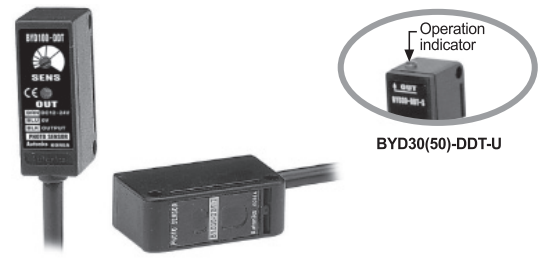
Autonics

PHOTOELECTRIC SENSOR BUILT-IN AMPLIFIER

BYD SERIES

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ Warning Serious injury may result if instructions are not followed.
⚠ Caution Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠ Caution: Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machinery(Ex: nuclear power control, medical equipment, ship,vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may cause a fire, human injury or damage to property.
2. **Do not disassemble or modify this unit. Please contact us if it is required.**
   It may cause electric shock or a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or cause electric shock.
   Use this product inside only. Do not use the product outdoors or location subject to temperatures or humidity outside.(Example: rain, dirty, frost, sunlight, condensation, etc.)
2. **Do not use this unit in place where there is flammable or explosive gas.**
   It may cause a fire or explosion.
3. **Please observe the rated voltage and do not supply AC power.**
   It may cause damage to this unit.
4. **Please check the polarity of power and wrong wiring.**
   It may cause damage to this unit
5. **Do not use this unit in place where there is vibration or impact.**
   It may cause damage to this unit.
6. **In cleaning the unit, do not use water or an oil-based detergent.**
   It may cause electric shock or a fire.

▣ Ordering information

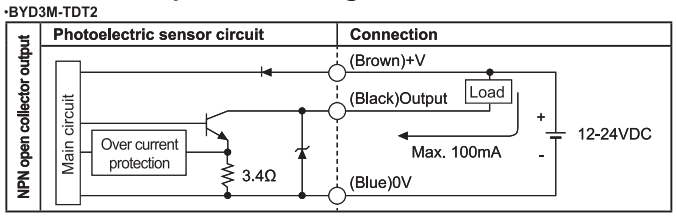
BYD 3M – T D T ☐ – P

Control output	**No mark**	NPN open collector output
	P	PNP open collector output
	T	Built-in timer type
Appearances	**No mark**	Emitter and Receiver
	1	Emitter
	2	Receive
Output	**T**	Solid-state output(Transistor)
Power supply	**D**	DC power
Sensing type	**T**	Through beam
	D	Diffuse reflective
Sensing distance	**No mark**	Unit: mm
	Number M	Unit: m
Item	**BYD**	Photoelectric sensor series

▣ Control output circuit diagram

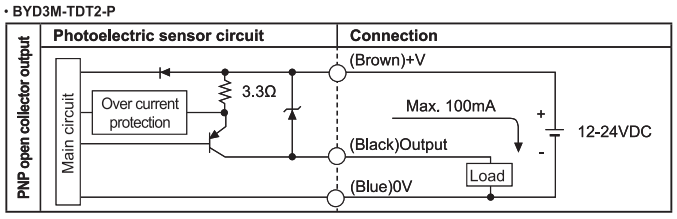
•BYD3M-TDT2

NPN open collector output



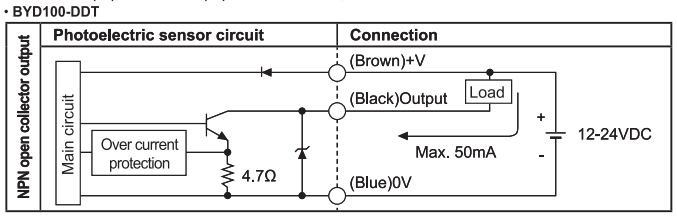
• BYD3M-TDT2-P

PNP open collector output



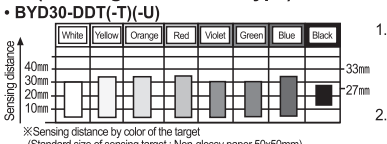
• BYD30-DDT(-U), BYD50-DDT(-U) • BYD30-DDT-T, BYD50-DDT-T
• BYD100-DDT

NPN open collector output



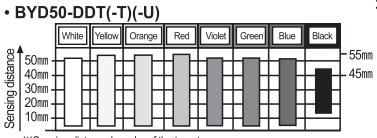
▣ Sensing distance by color of the target
(Convergent reflective type)

