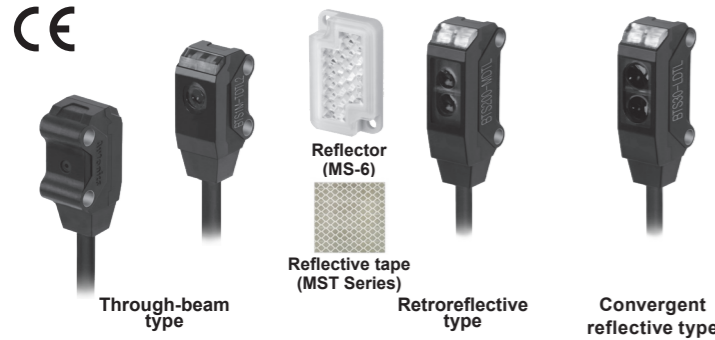


# Autonics Ultra-compact Photoelectric Sensor BTS SERIES

## 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

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.

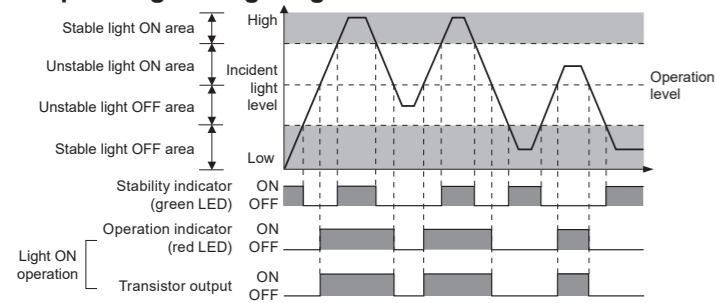
### ■ Ordering Information

BT	S	1	M	-	T	D	T	L	1	-	P
----	---	---	---	---	---	---	---	---	---	---	---

Control output: No mark (NPN open collector output), P (PNP open collector output)  
 Emitter/Receiver: No mark (Integrated type), 1 (Emitter), 2 (Receiver)  
 Operation mode: L (Light ON), D (Dark ON)  
 Output type: T (Transistor output)  
 Power supply: D (DC power)  
 Sensing type: T (Through-beam), M (Retroreflective), L (Convergent reflective)  
 Sensing distance unit: No mark (mm), M (m)  
 Appearance: S (Side view type), BT (Photoelectric sensor)  
 Item: BT (Photoelectric sensor)

⚠ This information is intended for product management of through-beam type. (no need to refer when selecting model)

### ■ 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	NPN open collector output: BTS1M-TD-TL, PNP open collector output: BTS1M-TD-TL-P	BTS200-MDTL, BTS200-MDTP	BTS30-LD-TD, BTS30-LD-TL-P, BTS15-LD-TL, BTS15-LD-TL-P
Sensing distance	1m	10 to 200mm <sup>※1</sup>	5 to 30mm <sup>※2</sup> , 5 to 15mm <sup>※2</sup>
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 <sup>※3</sup> (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 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 <sup>2</sup> (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	P67 (EC 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 <sup>※4</sup>	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. Please refer to the catalog or website.  
 ※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	Applied condition	Min. sensing target	Max. sensing distance
Ø1	Applied	Opaque materials of min. Ø1.6	500mm
Ø5	Applied	Opaque materials of min. Ø1.2	300mm
	Applied	Opaque materials of min. Ø1.2	300mm
	Applied	Opaque materials of min. Ø0.8	100mm

