

Groove-Depth 9 mm Photomicro Sensors with Built-In Connector



BS4 Series PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Compact size with built-in connector
- Dedicated connector cables (sold separately) and universal connector cables supported
- Various shapes available for installation flexibility (K, L, R, T, TA, F, Y types)
- Level sensing side and body for minimal detection errors
- Operation indicators viewable from multiple directions
- Indicator ON when light received and indicator ON when light blocked models available
- High shock and vibration resistance
- High-speed response frequency : 2 kHz
- Standard and flexible connector cables (sold separately)

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

- 01. 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.
- 02. Do not use or store 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.
- 03. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- 05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

- 01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 02. 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.

Cautions during Use

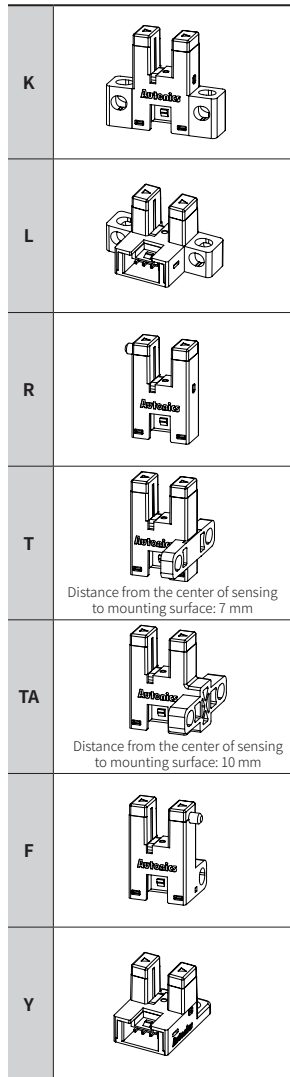
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.5 sec after supplying power.
When using a separate power supply for the sensor and load, supply power to the sensor first.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep it away from high voltage lines or power lines to prevent surge and inductive noise.
- When using a sensor with a noise-generating equipment (e.g., switching regulator, inverter, and servo motor), ground F.G. terminal of the equipment.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution Degree 2
 - Installation category II

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

BS 4 - ① ② ③ - ④

① Appearance



② Connection

2: Connector type

③ Indicator

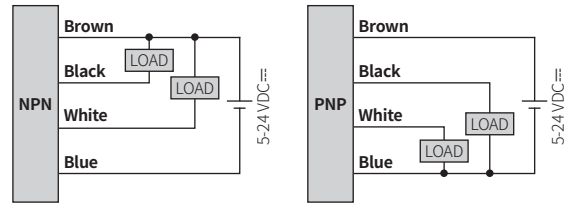
M: Turns ON under the light received condition
R: Turns ON under the light interrupted condition

④ Control output

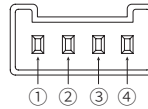
No mark: NPN open collector output
P: PNP open collector output

Wiring

■ Connections



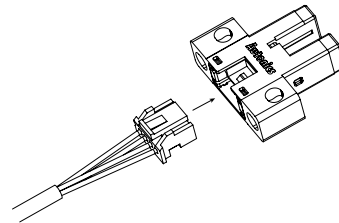
■ Connector



Pin	Color	Function
①	Brown	+ V
②	Black	OUT 1 (Light ON)
③	White	OUT 2 (Dark ON)
④	Blue	0 V

■ Connection method

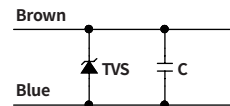
- For LOAD connection, follow the cable type connection.
- Be sure to connect the unit using the dedicated connector (CT-03□ or CT-04□, sold separately). If it is soldered on the unit terminal pin directly not using the connector, it may cause product damage.
- When installing the product on the moving part of the machine, ensure that the cable outlet of the connector is secured to prevent strain on the cables.



■ Surge

⚠ Be sure to remove the surge before using the product.

When the surge occurs in the power lines, connecting the TVS diode (TVS) and capacitor (C) to protect your device.



