

Cylindrical Capacitive Proximity Sensors



CR Series (AC 2-wire)

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

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

Features

- Detect various materials including metal, iron, stone, plastic, water, and grain
- Built-in surge protection circuit, reverse polarity protection
- Simple operation, reliable performance, and high durability
- Built-in sensitivity adjuster for convenient configuration
- Operation indicator (red)
- Ideal for level detection and position control

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

CR ① - ② A ③

① DIA. of sensing side

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

③ Control output

O: Normally Open
C: Normally Closed

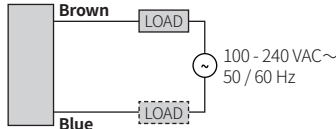
② Sensing distance

Number: Sensing distance (unit: mm)

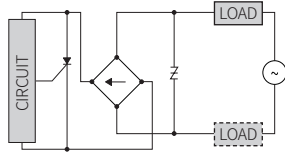
Connections

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

■ Cable type



■ Inner circuit



Operation Timing Chart

| | Normally open | Normally closed |
|----------------------------------|--------------------------------------|--------------------------------------|
| Sensing target | Presence: High pulse Nothing: Low | Presence: High pulse Nothing: Low |
| Load | Operation: High pulse Return: Low | Operation: High pulse Return: Low |
| Operation indicator (red) | ON: High pulse OFF: Low | ON: High pulse OFF: Low |

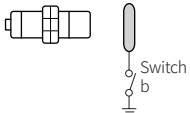
Sold Separately

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

Grounding

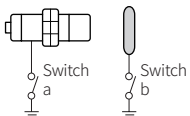
The sensing distance will be changed by grounding status of capacity proximity sensor and the target [50 × 50 × 1 mm (iron)]. Check the material when installing the sensor and selecting the target.

■ CR18-8A□



| Ground condition (switch b) | ON | OFF |
|-----------------------------|----|-----|
| Operating distance (mm) | 8 | 4 |

■ CR30-15A□



| Ground condition | Switch a | ON | OFF | ON | OFF |
|-------------------------|----------|----|-----|-----|-----|
| | Switch b | ON | ON | OFF | OFF |
| Operating distance (mm) | 15 | 18 | 6 | 6 | |

Specifications

| Installation | Non-flush type | |
|-----------------------------------|---|-------------------|
| | CR18-8A□ | CR30-15A□ |
| Model | CR18-8A□ | CR30-15A□ |
| DIA. of sensing side | Ø 18 mm | Ø 30 mm |
| Sensing distance | 8 mm | 15 mm |
| Setting distance | 0 to 5.6 mm | 0 to 10.5 mm |
| Hysteresis | ≤ 20% of sensing distance | |
| Standard sensing target: iron | 50 × 50 × 1 mm | |
| Response frequency ⁰¹⁾ | 20 Hz | |
| Affection by temperature | ≤ ± 20% for sensing distance at ambient temperature 20 °C | |
| Indicator | Operation indicator (red) | |
| Approval | ERC | ERC |
| Unit weight (package) | ≈ 70 g (≈ 82 g) | ≈ 200 g (≈ 237 g) |

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.

| | |
|------------------------------|--|
| Power supply | 100-240 VAC ~ 50 / 60 Hz, operating voltage: 85 - 264 VAC ~ |
| Leakage current | ≤ 2.2 mA |
| Control output | ≤ 5 to 200 mA |
| Residual voltage | ≤ 20 V |
| Protection circuit | Surge protection circuit |
| Insulation resistance | ≥ 50 MΩ (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 ² (≈ 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 | DIA. of sensing side Ø 18 mm: IP66 (IEC standard) / DIA. of sensing side Ø 30 mm: IP65 (IEC standard) |
| Connection | Cable type |
| Cable spec. | DIA. of sensing side Ø 18 mm: Ø 4 mm, 2-wire, 2 m DIA. of sensing side Ø 30 mm: Ø 5 mm, 2-wire, 2 m |
| Wire spec. | AWG 22 (0.08 mm, 60-wire), insulator DIA.: Ø 1.25 mm |
| Material | Standard type cable (black): polyvinyl chloride (PVC) |
| DIA. of sensing side Ø 18 mm | Case / Nut: PA6 |
| DIA. of sensing side Ø 30 mm | Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT |

Sensitivity Adjustment

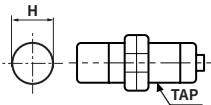
Please turn potentention VR to set sensitivity as below procedure.

- When there is distance fluctuation between proximity sensor and the target, please adjust 2 at the farthest distance from this unit.
- Turning potentention VR toward clockwise, it will be max., or turning toward counter clockwise, it will be min. The number of adjustment should be 15 ± 3 revolution and if it is turned to the right or left excessively, it will not stop, but it idles without breakdown.
- () is for Normally closed type.

