Autonics



Photoelectric Sensors with Built-in Timer

BYD 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 (UL Type 1 Enclosure)
  - Altitude: up to 2,000 m
  - Pollution Degree 3
  - Installation Category II

Product Components

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

Ordering Information

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

BYD ❶ - ❷ ❸ ❹ ❺ - ❻ - ❼ - ❽

❶ Sensing distance
Number: Sensing distance (unit: mm)
Number+M: Sensing distance (unit: m)

❷ Sensing type
T: Through-beam
D: Diffuse reflective
D: Convergent reflective

❸ Power supply
D: 12 - 24 VDC

❹ Output
T: Solid state (transistor)

❺ Through-beam Emitter/Receiver 01)
No mark: Reflective type
1: Emitter
2: Receiver

❻ Connection
No mark: Cable type

❼ Control output
No mark: NPN open collector output
P: PNP open collector output
(Through-beam type)

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

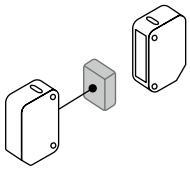
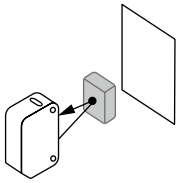
01) This model name is for through-beam photoelectric sensor management only and is not required when placing an order.

Sold Separately

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

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

Timer Setting

- 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.



Operation Timing Chart and Indicators

■ Standard type

Operation mode	Light ON	Dark ON
Received light	Received Interrupted	Received Interrupted
Operation indicator (red)	ON OFF	ON OFF
Transistor output	ON OFF	ON OFF

- In case of the through-beam type, to prevent malfunction, output of units keeps the state of OFF for 0.5 sec after power ON.

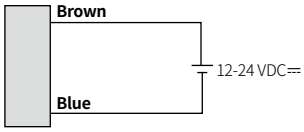
■ Built-in timer type

Operation mode	Light ON
Received light	Received Interrupted
Operation indicator (red)	ON OFF
Transistor output	ON OFF

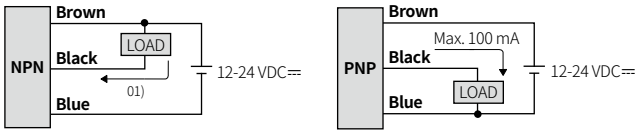
- T: Setting time by the adjuster (setting time: 0.1 to 2 sec)
- t: ≤ 3 ms (When the adjuster is set to Min (0.1 sec))
- If the interrupted time (Ta) after receiving the light is shorter than the setting time (T), the transistor output maintains the ON state.

Connections

■ Emitter



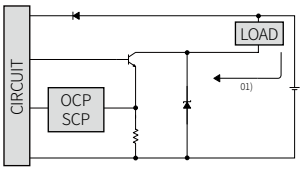
■ Receiver, Diffuse reflective, Convergent reflective type



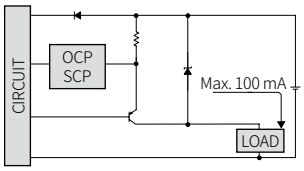
01) Through-beam type: max. 100 mA, diffuse reflective or convergent reflective type: max. 50 mA

Circuit

■ NPN open collector output



■ PNP open collector output



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

- 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

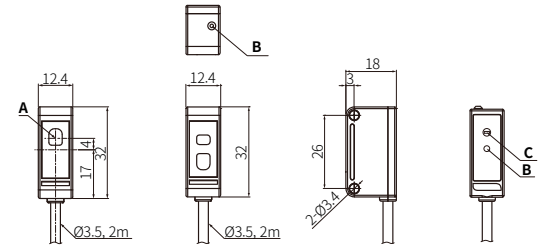
- Set the adjuster for stable Light ON area, minimizing the effect of the installation environment.
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.
- The steps below are based on Light ON mode.

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.

