Autonics

Photoelectric Sensor with Amplifier
BYD SERIES
INSTRUCTION MANUAL

BYD30(50)-DDT-U

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

▣ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.
⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **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.
2. **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.
3. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.
4. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
5. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **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.

▣ Ordering Information

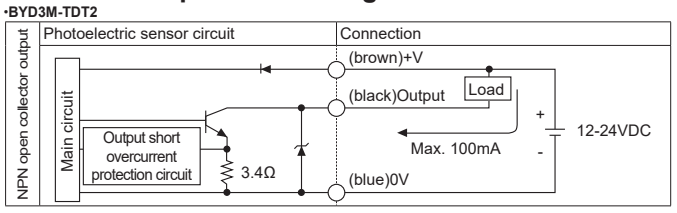
BYD 3 M – T D T □ – P – U

Item			
Indicator	No mark	Front operation indicator
	U	Upper operation indicator
Control output	No mark	NPN open collector output
	P	PNP open collector output
	T	Built-in timer type
Emitter/Receiver	No mark	Integrated type
	1	Emitter
	2	Receiver
Output type	T	Transistor output
Power supply	D	DC power
Sensing type	T	Through-beam type
	D	Diffuse reflective type
Sensing distance unit	No mark	mm
	M	m
Sensing distance	Number	Sensing distance
Item	BYD	Photoelectric sensor series

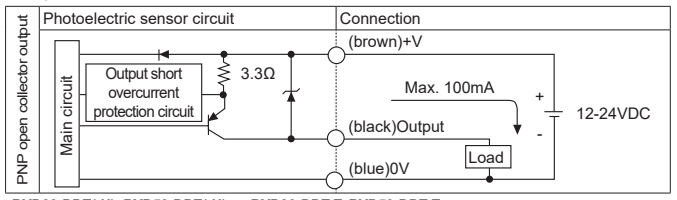
※□ This information is intended for product management of through-beam type.
(no need to refer when selecting model)
※Randomly combining model components can make a model which is not existing.

▣ Control Output Circuit Diagram

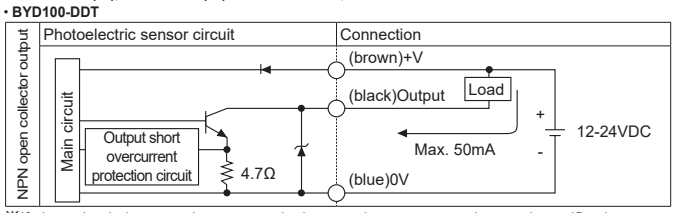
•BYD3M-TDT2



• BYD3M-TDT2-P



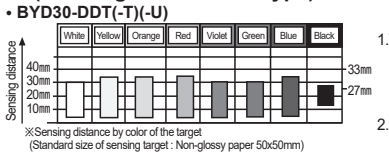
• BYD30-DDT(-U), BYD50-DDT(-U) **• BYD30-DDT-T, BYD50-DDT-T**
• BYD100-DDT



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

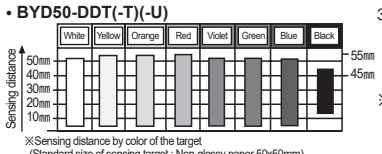
▣ Sensing Distance by Color of the Target
(Convergent reflective type)

• BYD30-DDT(-T)(-U)



※Sensing distance by color of the target
(Standard size of sensing target : Non-glossy paper 50x50mm)

• BYD50-DDT(-T)(-U)



※Sensing distance by color of the target
(Standard size of sensing target : Non-glossy paper 50x50mm)

1.This sensor, the stable convergent reflective photoelectric sensor, is not influenced by color or material of the sensing target within the sensing distance.
2.This sensor is able to sense a target stably because of small effect from background.
3.This chart for "Sensing distance by color of target" is when the central axis of photoelectric sensor are matched in a parallel state of a sensing target and the lens surface of the photoelectric sensor.
※Standard size of sensing target : Non-glossy paper 50x50mm

