Autonics



Diffuse Reflective Long-distance Photoelectric Sensors

BA Series

PRODUCT MANUAL

Be sure to follow the instructions and precautions in the instruction manual, other manuals, and the Autonics website.
The specifications, dimensions, and other information in this document are subject to change without notice for product improvement.
Certain models may be discontinued without notice.

Safety Precautions

- 'Safety Precautions' are provided to ensure safe and proper use of the product and to prevent accidents or hazards. Please make sure to follow them carefully.
- ⚠ symbol indicates a caution, warning of potential hazards under certain conditions.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. **Fail-safe device must be installed when using the product in applications that may cause serious injuries or property loss. (E.g. nuclear control systems, medical equipment, ships, vehicles, railroads, aircraft, combustion devices, safety devices, security systems, disaster prevention devices, etc.)**
    Failure to do so may result in personal injury, property loss or fire.
02. **Do not use or store the product in environments containing flammable, explosive, or corrosive gases, or in places exposed to high humidity, direct sunlight, radiant heat, vibration, shock, or salt.**
    Failure to do so may result in explosion or fire.
03. **Do not disassemble, repair, or modify the product without authorization.**
    Failure to do so may result in fire.
04. **Do not connect, repair, or inspect the product while connected to a power source.**
    Failure to do so may result in fire.
05. **Check the connection diagram before wiring.**
    Failure to do so may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use the product within its rated specifications and performance limits.**
    Failure to do so may result in fire or product damage.
02. **Use a dry cloth to clean the product. Do not use water or organic solvents.**
    Failure to do so may result in fire.

Cautions During Use

- Make sure to follow the instructions in 'Cautions During Use'. Failure to do so may result in unexpected accidents.
- When connecting inductive loads such as DC relays or solenoid valves use a diode, varistor, or similar component to suppress surges.
- Wait at least 0.5 seconds after applying power before using the product. When using separate power supplies for sensor and load, apply power to the sensor first.
- Power input should be supplied from an isolated and limited voltage/current source, or from a Class 2 or SELV power supply.
- To prevent surges and inductive noise, separate the wiring from high-voltage and power lines, and keep wiring lengths as short as possible.
- When supplying power with an SMPS, ground the F.G. terminal and connect a noise suppression capacitor between the 0 V and F.G. terminals.
- When using the product with noise-generating devices (e.g. switching regulators, inverters, servo motors, etc.), make sure to ground the F.G. terminal of the unit.
- This product may be used in the following environmental conditions.
  - Indoors (environment condition rated in 'Specifications')
  - Altitude: up to 2,000 m
  - Pollution Degree 3
  - Installation Category II

Product Components

- Product
- Adjustment screwdriver
- Instruction manual

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

BA	❶	-	❷	❸	❹	❺	-	❻

❶ Sensing distance
2M: 2 m

❷ Sensing type
D: Diffuse reflective

❸ Power supply
D: 12 - 24 VDC

❹ Output
T: Solid state (transistor)

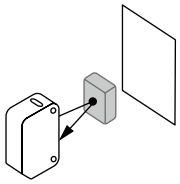
❺ Operation mode
No mark: Light ON
D: Dark ON

❻ Control output
No mark: NPN open collector output
P: PNP open collector output

Cautions during Installation

- 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.
- Do not impact with a hard object or bend the cable excessively. That could decrease the product's water resistance.
- Use this product after the test. Check whether the indicator works appropriately for the positions of the detectable object.

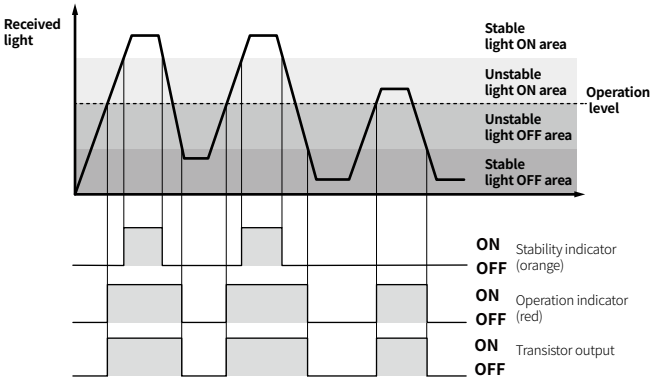
Reflective



Sensor - Sensing target:
Install to face each other (parallel with the sensing side of the unit)

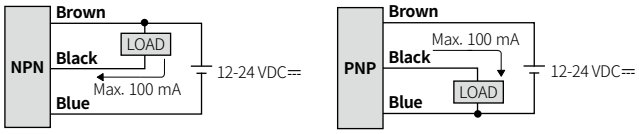
Operation Timing Chart and Indicators

■ Light ON mode



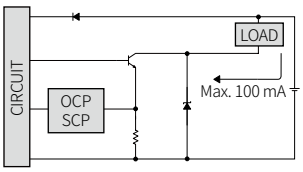
- In Dark ON mode, the waveforms are reversed.