• 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

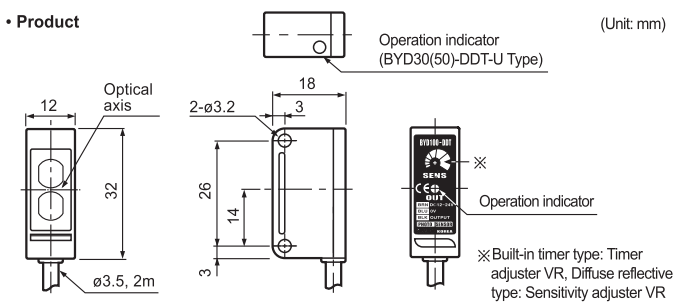
▣ Specifications

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 (Non-glossy white paper 50×50mm)	10 to 50mm (Non-glossy white paper 50×50mm)	100mm (Non-glossy white paper 50×50mm)	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 VR is minimum)		Operation: Max. 3ms Return: Max. 100ms	Max. 1ms	
Power supply	12 - 24 VDC ±10% (Ripple P-P: Max. 10%)				
Current consumption	Max. 35mA			Max. 30mA	
Light source	Infrared LED				
Sensitivity adjustment	Fixed		Adjuster VR	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. 1V			NPN or PNP open collector output ●Load voltage: Max. 30VDC ●Load current: Max. 100mA ●Residual voltage - NPN: Max.1V, PNP: Max. 2.5V	
Protection circuit	Reverse polarity protection, Short-circuit protection				
Timer function	Built-in(OFF delay) delay Time: Max. 0.1 to 2 sec.(adjuster VR)		—		
Indication	Operation indicator: Red LED				
Insulation resistance	Min. 20MΩ(at 500VDC megger)				
Noise strength	±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 directions 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	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	VR adjustment driver, Mounting bracket A, M3 Screws, Nuts			Mounting bracket A, M3 Screws, Nuts	
Approval	CE				
Unit weight	Approx. 70g			Approx. 150g	

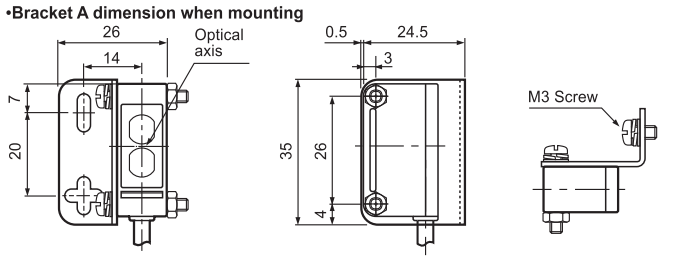
※1: Operation indicator is on top. ※2: OFF delay timer is built-in.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

