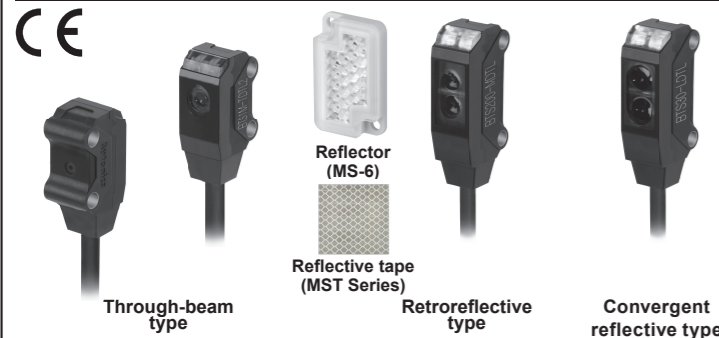


Autonics Ultra-compact Photoelectric Sensor BTS SERIES

INSTRUCTION MANUAL



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

- 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 fire, personal injury, or economic loss.
- Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
- Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

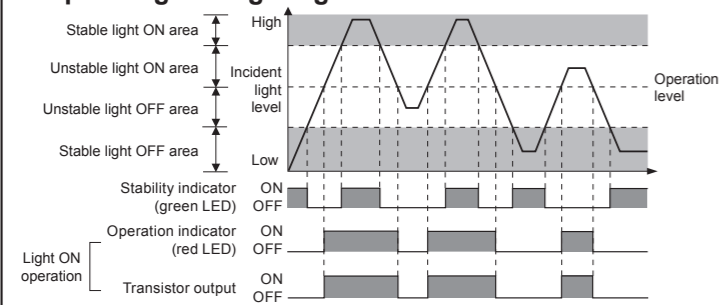
⚠ Caution

- Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- Use dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in fire or explosion.

■ Ordering Information

BT	S	1	M	-	T	D	T	L	1	-	P
Item	Appearance	Sensing distance	Sensing distance unit	Operation mode	Emitter/Receiver	Control output	Power supply	Sensing type	Appearance	Item	
BT	S	1	M	-	T	D	T	L	1	P	
BT	S	1	M	-	T	D	T	L	1	P	

■ Operating Timing Diagram



⚠ The waveforms of "Operation indicator" and "Transistor output" are for Light ON operation. They are reversed for Dark ON operation.
 ⚠ 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).

■ Specifications

Sensing type	Through-beam	Retroreflective type	Convergent reflective type
Model	BTS1M-TDTL BTS1M-TDTP	BTS1M-TDTD BTS1M-TDTP	BTS200-LDLD BTS200-LDTP BTS30-LDLD BTS30-LDTP BTS15-LDLD BTS15-LDTP
Sensing distance	1m	10 to 200mm ^{※1}	5 to 30mm ^{※2} 5 to 15mm ^{※2}
Sensing target	Opaque materials of min. Ø2mm	Opaque materials of min. Ø27mm	Opaque materials, translucent materials
Min. sensing target	Opaque materials of Ø2mm	Opaque materials of Ø2mm ^{※3} (sensing distance 100mm)	Ø0.15mm (sensing distance 10mm)
Hysteresis distance	—	—	Max. 15% of maximum sensing distance
Response time	Max. 1ms		
Power supply	12-24VDC=±10% (ripple P-P: max. 10%)		
Current consumption	Max. 20mA (in case of through-beam type, this value is for each emitter and receiver.)		
Light source	Red LED (650nm)		
Operation mode	Light ON	Dark ON	Light ON
Control output	NPN or PNP open collector output -Load voltage: max. 26.4VDC=, Load current: max. 50mA -Residual voltage: NPN: max. 1VDC=, PNP: max. 2VDC		
Protection circuit	Power reverse polarity protection circuit, output short over current protection circuit		
Indicator	Operation indicator: red, stability indicator: green		
Connection	Cable type		
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 min.		
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours		
Shock	500m/s ² (approx. 50G) in each X, Y, Z direction for 3 times		
Environment	Ambient illumination: Sunlight: max. 10,000lx, incandescent lamp: max. 3,000lx (receiver illumination) Ambient temp.: -20 to 55°C, storage: -30 to 70°C Ambient humi.: 35 to 85%RH, storage: 35 to 85%RH		
Protection structure	IP67 (IEC standard)		
Material	Case: polybutylene terephthalate, sensing part: polymethyl methacrylate, bracket: stainless steel 304, bolt: carbon steel wire for cold heading (SWCH10A)		
Cable	Ø2.5mm, 3-wire, 2m (emitter of through-beam type: Ø2.5mm, 2-wire, 2m) (AWG 28, Core diameter: 0.08mm, number of cores: 19, insulator out diameter: Ø0.9mm)		
Accessory	Bracket A: 2, sub-bracket for through-beam type: 2, M2 Bolt: 4	Reflector (MS-6), bracket A, sub-bracket for reflective type, M2 Bolt: 2	Bracket A, sub-bracket for reflective type, M2 Bolt: 2
Approval	CE		
Weight ^{※4}	Approx. 65g (approx. 40g) / Approx. 45g (approx. 25g)		

※1: The sensing distance is specified with the MS-6 reflector. When using reflective tapes, the reflection efficiency will vary by the size of the tape.
 ※2: It will vary by the installation environment and sensing conditions. Please refer to the catalog or website.
 ※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.