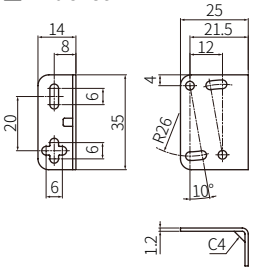
A	Optical axis
B	Upper operation indicator of convergent reflective type (red)
C	Sensitivity adjustment adjuster or timer adjuster of built-in timer model



Through-beam

Diffuse reflective,
Convergent reflective

■ Bracket A



Specifications

Model	BYD3M-TDT-□-□	BYD100-DDT-□	BYD□-DDT-□-□	
Sensing type	Through-beam	Diffuse reflective	Convergent reflective	
Sensing distance	3 m	100 mm [01]	10 to 30 mm ±10% [01]	10 to 50 mm ±10% [01]
Sensing target	Opaque materials	Opaque materials, translucent materials	Opaque materials, translucent materials	
Min. sensing target	≥ Ø 6 mm	-	-	
Hysteresis	-	≤ 25 % of sensing distance	≤ 10 % of sensing distance	
Response time	≤ 1 ms	Operation: ≤ 3 ms Return: ≤ 100 ms	Operation: ≤ 3 ms Return: ≤ 100 ms [02]	
Light source	Infrared	Infrared	Infrared	
Sensitivity adjustment	-	YES (Adjuster)	-	
Timer function	-	-	OFF delay mode : 0.1 to 2 sec (Adjuster)	
Operation mode	Dark ON mode	Light ON mode	Light ON mode	
Indicator	Front	Front	Front / Upper operation indicator model	
	Operation indicator (red)			
Certifications	CE EAC cULus EAC	CE EAC cULus EAC	CE EAC cULus EAC	
Unit weight (packaged)	≈ 80 g (≈ 105 g)	≈ 38 g (≈ 75 g)	≈ 38 g (≈ 75 g)	

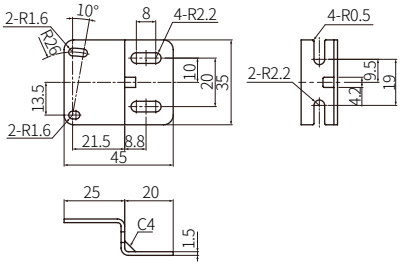
01) Non-glossy white paper 50 × 50 mm
02) When the timer adjuster is set to min (0.1 sec).

Power supply	12-24 VDC⎓ ±10 % (ripple P-P: ≤ 10 %)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 30 mA, receiver: ≤ 30 mA
Reflective	≤ 35 mA
Control output	Through-beam type : NPN open collector output / PNP open collector output model Diffuse reflective, convergent reflective type : NPN open collector output
Load voltage	≤ 26.4 VDC⎓
Load current	Through-beam type : ≤ 100 mA Diffuse reflective, convergent reflective type : ≤ 50 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	500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature [01]	-20 to 65 °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	Through-beam, convergent reflective type (front operation indicator model) : IP64 (IEC standard), Others: IP50 (IEC standard)
Connection	Cable type
Cable specification	Ø 3.5 mm, 3-wire (Emitter: 2-wire), 2 m
Wire specification	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm
Material	Case: PC, sensing part: PC, bracket: SPCC, bolt: SCM, nut: SCM, sleeve: Brass, Ni-plate

01) UL approved surrounding air temperature: 60°C

Sold Separately: Bracket B

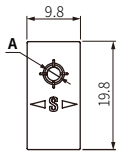
• Unit: mm, For the detailed drawings, follow the Autonics website.



Sold Separately: Slit for Through-beam Type

■ BYD3M-ST (sticker)

• Unit: mm



- Attach this slit at both an emitter and a receiver. (packaged unit: 2 pieces of each different Ø, total 8 pieces)
- Gently wipe the dirt on the lens of the sensor before using it.
- After attaching the slit, remove the front protection film.