Connections

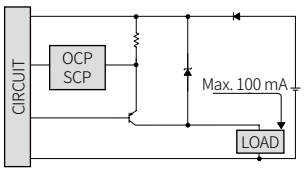


Circuit

■ NPN open collector output



■ PNP open collector output



- 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.

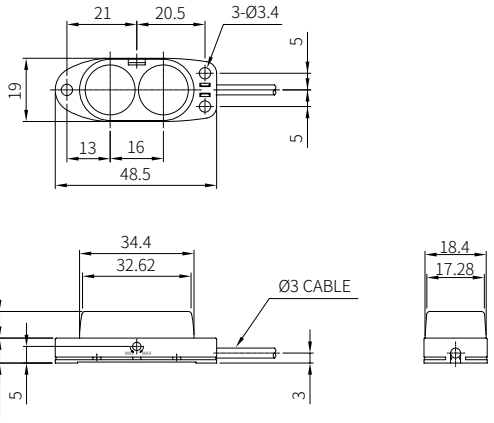
Sensitivity Adjustment

- 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		Turn the adjuster from MIN to MAX sensitivity and check the position (A) where the operation indicator activates under the light ON area.
02	Interrupted		Turn the adjuster from (A) to MAX and check the position (B) where the operation indicator activates under the light OFF area. If the operation indicator does NOT activate at the MAX (maximum sensitivity): MAX = (B).
03	-		Set the adjuster at the mid position between (A) and (B) for optimal sensitivity.

Dimensions

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



Specifications

Model	BA2M-DDT□-□
Sensing type	Diffuse reflective
Sensing distance	2 m [01]
Sensing target	Opaque materials, translucent materials
Hysteresis	≤ 20 % of sensing distance
Response time	≤ 1 ms
Light source	Infrared
Peak emission wavelength	850 nm
Sensitivity adjustment	YES (Adjuster)
Operation mode	Light ON mode / Dark ON mode model
Indicator	Operation indicator (red), stability indicator (Light ON: orange, Dark ON: green)
Certifications	CE UK EAC
Unit weight	≈ 50 g

01) Non-glossy white paper 200 × 200 mm

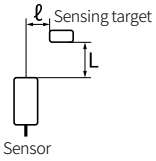
Power supply	12-24 VDC⎓ ±10 % (ripple P-P: ≤ 10%)
Current consumption	≤ 15 mA (output ON: ≤ 30 mA)
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC⎓
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC⎓, PNP: ≤ 2.5 VDC⎓
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC⎓ megger)
Noise immunity	±240 VDC⎓ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	Between the charging part and the case : 1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	100 m/s² (≈ 10 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP64 (IEC standard)
Connection	Cable type
Cable spec.	Ø 3 mm, 3-wire, 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1 mm
Material	Case: ABS, CAP: PC, sensing part: PC, adjuster: IXEF

Product Characteristics

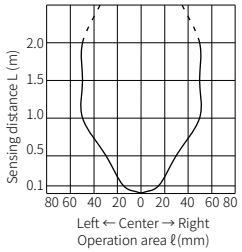
This data is based on internal testing and for reference only. Performance may vary by installation and usage environment. Product testing prior to use is recommended.

Diffuse Reflective Type (TYPICAL)

■ Detection Area

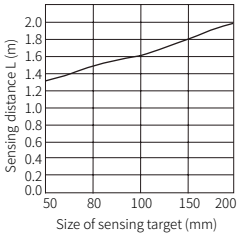


• BA2M-DDT



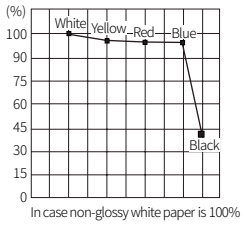
■ Detection Distance by Target Size

• BA2M-DDT



■ Detection Distance by Target Color

• BA2M-DDT



18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-2-2048-1577 | sales@autonics.com

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