▣ Dimension

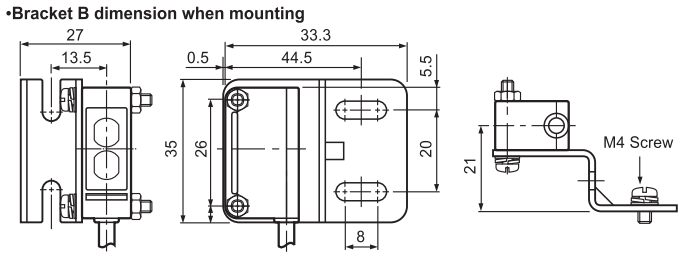
• Product



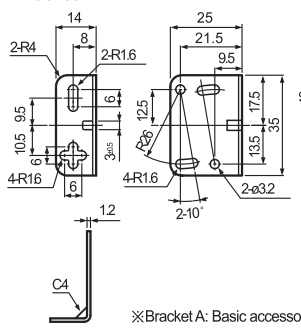
•Bracket A dimension when mounting



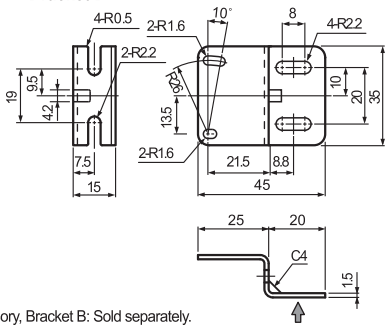
•Bracket B dimension when mounting



• Bracket A



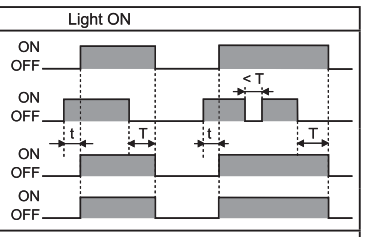
• Bracket B



※Bracket A: Basic accessory, Bracket B: Sold separately.

▣ Operation mode and timing diagram

Operation mode	Light ON
Receiver operation	(Standard) / (Built-in timer)
Operation indicator (Red LED)	
Transistor output	



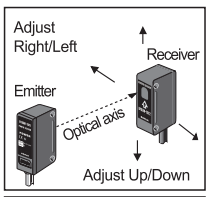
1. T: Setting time by timer adjuster VR(Time setting range: 0.1 to 2 sec.)
2. t: Max. 3ms(When the timer adjuster VR is minimum)
3. To prevent from incorrect operation, output of units keeps the state of OFF for 0.5 sec. after power ON.
4. The waveform of output TR and operation indicator are the state 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)
5. If the control output terminal is short circuited or overcurrent condition exists, the control signal will not be output normally due to protection circuit.

▣ 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.

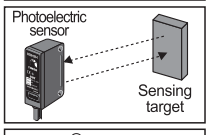
※If the sensing target is translucent or smaller than 6mm, it is not able to sense because the light of the sensor is penetrated.

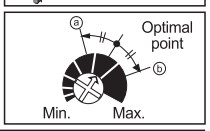


• Diffuse reflective type

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 VR 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 VR.(If the operation indicator does not turn on, max. sensitivity point is ⓑ.)
4. The optimal point is the center of the point ⓐ and ⓑ.

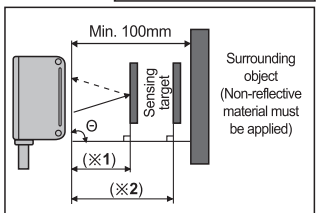
※The sensing distance indicated on the specification chart is that of non-glossy white paper 50x50mm. Be sure that it can be different by size, surface and gloss of the sensing target.





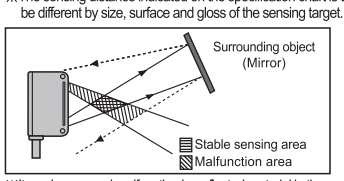
• Convergent reflective type

1. Supply the power after mounting the photo-electric 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 VR.(The timer of a photoelectric sensor is available status.)

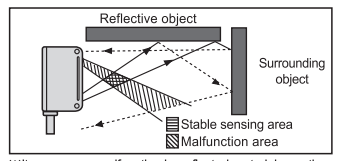


※1: 10 ~ 30mm: BYD30-DDT(-T)(-U)
※2: 10 ~ 50mm: BYD50-DDT(-T)(-U)

※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.



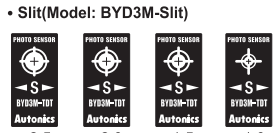
※It can be occured malfunction by reflected material in the background.



※It may cause malfunction by reflected material near the light beam.

▣ Accessory(Sold separately)

• Slit(Model: BYD3M-Slit)



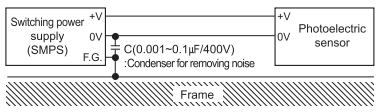
• Min. Sensing target and max. sensing distance by slit's ø when attach the slits at both a receiver and an emitter.

