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.
※Safety considerations are categorized as follows.
⚠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.
※The symbols used on the product and instruction manual represent the following
⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ 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, fire, or economic loss.
2. **Do not disassemble or modify the unit. Please contact us if necessary.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **Do not use the unit outdoors.**
   Failure to follow this instruction may result in shortening the life cycle of the unit. Use the unit indoors only. Do not use the unit outdoors, where it may be affected out external environmental factors. (e.g. rain, dust, frost, sunlight, condensation, etc.)
2. **Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat may be present.**
   Failure to follow this instruction may result in fire or explosion.
3. **Use the unit within the rated specifications.**
   Failure to follow this instruction may shortening the life cycle of the unit.
4. **Do not use loads beyond the rated voltage range. Do not supply AC power.**
   Failure to follow these instructions may result in product damage.
5. **Check the polarity of the power before wiring the unit.**
   Failure to follow this instruction may result in product damage.
6. **Do not use the unit where heavy vibration or impact may be present.**
   Failure to follow this instruction may result in product damage.
7. **Do not use water or oil-based detergent when cleaning the unit.**
   Failure to follow this instruction may result in fire.

▣ Ordering Information

BT S 1 M – T D T L 1 – P

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

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

▣ 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

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

▣ Specifications

Sensing type		Through-beam		Retroreflective type		Convergent reflective type			
Model	NPN open collector output	BTS1M-TDTL	BTS1M-TDTD	BTS200-MDTL	BTS200-MDTD	BTS30-LDTL	BTS30-LDTD	BTS15-LDTL	BTS15-LDTD
	PNP open collector output	BTS1M-TDTL-P	BTS1M-TDTD-P	BTS200-MDTL-P	BTS200-MDTD-P	BTS30-LDTL-P	BTS30-LDTD-P	BTS15-LDTL-P	BTS15-LDTD-P
Sensing distance		1m		10 to 200mm※1 (MS-6)		5 to 30mm (non-glossy white paper 50×50mm)		5 to 15mm (non-glossy white paper 50×50mm)	
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※2 (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 throught-beam type, this value is for each emitter and receiver.)							
Light source		Red LED (650nm)							
Operation mode		Light ON	Dark ON	Light ON	Dark ON	Light ON	Dark ON	Light ON	Dark ON
Control output		NPN or PNP open collector output ·Load voltage: max. 26.4VDC ·Load current: max. 50mA ·Residual voltage -NPN: max. 1V, PNP: max. 2V							
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/s² (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※3		Approx. 90g (approx. 40g)		Approx. 70g (approx. 25g)					

※1: 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: 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 (model: BTS1M-ST)

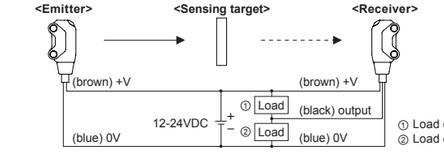
● Min. sensing target and max. sensing distance by slit's Ø when attach the slit at an emitter.

Slit Ø	Min. sensing target	Max. sensing distance
Ø1	Opaque materials of Min. Ø1.6	500mm

※This slit is for BTS1M-TDT□-□ only.
※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.

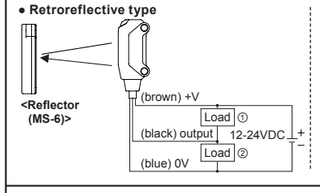
▣ Connection

• Through-beam type

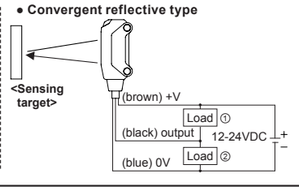


① Load connection for NPN output
② Load connection for PNP output

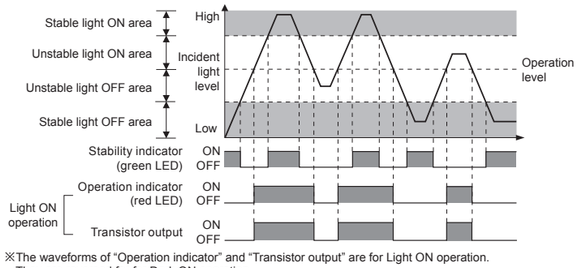
• Retroreflective type



• Convergent reflective type



▣ Operating Timing Diagram

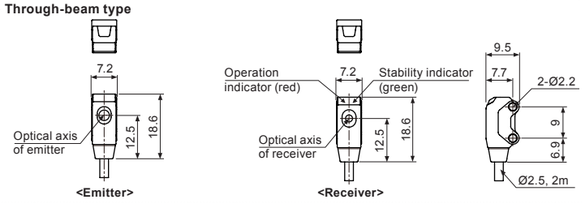


※The waveforms of "Operation indicator" and "Transistor output" are for Light ON operation.
They are reversed for for Dark ON operation.