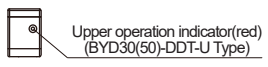
▣ Specifications

Type	Convergent reflective		Diffuse reflective	Through beam	
Model	**BYD30-DDT** **BYD30-DDT-U**※1 **BYD30-DDT-T**※2	**BYD50-DDT** **BYD50-DDT-U**※1 **BYD50-DDT-T**※2	**BYD100-DDT**	NPN output type **BYD3M-TDT**	PNP output type **BYD3M-TDT-P**
Sensing distance	10 to 30mm※3	10 to 50mm※3	100mm※3	3m	
Sensing target	Translucent, opaque materials			Opaque materials of min. Ø6mm	
Hysteresis	Max. 10% at sensing distance		Max. 25% at sensing distance	—	
Response time	Operation: max. 3ms Return: max. 100ms (when the time adjuster is minimum)		Operation: max. 3ms Return: max. 100ms	Max. 1ms	
Power supply	12-24VDC⎓ ±10% (ripple P-P: max. 10%)				
Current consumption	Max. 35mA			Max. 30mA	
Light source	Infrared LED				
Sensitivity adjustment	Fixed		Sensitivity Adjuster	Fixed	
Operation mode	Light ON fixed			Dark ON (light ON: option)	
Control output	NPN open collector output •Load voltage: max. 30VDC⎓ •Load current: max. 50mA •Residual voltage: max. 1VDC⎓			NPN or PNP open collector output ●Load voltage: max. 30VDC⎓ ●Load current: max. 100mA ●Residual voltage - NPN: max.1VDC⎓, PNP: max. 2.5VDC	
Protection circuit	Reverse polarity protection circuit, output short overcurrent protection circuit				
Timer function	Built-in (OFF delay) delay time: max. 0.1 to 2 sec (timer adjuster)		—		
Indication	Operation indicator: red LED				
Insulation resistance	Over 20MΩ (at 500VDC megger)				
Noise immunity	±240V the square wave noise (pulse width: 1μs) by the noise simulator				
Dielectric strength	1,000VAC 50/60Hz for 1 minute				
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z direction for 2 hours				
Shock	500m/s²(50G) in X, Y, Z directions for 3 times				
Environment: Ambient illumination	Sunlight: max. 11,000lx, incandescent lamp: max. 3,000lx (receiver illumination)				
Environment: Ambient temperature	-20 to 65℃, storage: -25 to 70℃				
Environment: Ambient humidity	35 to 85%RH, storage: 35 to 85%RH				
Protection structure	Standard type: IP64 (IEC standards) / ※1, ※2: IP50 (IEC standards)		IP50 (IEC standards)	IP64 (IEC standards)	
Material	Case: ABS, sensing part: acryl				
Cable	Ø3.5mm, 3-wire, length: 2m (emitter of through-beam type: Ø3.5mm, 2-wire, length: 2m) (AWG24, core diameter: 0.08mm, number of cores: 40, insulator diameter: 1mm)				
Accessory	Adjustment screwdriver, fixing bracket A, M3 bolt: 2, M3 nut: 2			Mounting bracket A, M3 bolt: 4, M3 nut: 4	
Approval	CE				
Weight※4	Approx. 75g (approx. 38g)			Approx. 105g (approx. 80g)	

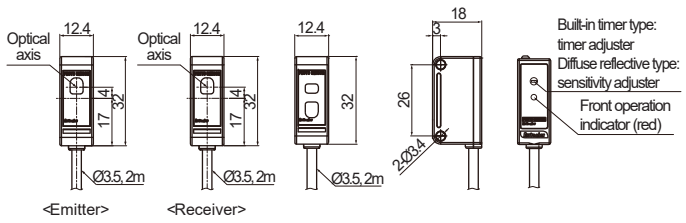
※1: Operation indicator is on top.
※2: OFF delay timer is built-in.
※3: Non-glossy white paper 50×50mm.
※4: The weight includes packaging. The weight in parenthesis is for unit only.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

