

# BYD Series

## INSTRUCTION MANUAL

# Autonics

Keep this instruction manual in a place where you can find easily.



Certain models may be discontinued without notice.

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

Failure to follow this instruction may result in fire.

**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.

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- When connecting an inductive load such as DC relay or solenoid valve to the output, remove surge by using diodes or varistors.
- Use the product after 0.5 sec of the power input.  
When using a separate power supply for the sensor and load, supply power to the sensor first.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep it away from high voltage lines or power lines to prevent surge and inductive noise.
- When using switching mode power supply (SMPS), ground F.G. terminal and connect a condenser between OV and F.G. terminal to remove noise.
- When using a sensor with a noise-generating equipment (e.g., switching regulator, inverter, and servo motor), ground F.G. terminal of the equipment.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 3
  - Installation category II

| Sensing type           | Through-beam                | Diffuse reflective | Convergent reflective |
|------------------------|-----------------------------|--------------------|-----------------------|
| Product components     | Product, instruction manual |                    |                       |
| Adjustment screwdriver | -                           | × 1                | × 1                   |
| Bracket A              | × 2                         | × 1                | × 1                   |
| M3 bolt / nut          | × 4                         | × 2                | × 2                   |

**⑧ Feature of convergent reflective type**  
No mark: Front operation indicator  
U: Upper operation indicator  
T: Built-in timer (OFF delay mode)

- Bracket B
- Slit for through-beam type: BYD3M-ST (sticker)

- Be sure to install this product by following the usage environment, location, and specified ratings. Consider the listed conditions below.
  - Installation environment and background (reflected light)
  - Sensing distance and sensing target
  - Direction of target's movement
  - Characteristic curves
- When installing multiple sensors closely, it may result in malfunction due to mutual interference.
- For installation, tighten the screw with a torque of 0.5 N m. Mount the brackets correctly to prevent the twisting of the sensor's optical axis.
- The waterproof function may be damaged if the product is subjected to impact from a hard object or bent excessively or repeatedly.
- Use this product after the test. Check whether the indicator works appropriately for the positions of the detectable object.

| Through-beam                                                                                                                                 | Reflective                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Emitter - Receiver:<br/>Install to face each other</p> |  <p>Sensor - Sensing target:<br/>Install to face each other (parallel with the sensing side of the unit)</p> |

- In case of the built-in timer model, you can set the OFF Delay timer.  
(adjustable time: 0.1 to 2 sec)
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.



- T: Setting time by the adjuster (setting time: 0.1 to 2 sec)
- $t \leq 3 \text{ ms}$  (When the adjuster is set to Min (0.1 sec))
- If the interrupted time (Ta) after receiving the light is shorter than the setting time (T) the transistor output maintains the ON state.

01) Through-beam type: max. 100 mA, diffuse reflective or convergent reflective type: max. 50 mA

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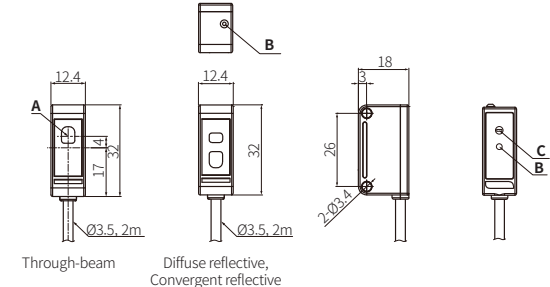
- OCP (over current protection), SCP (short circuit protection)
- If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the protection circuit.

- Set the adjuster for stable Light ON area, minimizing the effect of the installation environment
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.
- The steps below are based on Light ON mode.

| STEP | Status      | Description                                                                                                                                                                                                                                                                                                               |
|------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01   | Received    |  <p>Turn the adjuster from MIN to MAX sensitivity and check the position (A) where the operation indicator activates under the light ON area.</p>                                                                                     |
| 02   | Interrupted |  <p>Turn the adjuster from (A) to MAX and check the position (B) where the operation indicator activates under the light OFF area.<br/>If the operation indicator does NOT activate at the MAX (maximum sensitivity): MAX = (B).</p> |
| 03   | -           |  <p>Set the adjuster at the mid position between (A) and (B) for optimal sensitivity.</p>                                                                                                                                            |

- Unit: mm, For the detailed drawings, follow the Autonics website

|          |                                                                           |
|----------|---------------------------------------------------------------------------|
| <b>A</b> | Optical axis                                                              |
| <b>B</b> | Upper operation indicator of convergent reflective type (red)             |
| <b>C</b> | Sensitivity adjustment adjuster or timer adjuster of built-in timer model |



02) When the timer adjuster is set to min (0.1 sec).

|                                           |                                                                                                                                                                     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power supply</b>                       | 12-24 VDC $\pm$ $\pm$ 10 % (ripple P-P: $\leq$ 10 %)                                                                                                                |
| <b>Current consumption</b>                | It depends on the sensing type                                                                                                                                      |
| Through-beam                              | Emitter: $\leq$ 30 mA, receiver: $\leq$ 30 mA                                                                                                                       |
| Reflective                                | $\leq$ 35 mA                                                                                                                                                        |
| <b>Control output</b>                     | Through-beam type<br>: NPN open collector output / PNP open collector output model<br>Diffuse reflective, convergent reflective type<br>: NPN open collector output |
| Load voltage                              | $\leq$ 26.4 VDC $\pm$                                                                                                                                               |
| Load current                              | Through-beam type : $\leq$ 100 mA<br>Diffuse reflective, convergent reflective type : $\leq$ 50 mA                                                                  |
| Residual voltage                          | NPN: $\leq$ 1 VDC $\pm$ , PNP: $\leq$ 2.5 VDC $\pm$                                                                                                                 |
| <b>Protection circuit</b>                 | Reverse power protection circuit, output short overcurrent protection circuit                                                                                       |
| <b>Insulation resistance</b>              | $\geq$ 20 M $\Omega$ (500 VDC $\pm$ megger)                                                                                                                         |
| <b>Noise immunity</b>                     | $\pm$ 240 VDC $\pm$ = the square wave noise (pulse width: 1 $\mu$ s) by the noise simulator                                                                         |
| <b>Dielectric strength</b>                | Between the charging part and the case: 1,000 VAC $\sim$ 50/60 Hz for 1 min                                                                                         |
| <b>Vibration</b>                          | 1.5 mm double amplitude at frequency of 10 to 55 Hz 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 illuminance (receiver)</b>     | Sunlight: $\leq$ 11,000 lx, incandescent lamp: $\leq$ 3,000 lx                                                                                                      |
| <b>Ambient temperature</b> <sup>01)</sup> | -20 to 65 °C, storage: -25 to 70 °C (no freezing or condensation)                                                                                                   |
| <b>Ambient humidity</b>                   | 35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)                                                                                                   |
| <b>Protection rating</b>                  | Through-beam, convergent reflective type (front operation indicator model) : IP64 (IEC standard), Others: IP50 (IEC standard)                                       |
| <b>Connection</b>                         | Cable type                                                                                                                                                          |
| <b>Cable specification</b>                | $\varnothing$ 3.5 mm, 3-wire (Emitter: 2-wire), 2 m                                                                                                                 |
| <b>Wire specification</b>                 | AWG26 (0.52 mm, 20-core), insulator outer diameter: $\varnothing$ 1 mm                                                                                              |
| <b>Material</b>                           | Case: PC, sensing part: PC, bracket: SPCC, bolt: SCM, nut: SCM, sleeve: Brass, Ni-plate                                                                             |

01) UL approved surrounding air temperature: 60°C