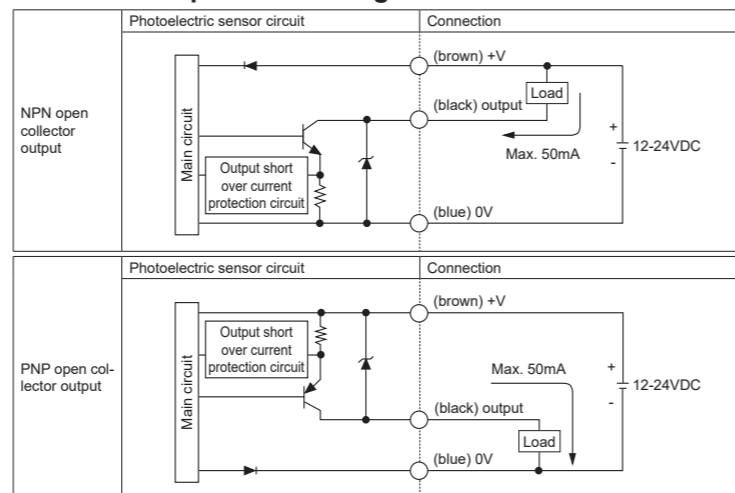
⚠ This slit is for BTS1M-TD-TL only. Attach only to the emitter to use.  
 ※4 pieces are packed and sold separately.  
 ⚠ This slit is sticker for attachment, please remove the dirt on lens of photoelectric sensor before using it. After attach the slit, remove the front protection film.

● BTS1M-ST

Slit Ø	Applied condition	Min. sensing target	Max. sensing distance
Ø1	Applied	Opaque materials of min. Ø1.6	500mm
Ø5	Applied	Opaque materials of min. Ø1.2	300mm
	Applied	Opaque materials of min. Ø0.8	100mm

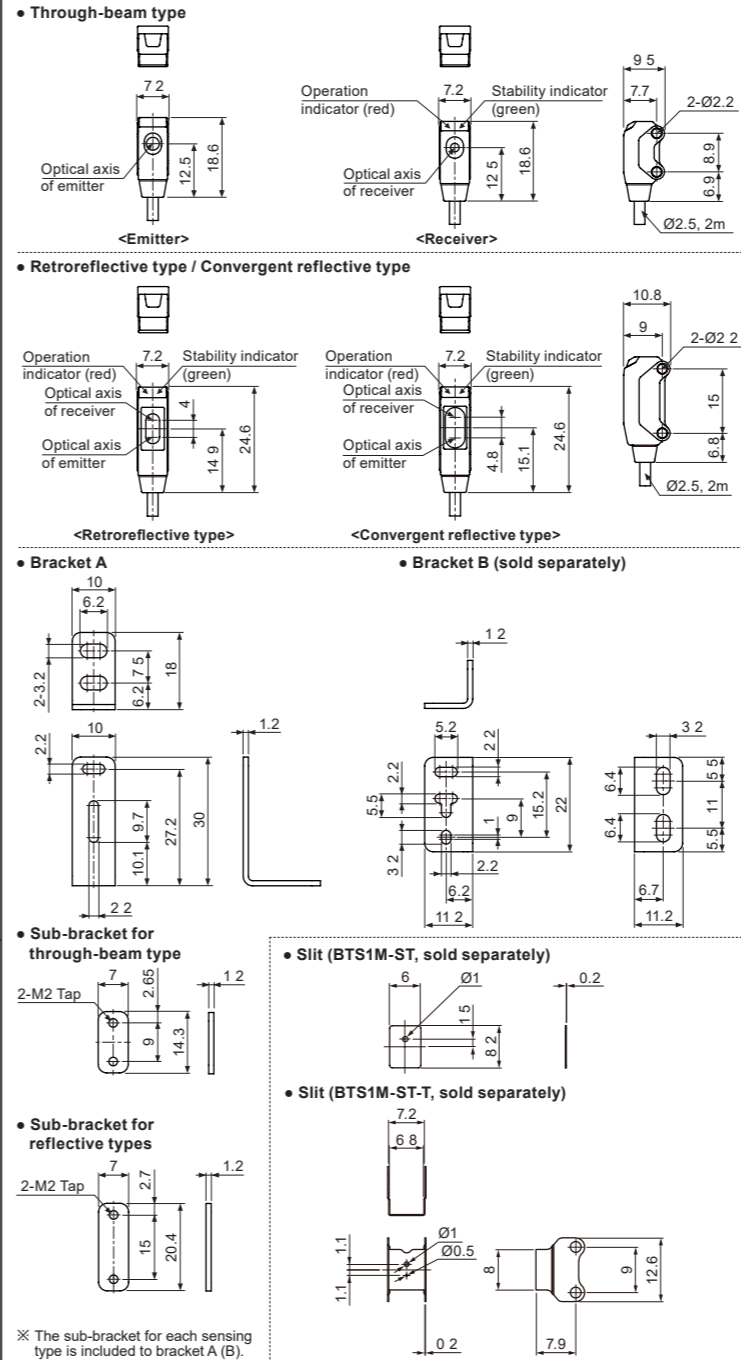
⚠ This slit is for BTS1M-TD-TL only.  
 ⚠ This slit can be used in Ø1 or Ø0.5 by its installation direction.  
 ※2 pieces are packed and sold separately.  
 ⚠ This slit is made of SUS. After covering the product with the slit, fix them with the bolts and sub-bracket.