▣ Dimension

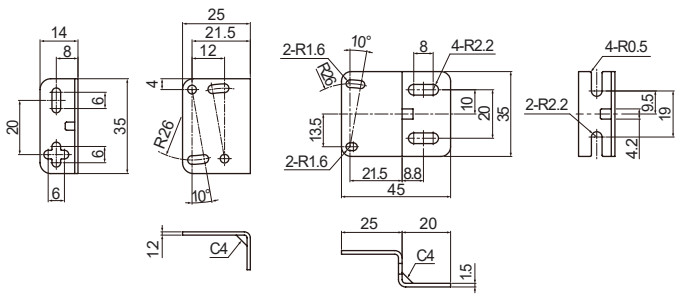
(unit: mm)



• Through beam type **• Convergent/Diffuse reflective type**



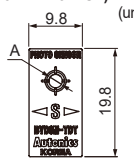
• Bracket A **• Bracket B (sold separately)**



▣ Accessory (sold separately)

• Slit (Model: BYD3M-ST)

(unit: mm)



• Min. Sensing target and max. sensing distance by Ø of slit when attach the slits at both a receiver and an emitter.

Slit Ø	Min. size of sensing target	Max. sensing distance
Ø1.0	Opaque materials of Min.Ø0.8	500mm
Ø1.5	Opaque materials of Min.Ø1.5	700mm
Ø2.0	Opaque materials of Min.Ø2.0	1,200mm
Ø2.5	Opaque materials of Min.Ø2.5	2,300mm

※This slit is for BYD3M-TDT(-P) only.
※Total 8 pieces (2 pieces of each different Ø) are packed and sold separately.
※This slit is sticker for attachment, please remove the dirt on lens of photoelectric sensor before using it.

▣ Operation Timing Diagram

Operation mode	Light ON
Receiver operation	(Standard) ON / OFF (Built-in timer) ON / OFF, t, T, < T
Operation indicator (Red LED)	ON / OFF
Transistor output	ON / OFF

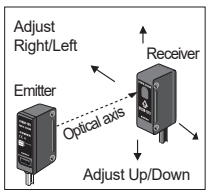
1. T: Setting time by timer adjuster (time setting range: 0.1 to 2 sec)
2. t: Max. 3ms (when the timer adjuster is minimum)
3. To prevent from incorrect operation, output of units keeps the state of OFF for 0.5 sec after power ON.
4. The waveform of transistor output and operation indicator are the state of operation for Light ON, but in case of Dark ON, it is opposite operation against Light ON mode. (Above figure is Dark ON for BYD3M series.)

▣ Mounting & Adjustment

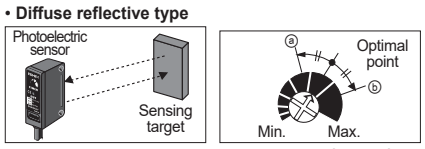
• Through beam type

1. Supply the power after set the emitter and the receiver facing each other.
2. Set them in the middle after checking the operation range of the indicator by adjusting or rotating the receiver and the emitter right and left slightly.
3. Adjust up and down direction in the same way as above.
4. After adjustment, fix them after checking the stable operation by putting the sensing target at the optical axis.

※If the sensing target is translucent or smaller than 6mm, it is not able to sense because the light of the sensor is penetrated.



• Diffuse reflective type

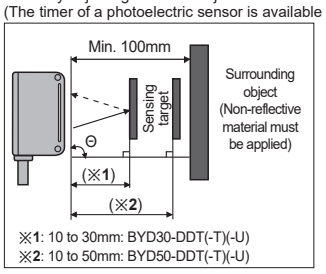


1. The sensitivity should be adjusted considering the influence of behind objects or mounting side even though it is available to use at max. sensitivity point normally.
2. Put a sensing target at the sensing distance and check the point ⓐ where the operation indicator turns on by adjusting slowly the sensitivity adjuster from the min. sensitive point .
3. Remove the sensing target and check the point ⓑ where the operation indicator until turns on by adjusting the sensitivity adjuster. (If the operation indicator does not turn on, max. sensitivity point is ⓑ.)
4. The optimal point is the center of the point ⓐ and ⓑ.