■ Accessory (sold separately)

○ Slit

● BTS1M-ST

Slit Ø	Min. sensing target	Max. sensing distance
Ø1	Opaque materials of min. Ø1.6	500mm
Ø0.5	Opaque materials of min. Ø1.2	300mm
Ø0.5	Opaque materials of min. Ø1.2	300mm
Ø0.5	Opaque materials of min. Ø0.8	100mm

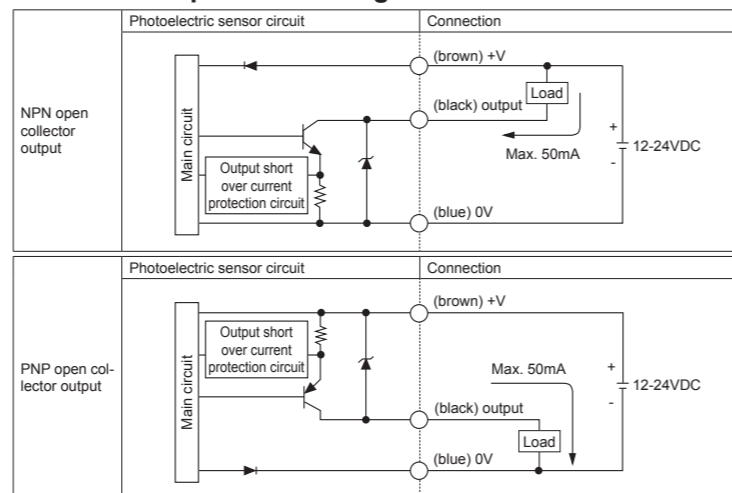
※ This slit is for BTS1M-TDTP only. Attach only to the emitter to use.
 ※ 4 pieces are packed and sold separately.
 ※ This slit is sticker for attachment, please remove the dirt on lens of photoelectric sensor before using it. After attach the slit, remove the front protection film.

● BTS1M-ST

Slit Ø	Applied condition	Min. sensing target	Max. sensing distance
Ø1	Emitter	—	—
	Receiver	—	—
Ø0.5	Applied	Applied	Opaque materials of min. Ø1.2
	Applied	Applied	Opaque materials of min. Ø1.2
Ø0.5	Applied	Applied	Opaque materials of min. Ø1.2
	Applied	Applied	Opaque materials of min. Ø0.8

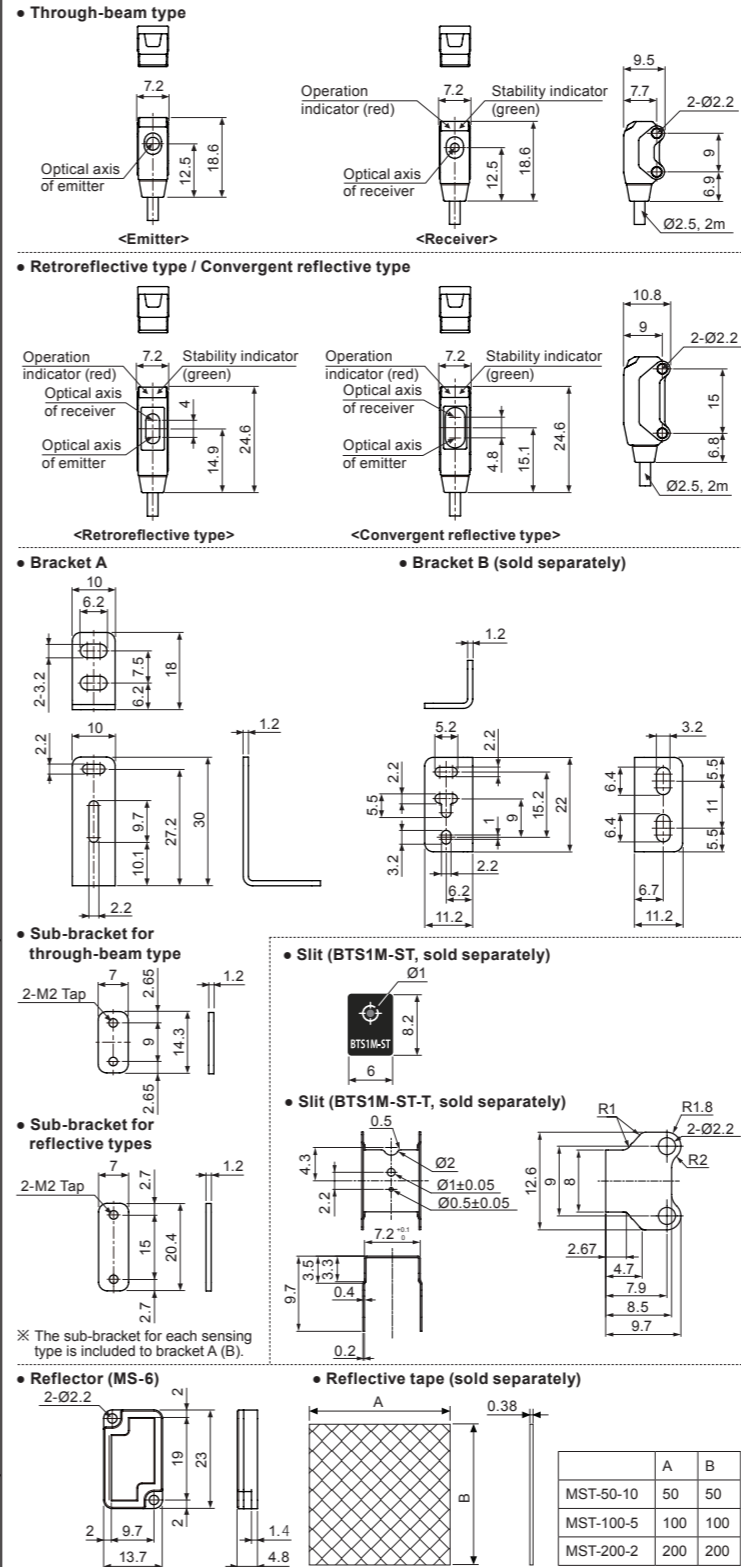
※ This slit is for BTS1M-TDTP only.
 ※ This slit can be used in Ø1 or Ø0.5 by its installation direction.
 ※ 2 pieces are packed and sold separately.
 ※ This slit is made of SUS. After covering the product with the slit, fix them with the bolts and sub-bracket.