### ■ 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

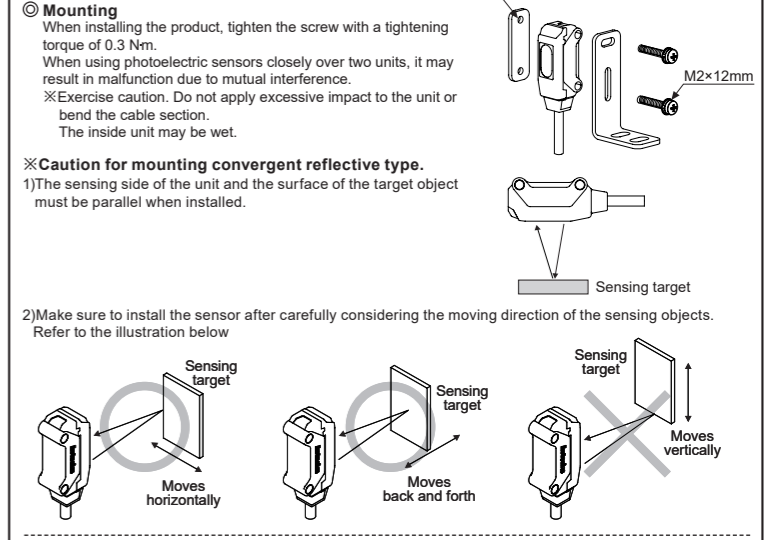
### ■ Dimensions



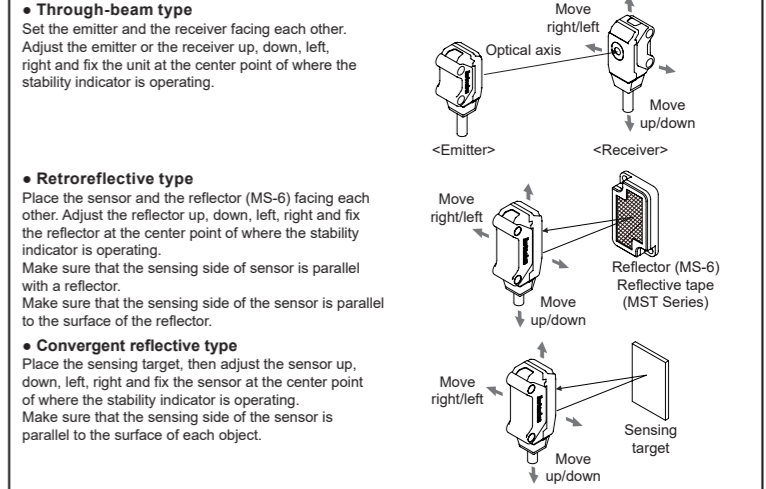
### ■ Operation Mode

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

### ■ Installation & Adjustment



### ○ Optical axis adjustment



### ■ 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, 0.1 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.
  - 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
- 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
- Switching Mode Power Supplies