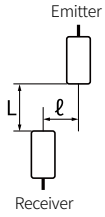
A	Applied condition		Min. sensing target	Max. sensing distance
	Emitter	Receiver		
Ø 1.0 mm	○	○	≥ Ø 0.8 mm Opaque materials	500 mm
Ø 1.5 mm			≥ Ø 1.5 mm Opaque materials	700 mm
Ø 2.0 mm			≥ Ø 2.0 mm Opaque materials	1,200 mm
Ø 2.5 mm			≥ Ø 2.5 mm Opaque materials	2,300 mm

Product Characteristics

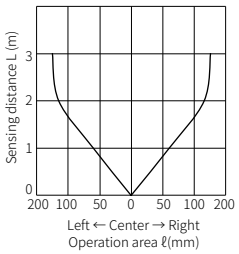
This data is based on internal testing and for reference only. Performance may vary by installation and usage environment. Product testing prior to use is recommended.

Through-beam Type (TYPICAL)

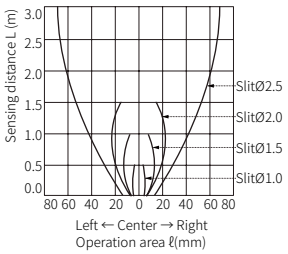
■ Sensing area



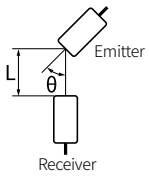
• BYD3M-TDT



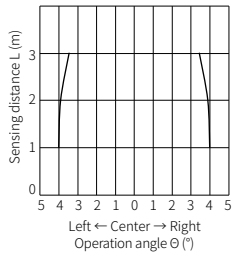
• BYD3M-TDT + Slit



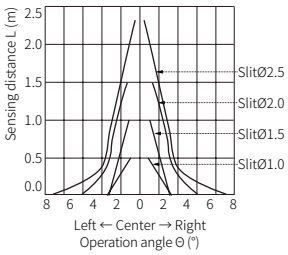
■ Emitter angle



• BYD3M-TDT

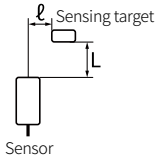


• BYD3M-TDT + Slit

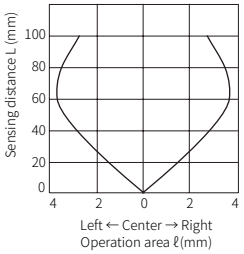


Diffuse Reflective Type (TYPICAL)

■ Sensing area

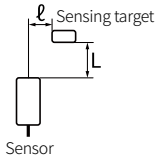


• BYD100-DDT

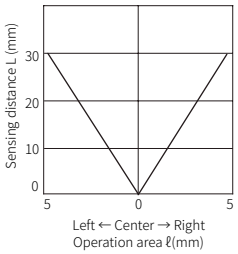


Convergent Reflective Type (TYPICAL)

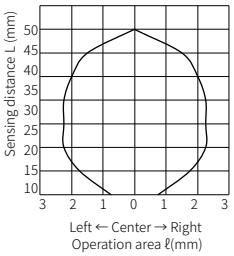
■ Sensing area



• BYD30-DDT



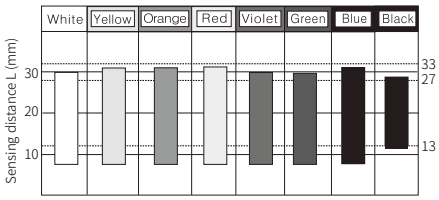
• BYD50-DDT



■ Sensing distance by color

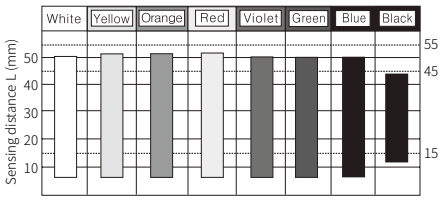
The blind zone may exist about ±10% (3 mm / 5 mm) of the minimum/maximum sensing distance.

• BYD30-DDT



Sensing target: Non-glossy paper 50mm×50mm

• BYD50-DDT



Sensing target: Non-glossy paper 50mm×50mm