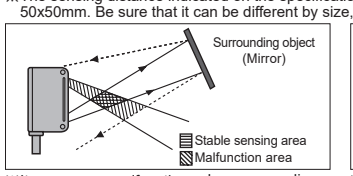
※The sensing distance indicated on the specification chart is that of non-glossy white paper 50x50mm. Be sure that it can be different by size, surface and gloss of the sensing target.

• Convergent reflective type

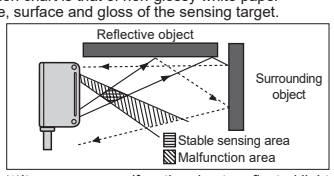
1. Supply the power after mounting the photoelectric sensor to the sensing place.
2. Put the target at sensing position and adjust the sensor right and left or up and down to be at the right angle against optical axis and fix it at the stable operating position.Keep the distance min. 10 to 30mm for BYD30-DDT(-T)(-U) or min. 10 to 50mm for BYD50-DDT(-T)(-U) between photoelectric sensor and sensing target.
3. In case of built-in timer type, set the response time of the photoelectric sensor to the optimal status by adjusting the timer adjuster.
   (The timer of a photoelectric sensor is available status.)



※The sensing distance indicated on the specification chart is that of non-glossy white paper 50x50mm. Be sure that it can be different by size, surface and gloss of the sensing target.



※It may cause malfunction, when surrounding object is mirror and emitter axis and mirror surface meet at right angles.



※It may cause malfunction due to reflected light when reflective material is placed near the optical axis.

※When using photoelectric sensors closely over two units, it may result in malfunction due to mutual interference.
※When installing the product, tighten the screw with a tightening torque of 0.5N·m.

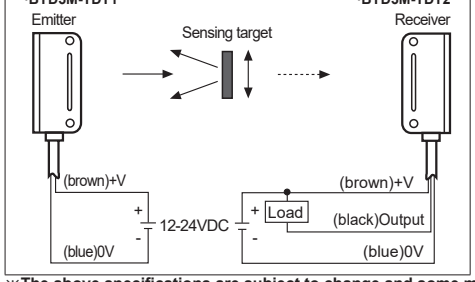
▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. When connecting a DC relay or other inductive load to the output, remove surge by using diodes or varistors.
3. Use the product, 0.5 sec after supplying power.
   When using separate power supply for the sensor and load, supply power to sensor first.
4. 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
5. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
6. When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
7. When using sensor with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground F.G. terminal of the equipment.
8. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 3
   ④Installation category II

▣ Connections

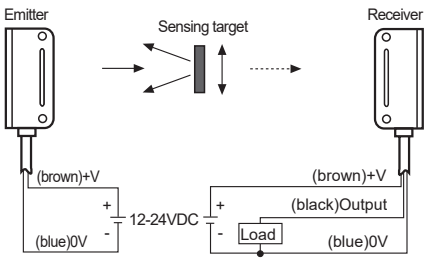
NPN open collector output

•BYD3M-TDT1 Emitter — **•BYD3M-TDT2** Receiver



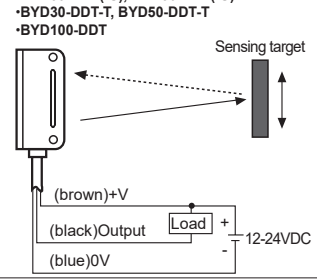
PNP open collector output

•BYD3M-TDT1 Emitter — **•BYD3M-TDT2-P** Receiver



NPN open collector output

•BYD30-DDT(-U), BYD50-DDT(-U)
•BYD30-DDT-T, BYD50-DDT-T
•BYD100-DDT



※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

▣ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connectors/Sockets
- 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, CO_2, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometers/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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