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.

▣ Caution for using

1. Intercept a strong source of light as like sunlight, spotlight within inclination angle range of photoelectric sensor.
2. The photoelectric sensor may cause malfunction under the fluorescent lamp light, so be sure to use cut-off light with panel .
3. When more than 2 sets of Through beam type sensor are used closely, it might cause interference each other. Be sure to put enough space between them in order to avoid malfunction.
4. When more than 2 sets of diffuse reflection types are installed adjacently, it can be occurred malfunction by light beam from the other target. So it must be installed at an enough interval.
5. Tighten strength of installing screws should be under 10kgf·m.
6. If photoelectric sensor is installed at flat part, it might cause malfunction by reflection light from flat part. Be sure to put space between photoelectric sensor and ground.
7. When wire the photoelectric sensor with high voltage line, power line in the same conduit, it may cause malfunction or mechanical trouble. Therefore please wire seperately or use different conduit.
8. Avoid installing the unit as following place.
   Where corrosive gas, oil or dust, strong flus, noise, sunlight, strong alkali, acid exist.
9. In case of connect DC relay as inductive load to output please remove surges by using diode or varistor.
10. The photoelectric sensor cable shall be used as short as possible, because it may cause malfunction by noise through the cable.
11. When it is stained by dirt at lens, please clean the lens with dry cloth, but do not use an organic materials such as alkali acid, chromic acid.
12. When use switching power supply as the source of supplying power, F.G. terminal shall be good earth ground and condenser for removing noise shall be installed between 0V and F.G. termial.

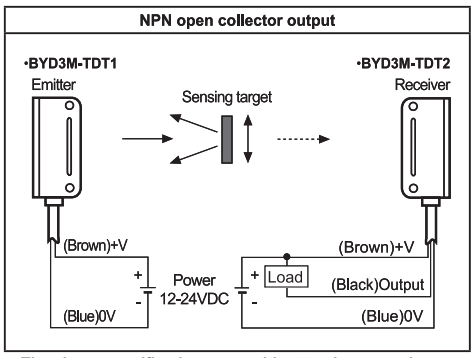


13. Installation environment .
    ① It shall be used indoor ② Altitude Max. 2,000m
    ③ Pollution Degree 3 ④ Installation Category II

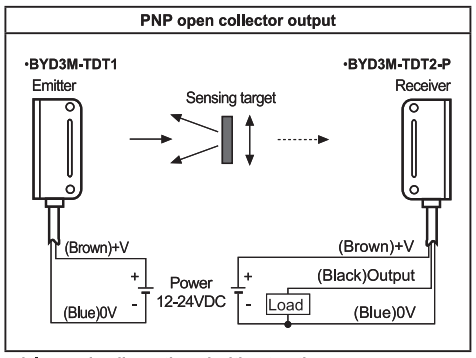
※**It may cause malfunction if above instructions are not followed.**

▣ Connections

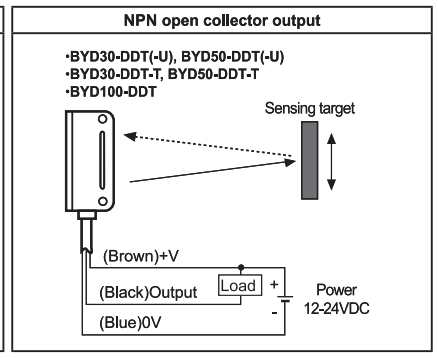
NPN open collector output



PNP open collector output



NPN open collector output



※**The above specifications are subject to change and some models may be discontinued without notice.**

▣ Major products

■ Photoelectric sensors
■ Fiber optic sensors
■ Door sensors
■ Door side sensors
■ Area sensors
■ Proximity sensors
■ Pressure sensors
■ Rotary encoders
■ Connector/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/soldering system
■ Temperature controllers
■ Temperature/Humidity transducers
■ SSR/Power controllers
■ Counters
■ Timers
■ Panel meters
■ Tachometer/Pulse(Rate)meters
■ Display units
■ Sensor controllers

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