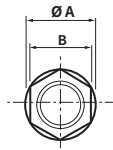
| Procedure | Potentention VR | Description |
|-----------|--|---|
| 1 | Stop at ON (OFF) position | Without a sensing object, turn the potentention VR to the right and stop at the proximity sensor is ON (OFF). |
| 2 | Stop at OFF (ON) position | Put the object in right sensing position, turn the potentention VR to the left and stop at the proximity sensor is OFF (ON). |
| 3 | It is stable when it is over 1.5 times OFF (ON) position ON (OFF) position | If the difference of the number of potentention VR rotation between the ON (OFF) point and the OFF (ON) point is more than 1.5 turns, the sensing operation will be stable. |
| 4 | Adjustment completed OFF (ON) position ON (OFF) position | If it is set in sensitivity adjustment position of potentention VR at center between 1 and 2, sensitivity setting will be completed. |

Cut-out Dimensions

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



| | Ø 18 mm | Ø 30 mm |
|-------------------|-------------------------------------|-------------------------------------|
| Mounting hole (H) | Ø 18.5 ^{+0.5} ₀ | Ø 30.5 ^{+0.5} ₀ |
| TAP | M18×1 | M30×1.5 |



| | Ø 18 mm | Ø 30 mm |
|-----|---------|---------|
| Ø A | 26.5 | 42 |
| B | 24 | 35 |

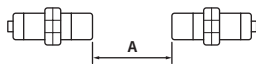
Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

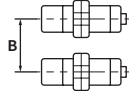
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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

[Face to Face]

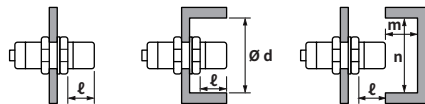


[Parallel]



■ 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)

| Item \ Sensing side | Ø 18 mm | Ø 30 mm |
|---------------------|---------|---------|
| A | 48 | 90 |
| B | 54 | 90 |
| ℓ | 20 | 10 |
| Ø d | 54 | 90 |
| m | 24 | 45 |
| n | 54 | 90 |

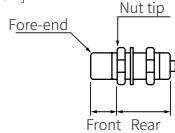
Tightening Torque

Use the provided washer to tighten the nuts.

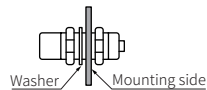
The tightening torque of the nut varies with the distance from the fore-end. [Figure 1]

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].

[Figure 1]



[Figure 2]



| Sensing side | Ø 18 mm | Ø 30 mm |
|--------------|----------|----------|
| Strength | - | 12 mm |
| Front size | - | 49 N m |
| Front torque | 0.39 N m | 78.4 N m |
| Rear torque | 0.39 N m | - |

Cylindrical Capacitive Proximity Sensors



CR Series (DC 3-wire)

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

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

Major Features

- Detect various materials including metal, iron, stone, plastic, water, and grain
- Built-in surge protection circuit, reverse polarity protection
- Simple operation, reliable performance, and high durability
- Built-in sensitivity adjuster for convenient configuration
- Operation indicator (red)
- Ideal for level detection and position control

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 \Rightarrow 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.
- 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.

CR ① - ② D ③

① DIA. of sensing side

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

③ Control output

N: NPN Normally open

N2: NPN Normally closed

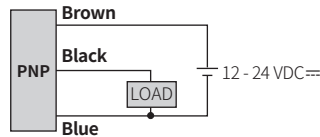
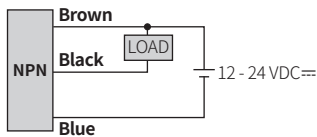
P: PNP Normally open

② Sensing distance

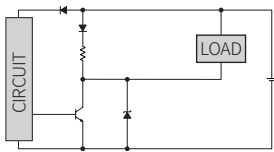
Number: Sensing distance (unit: mm)

Connections

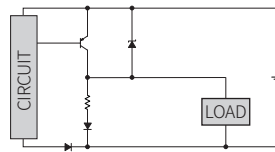
■ Cable type



■ Inner circuit (NPN output)



■ Inner circuit (PNP output)



Operation Timing Chart

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

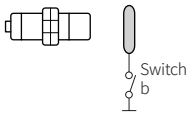
Sold Separately

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

Grounding

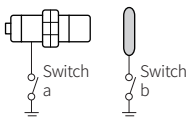
The sensing distance will be changed by grounding status of capacity proximity sensor and the target [50 × 50 × 1 mm (iron)]. Check the material when installing the sensor and selecting the target.

■ CR18-8D□



| Ground condition (switch b) | ON | OFF |
|-----------------------------|----|-----|
| Operating distance (mm) | 8 | 4 |

■ CR30-15D□



| Ground condition | Switch a | ON | OFF | ON | OFF |
|-------------------------|----------|----|-----|-----|-----|
| | Switch b | ON | ON | OFF | OFF |
| Operating distance (mm) | 15 | 18 | 6 | 6 | |

