1	47.5	29.5	4	5	24	29	2,000
	PRAT								2,000
	PRAWT								300
	M30 PRA	M30×1.5	58.5	38.5	5	5	35	42	2,000
	PRAT								2,000
	PRAWT								300
AC type	M12 PRA	M12×1	60	49	4	4	17	21	2,000
	M18 PRA	M18×1	53.8	35.8	4	5	24	29	2,000
	M30 PRA	M30×1.5	58.5	38.5	5	5	35	42	2,000

※"J" type standard: Cable outgoing type/2,000mm, Cable outgoing connector type/300mm
※**The above specifications are subject to change and some models may be discontinued without notice.**

■ Specifications

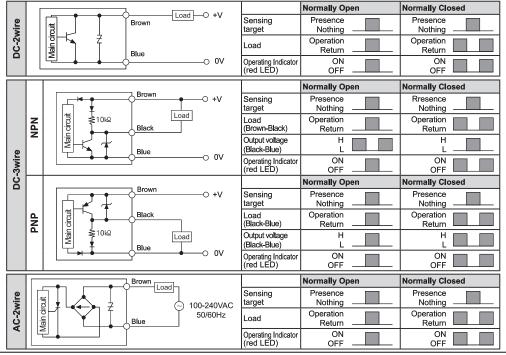| Model	PRAT12-2□□O PRAT12-2□□C PRAWT12-2□□O PRAWT12-2□□C PRAWT12-2□□O4 PRAWT12-2□□C4	PRAT18-5□□O PRAT18-5□□C PRAWT18-5□□O PRAWT18-5□□C PRAWT18-5□□O4 PRAWT18-5□□C4	PRAT30-10□□O PRAT30-10□□C PRAWT30-10□□O PRAWT30-10□□C PRAWT30-10□□O4 PRAWT30-10□□C4	PRA12-2DN PRA12-2DP PRA12-2DN2 PRA12-2DP2	PRA18-5DN PRA18-5DP PRA18-5DN2 PRA18-5DP2	PRA30-10DN PRA30-10DP PRA30-10DN2 PRA30-10DP2	PRA12-2AO PRA12-2AC	PRA18-5AO PRA18-5AC	PRA30-10AO PRA30-10AC
Sensing distance	2mm	5mm	10mm	2mm	5mm	10mm	2mm	5mm	10mm
Hysteresis	Max. 10% of sensing distance								
Standard sensing target	12×12×1mm (Iron)	18×18×1mm (Iron)	30×30×1mm (Iron)	12×12×1mm (Iron)	18×18×1mm (Iron)	30×30×1mm (Iron)	12×12×1mm (Iron)	18×18×1mm (Iron)	30×30×1mm (Iron)
Setting distance	0 to 1.4mm	0 to 3.5mm	0 to 7mm	0 to 1.4mm	0 to 3.5mm	0 to 7mm	0 to 1.4mm	0 to 3.5mm	0 to 7mm
Power supply (Operating voltage)	12-24VDC(10-30VDC)			12-24VDC(10-30VDC)			100-240VAC 50/60Hz(85-264VAC)		
Current consumption	-			Max. 10mA			-		
Leakage current	Max. 0.6mA			-			Max. 2.5mA		
Response frequency[1]	1.5kHz	500Hz	400Hz	1.5kHz	500Hz	400Hz	20Hz		
Residual voltage[2]	Max. 3.5V(Non-polarity type is Max. 5V)			Max. 1.5V			Max. 10V		
Affection by Temp.	Max.±10% for sensing distance at ambient temperature 20℃								
Control output	2 to 100mA			200mA			5 to 150mA	5 to 200mA	
Insulation resistance	Min. 50MΩ (at 500VDC megger)								
Dielectric strength	1,500VAC 50/60Hz for 1minute(between all terminals and case)								
Vibration	1mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours								
Shock	500m/s²(50G) X, Y, Z directions for 3 times								
Indicator	Operating indicator(red LED)								
Environment Ambient temperature	-25 to 70℃, Storage: -30 to 80℃								
Environment Ambient humidity	35 to 95%RH, Storage: 35 to 95%RH								
Protection circuit	Surge protection circuit, Overload & Short protection circuit			Surge protection circuit, Overload & Short protection circuit Reverse polarity proteciton circuit			Surge protection circuit		
Protection	IP67(IEC Standards)								
Cable PRA(T)	Ø4, 2-wire, 2m	Ø5, 2-wire, 2m		Ø4, 3-wire, 2m	Ø5, 3-wire, 2m		Ø4, 2-wire, 2m	Ø5, 2-wire, 2m	
	(AWG22, Core diameter: 0.08mm, Number of cores: 60, Insulator out diameter: Ø1.25mm)								
Cable PRAWT	Ø4, 2-wire, 300mm, M12 connector			Ø5, 2-wire, 300mm, M12 connector					
Materials	Case/Nut: Teflon coated Brass, Washer: Teflon coated Iron, Sensing surface: Teflon, Standard cable(Black): Polyvinyl chloride(PVC)								
Insulation type	-						Double insulation or reinforced insulation (Mark: □) Dielectric strength between the measuring input part and the power part : 1.5kVAC)		
Approval	CE								
Unit weight	PRAT: Approx. 84g (Approx. 72g) PRAWT: Approx. 54g (Approx. 42g)	PRAT: Approx. 122g (Approx. 110g) PRAWT: Approx. 70g (Approx. 58g)	PRAT: Approx. 207g (Approx. 170g) PRAWT: Approx. 134g (Approx. 122g)	Approx. 84g (Approx. 72g)	Approx. 122g (Approx. 110g)	Approx. 207g (Approx. 170g)	Approx. 78g (Approx. 66g)	Approx. 118g (Approx. 106g)	Approx. 207g (Approx. 170g)