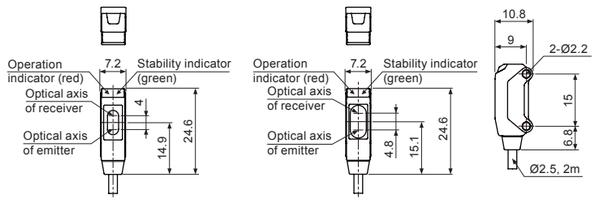
▣ Dimensions

(unit: mm)

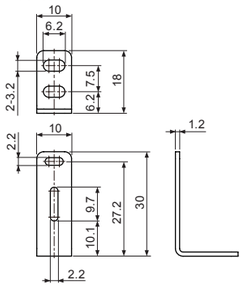
• Through-beam type



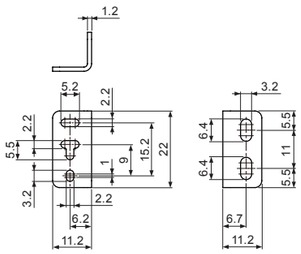
• Retroreflective type / Convergent reflective type



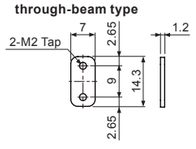
• Bracket A



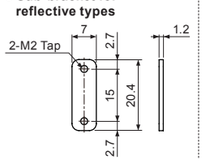
• Bracket B (sold separately)



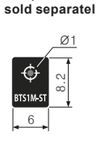
• Sub-bracket for through-beam type



• Sub-bracket for reflective types

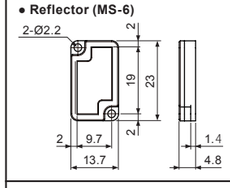


• Slit (BTS1M-ST, sold separately)

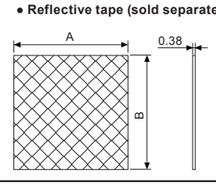


※ The sub-bracket for each sensing type is included bracket A (B).

• Reflector (MS-6)



• Reflective tape (sold separately)



	A	B
MST-50-10	50	50
MST-100-5	100	100
MST-200-2	200	200

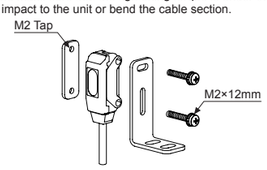
▣ Control Output Circuit Diagram

	Photoelectric sensor circuit	Connection
NPN open collector output	Main circuit; Output short over current protection circuit	(brown) +V; (black) output; Load; Max. 50mA; 12-24VDC +/-; (blue) 0V
PNP open collector output	Main circuit; Output short over current protection circuit	(brown) +V; Max. 50mA; 12-24VDC +/-; (black) output; Load; (blue) 0V

▣ Installation & Adjustment

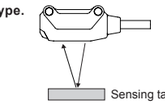
◎ Mounting

Please use M2 bolts to mount the sensor, and make sure that the tightening torque is under 0.3N·m.
※Exercise caution. Do not apply excessive impact to the unit or bend the cable section.
The inside unit may be wet.

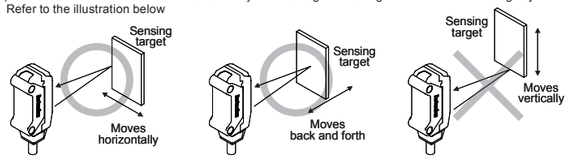


※Caution for mounting convergent reflective type.

1)The sensing side of the unit and the surface of the target object must be parallel when installed.



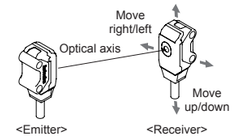
2)Make sure to install the sensor after carefully considering the moving direction of the sensing objects.
Refer to the illustration below



◎ Optical axis adjustment

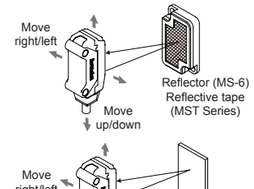
• Through-beam type

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.



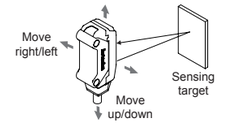
• Retroreflective type

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 sensor is parallel with a reflector.
Make sure that the sensing side of the sensor is parallel to the surface of the reflector.



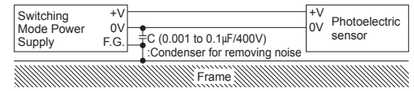
• Convergent reflective type

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

1. The sensor will be able to detect objects after 100ms of supplying power.
   If the sensor and the load are using separate power sources, power must be supplied to the sensor first.
2. Use a visor or a hood so that excessive light (e.g. sunlight, spotlight) does not directly enter into the inclination angle of the sensor.
3. The sensor may malfunction under fluorescent lighting. Please use a visor if necessary.
4. If the sensor is installed directly on a flat surface, the reflection off the surface may cause malfunction.
   Make sure there is enough space between the sensor and the surface.
5. If the sensor is wired with a high voltage line or power line, it may cause product damage or malfunction.
   Use separate wiring or a dedicated conduit.
6. Avoid installation in places where dust or corrosion may be present, as it may cause product malfunction.
7. When connecting a DC relay or other inductive load to the output, remove power surge by using diodes or varistors.
8. Please use short cables for wiring the sensors. Power surge from extended wiring may cause product malfunction.
9. When the lens is stained by foreign substances, clean the lens lightly with dry cloth. Do not use chemical or organic solvents.
10. When using switching mode power supplies to supply power, the F.G. terminal must be grounded, and a noise removing condenser must be installed between 0V and F.G. terminals.



11. This unit may be used in the following environments.
    ① Indoor.
    ② Altitude max. 2,000m
    ③ Pollution degree 3
    ④ Installation category II

※**Failure to follow these instructions may result in product damage.**

▣ 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
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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