■ Control Output Circuit Diagram

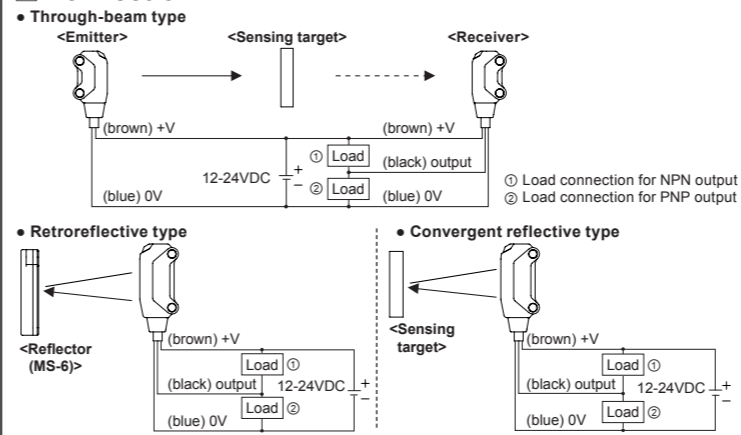


※ If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit

■ Dimensions



■ Connection



■ Operation Mode

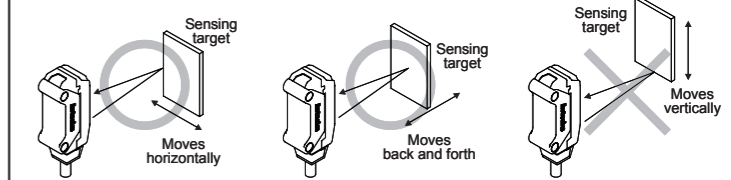
Operation mode	Light ON	Dark ON
Receiver operation	Received light Interrupted light	Received light Interrupted light
Operation indicator (red LED)	ON	OFF
Transistor output	ON	OFF

■ Installation & Adjustment

○ Mounting
 When installing the product, tighten the screw with a tightening torque of 0.3 Nm.
 When using photoelectric sensors closely over two units, it may result in malfunction due to mutual interference.
 ※ Exercise caution. Do not apply excessive impact to the unit or bend the cable section.
 The inside unit may be wet.

※ Caution for mounting convergent reflective type.

- The sensing side of the unit and the surface of the target object must be parallel when installed.
- Make sure to install the sensor after carefully considering the moving direction of the sensing objects. Refer to the illustration below



○ Optical axis adjustment

- Through-beam type
 Set the emitter and the receiver facing each other. Adjust the emitter or the receiver up, down, left, right and fix the unit at the center point of where the stability indicator is operating.
- Retroreflective type
 Place the sensor and the reflector (MS-6) facing each other. Adjust the reflector up, down, left, right and fix the reflector at the center point of where the stability indicator is operating. Make sure that the sensing side of the sensor is parallel to the surface of the reflector.
- Convergent reflective type
 Place the sensing target, then adjust the sensor up, down, left, right and fix the sensor at the center point of where the stability indicator is operating. Make sure that the sensing side of the sensor is parallel to the surface of each object.

■ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- When connecting a DC relay or other inductive load to the output, remove surge by using diodes or varistors.
- Use the product, 0.1 sec after supplying power. When using separate power supply for the sensor and load, supply power to sensor first.
- 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
- 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.
- When using sensor with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground F.G. terminal of the equipment.
- This unit may be used in the following environments.
 - ① Indoors (in the environment condition rated in 'Specifications')
 - ② Altitude max. 2,000m
 - ③ Pollution degree 3
 - ④ Installation category II

■ 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, Co2, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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