※1: 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.   ※2: Before using non-polarity type, check the condition of connected device because residual voltage is 5V.
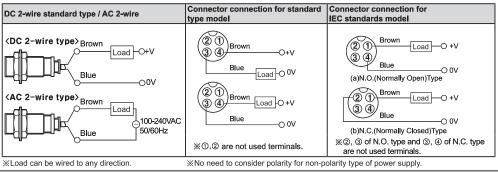※3: The weight with packaging and the weight in parentheses is only unit weight.   ※Environment resistance is rated at no freezing or condensation.

■ Control output diagram & Load operation

DC-2wire

	Normally Open	Normally Closed
Sensing target	Presence / Nothing	Presence / Nothing
Load	Operation / Return	Operation / Return
Operating Indicator (red LED)	ON / OFF	ON / OFF

DC-3wire NPN

	Normally Open	Normally Closed
Sensing target	Presence / Nothing	Presence / Nothing
Load (Brown-Black)	Operation / Return	Operation / Return
Output voltage (Black-Blue)	H / L	H / L
Operating Indicator (red LED)	ON / OFF	ON / OFF

DC-3wire PNP

	Normally Open	Normally Closed
Sensing target	Presence / Nothing	Presence / Nothing
Load (Black-Blue)	Operation / Return	Operation / Return
Output voltage (Black-Blue)	H / L	H / L
Operating Indicator (red LED)	ON / OFF	ON / OFF

AC-2wire

	Normally Open	Normally Closed
Sensing target	Presence / Nothing	Presence / Nothing
Load	Operation / Return	Operation / Return
Operating Indicator (red LED)	ON / OFF	ON / OFF

■ Connections

DC 2-wire standard type / AC 2-wire

<DC 2-wire type> Brown — Load — +V ; Blue — 0V

<AC 2-wire type> Brown — Load — 100-240VAC 50/60Hz ; Blue

※①,② are not used terminals.

Connector connection for standard type model

(a)N.O.(Normally Open)Type
(b)N.C.(Normally Closed)Type

Connector connection for IEC standards model

②①③④ Brown — +V ; Blue — 0V

※②, ③ of N.O. type and ③, ④ of N.C. type are not used terminals.

※Load can be wired to any direction.   ※No need to consider polarity for non-polarity type of power supply.
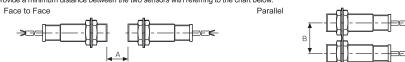
■ Power supply connection

Be sure to connect the power after connecting the load, because direct connection of the proximity sensor may cause damage to the inner elements of this product.
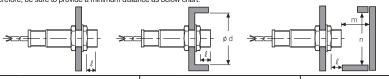

■ Mutual-interference & Influence by surrounding metals

◎ **Mutual- interference**

When several proximity sensors are mounted closely, malfunction of sensor may be caused due to mutual interference. Therefore, be sure to provide a minimum distance between the two sensors with referring to the chart below.
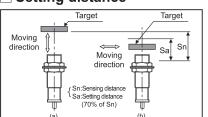
Face to Face   Parallel

■ **Influence by surrounding metals**

When sensors are mounted on metallic panel, it is required to protect the sensors from being affected by any metallic object except target. Therefore, be sure to provide a minimum distance as below chart.