Specifications

| Installation | Non-flush type | |
|-----------------------------------|---|-------------------|
| Model | CR18-8D□ | CR30-15D□ |
| DIA. of sensing side | Ø 18 mm | Ø 30 mm |
| Sensing distance | 8 mm | 15 mm |
| Setting distance | 0 to 5.6 mm | 0 to 10.5 mm |
| Hysteresis | ≤ 20% of sensing distance | |
| Standard sensing target: iron | 50 × 50 × 1 mm | |
| Response frequency ⁰¹⁾ | 50 Hz | |
| Affection by temperature | ≤ ± 20% for sensing distance at ambient temperature 20 °C | |
| Indicator | Operation indicator (red) | |
| Approval | ERC | ERC |
| Unit weight (package) | ≈ 76 g (≈ 88 g) | ≈ 206 g (≈ 243 g) |

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.

| | |
|------------------------------|--|
| Power supply | 12 - 24 VDC≒ (ripple P-P: ≤ 10%), operating voltage: 10 - 30 VDC≒ |
| Current consumption | ≤ 15 mA |
| Control output | ≤ 200 mA |
| Residual voltage | ≤ 1.5 V |
| Protection circuit | Surge protection circuit, reverse polarity protection |
| Insulation resistance | ≥ 50 MΩ (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 ² (≈ 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 | DIA. of sensing side Ø 18 mm: IP66 (IEC standard) / DIA. of sensing side Ø 30 mm: IP65 (IEC standard) |
| Connection | Cable type |
| Cable spec. | DIA. of sensing side Ø 18 mm: Ø 4 mm, 3-wire, 2 m DIA. of sensing side Ø 30 mm: Ø 5 mm, 3-wire, 2 m |
| Wire spec. | AWG 22 (0.08 mm, 60-wire), insulator DIA.: Ø 1.25 mm |
| Material | Standard type cable (black): polyvinyl chloride (PVC) |
| DIA. of sensing side Ø 18 mm | Case / Nut: PA6 |
| DIA. of sensing side Ø 30 mm | Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT |

Sensitivity Adjustment

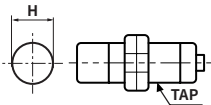
Please turn potentiometer VR to set sensitivity as below procedure.

- When there is distance fluctuation between proximity sensor and the target, please adjust 2 at the farthest distance from this unit.
- Turning potentiometer VR toward clockwise, it will be max., or turning toward counter clockwise, it will be min. The number of adjustment should be 15 ± 3 revolution and if it is turned to the right or left excessively, it will not stop, but it idles without breakdown.
- () is for Normally closed type.

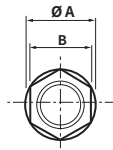
| Procedure | Potentiometer VR | Description |
|-----------|--|--|
| 1 | Stop at ON (OFF) position | Without a sensing object, turn the potentiometer VR to the right and stop at the proximity sensor is ON (OFF). |
| 2 | Stop at OFF (ON) position | Put the object in right sensing position, turn the potentiometer VR to the left and stop at the proximity sensor is OFF (ON). |
| 3 | OFF (ON) position ON (OFF) position | It is stable when it is over 1.5 times If the difference of the number of potentiometer VR rotation between the ON (OFF) point and the OFF (ON) point is more than 1.5 turns, the sensing operation will be stable. |
| 4 | Adjustment completed OFF (ON) position ON (OFF) position | Adjustment completed If it is set in sensitivity adjustment position of potentiometer VR at center between 1 and 2, sensitivity setting will be completed. |

Cut-out Dimensions

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



| | Ø 18 mm | Ø 30 mm |
|-------------------|-------------------------------------|-------------------------------------|
| Mounting hole (H) | Ø 18.5 ^{+0.5} ₀ | Ø 30.5 ^{+0.5} ₀ |
| TAP | M18×1 | M30×1.5 |



| | Ø 18 mm | Ø 30 mm |
|-----|---------|---------|
| Ø A | 26.5 | 42 |
| B | 24 | 35 |

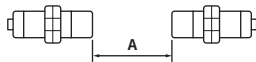
Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

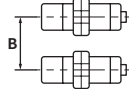
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

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

[Face to Face]

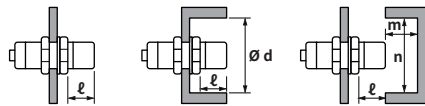


[Parallel]



■ 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)

| Item \ Sensing side | Ø 18 mm | Ø 30 mm |
|---------------------|---------|---------|
| A | 48 | 90 |
| B | 54 | 90 |
| ℓ | 20 | 10 |
| Ø d | 54 | 90 |
| m | 24 | 45 |
| n | 54 | 90 |

Tightening Torque

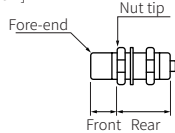
Use the provided washer to tighten the nuts.

The tightening torque of the nut varies with the distance from the fore-end. [Figure 1]

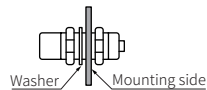
If the nut tip is located at the front of the product, apply the front tightening torque.

the allowable tightening torque table is for inserting the washer as [Figure 2].

[Figure 1]



[Figure 2]



| Sensing side | Ø 18 mm | Ø 30 mm |
|--------------|----------|----------|
| Strength | - | 12 mm |
| Front size | - | 49 N m |
| Front torque | 0.39 N m | 78.4 N m |
| Rear torque | 0.39 N m | - |