(Unit:mm)

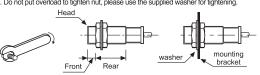| PRA□12-2□□		PRA□18-5□□		PRA□30-10□□	
A	12	ød	12	A	30	ød	18	A	60	ød	30
B	24	m	6	B	36	m	15	B	60	m	30
ℓ	0	n	18	ℓ	0	n	27	ℓ	0	n	45

■ Setting distance

• Sensing distance can be changed by the shape, size or material of the target. Therefore please check the sensing distance like (a), then pass the target within range of setting distance(Sa).
• Setting distance(Sa)
   = Sensing distance(Sn) × 70%
   Ex)PRA30-10DN
   Setting distance(Sa) = 10mm × 0.7 = 7mm

Sn:Sensing distance
Sa:Setting distance (70% of Sn)

■ Caution for using

1. This equipment shall not be used outdoors or beyond specified temperature range.
2. Do not apply over tensile strength of cord. (ø4: 30N max., ø5: 50N max.)
3. Do not use the same conduit with cord of this unit and electric power line or power line.
4. Do not put overload to tighten nut, please use the supplied washer for tightening.

		Strength	Front		Rear
Model			Size	Torque	Torque
PRA12 Series	Flush	13mm	65kgf·cm (6.37N·m)		120kgf·cm (11.76N·m)
	Non-Flush	7mm	-		
PRA18 Series	Flush	-	150kgf·cm (14.7N·m)		150kgf·cm (14.7N·m)
	Non-Flush	-			
PRA30 Series	Flush	26mm	500kgf·cm (49N·m)		800kgf·cm (78.4N·m)
	Non-Flush	12mm			

[Figure 1] [Figure 2] [Table 1]

Note1) Allowable tightening torque of a nut may be different by the distance from the head. For allowable tightening torque and the range of front and rear parts, refer to [Table 1] and above [Figure 1] respectively. The rear part includes a nut on the head side(see above [Figure 1]). Please apply a tightening torque of the front part when the nut on the front is located in the front part.
Note2) The allowable tightening torque denotes a torque value when using a provided washer as above [Figure 2].
5. Please check the voltage changes of power source in order not to excess rating power input.
6. Do not use this unit during transient time(80ms) after apply power.
7. It might result in damage to this product, if use automatic transformer. So please use insulated transformer.
8. Please make wire as short as possible in order to avoid noise.
9. Be sure to use cable as indicated specification on this product. If wrong cable or bended cable is used, it shall not maintain the water-proof.
10. It is possible to extend cable with over 0.3mm² and max. 200m.
11. If the target is plated, the sensing distance can be changed by the plating material.
12. It may result in malfunction by metal particle on product.
13. If there are machines(motor, welding etc), which occurs big surge around this unit, please install the varistor or absorber to source of surge, even though there is built-in surge absorber in this unit.
14. If connecting the load with big inrush current(DC type bulb) to this unit, the big inrush current will flow since the initial resistance is low. If the current flows, the resistance of load will be bigger, then it will return to standard current. In this case, proximity sensor might be damaged by inrush current.
   If you use DC type bulb, please connect extra relay or resistance in order to protect proximity sensor from.
15. If making a transceiver close to proximity sensor or wire connection, it may cause malfunction.
16. In case of the load current is small(AC type): When the load current is under 5mA, make the residual voltage is less than return voltage to connect the bleeder resistor to load in parallel.(※110VAC 50/60Hz: 20kΩ, Min. 3W, 220VAC 50/60Hz: 39kΩ, Min. 5W)
17. In case of the load current is small(DC 2-wire): Make the residual current is less than return current to connect the bleeder resistor to load in parallel.

Vs:Power supply, Io:Min.operating current for proximity sensor, Ioff:Return current of load, P:Resistance W of Bleeder resistor

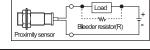$$R \le \frac{Vs}{Io\text{-}Ioff} \ (k\Omega) \qquad P > \frac{Vs^2}{R} \ (mW)$$

※It may cause malfunction if above instructions are not followed.

■ Major products

- Photoelectric sensors
- Fiber optic sensors
- Door sensors
- Door side sensors
- Area sensors
- Proximity sensors
- Pressure sensors
- Rotary encoders
- Connector/Sockets
- Temperature controllers
- Temperature/Humidity transducers
- SSR/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse(Rate) meters
- Display units
- Sensor controllers
- Switching mode power supplies
- Control switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper motors/drivers/motion controllers
- Graphic/Logic panels
- Field network devices
- Laser marking system(Fiber, CO₂, Nd:YAG)
- Laser welding/soldering system

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