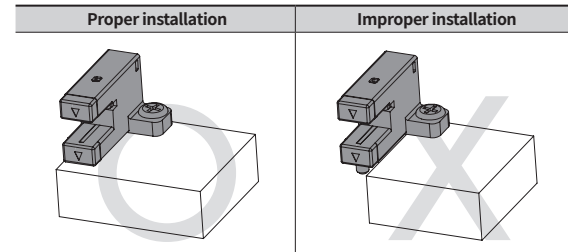
- TVS diode
 V_{RWM} (reverse stand-off voltage): 30 to 35 VDC=
 P_D (power dissipation): ≥ 6.5 W
- Capacitor
 Capacitance: 0.1 to 1 μ F

Sold Separately

- Connector: CT-03□, CT-04□

Cautions during Installation

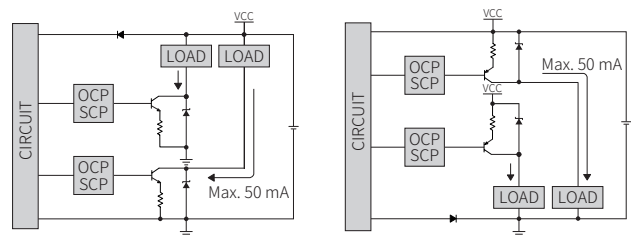
- Tighten the screw with tightening torque under 0.49 N m.
- In case of F and R type, as shown below, make sure that the bottom of the product and the mounting surface are in direct contact with each other.



Circuit

■ NPN open collector output

■ PNP open collector output



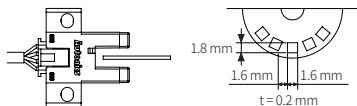
- OCP (over current protection circuit), SCP (short circuit protection circuit)
- If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the protection circuit.
- The operation indicator (red) flashes when the overcurrent or short occurs in the circuit.

Operation Timing Chart and Indicators

Model	Indicator turns ON under light received condition	Indicator turns ON under light interrupted condition
Received light	Received Interrupted	Received Interrupted
Light ON	Operation indicator ON OFF	ON OFF
	Transistor output ON OFF	ON OFF
Dark ON	Operation indicator ON OFF	ON OFF
	Transistor output ON OFF	ON OFF

Specifications	
Series	BS4
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	≥ 0.8 mm × 1.8 mm
Hysteresis	≤ 0.05 mm
Response time	Received light: ≤ 20 μs , Interrupted light: ≤ 80 μs
Response frequency	2 kHz ⁰¹⁾
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Built-in Light ON / Dark ON
Indicator	Operation indicator (Red)
Certification	CE  
Unit weight	≈ 2.4 g

01) Response frequency is the value getting from revolving the circle panel below.



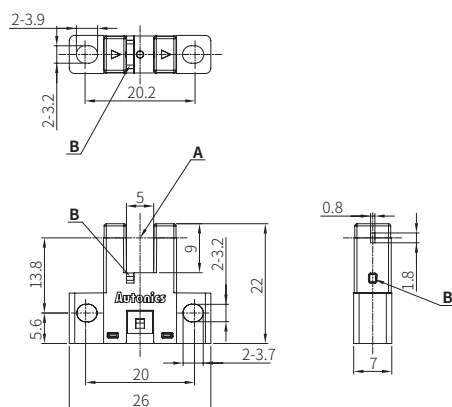
Power supply	5-24 VDC≡ ±10% (ripple P-P: ≤ 10%)
Current consumption	≤ 15 mA
Control output	NPN open collector output / PNP open collector output Model
Load voltage	≤ 24 VDC≡
Load current	≤ 50 mA
Residual voltage	NPN: ≤ 1.2 VDC≡, PNP: ≤ 1.2 VDC≡
Protection circuit	Reverse power polarity protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (250 VDC≡ megger)
Noise immunity	± 240 VDC≡ square wave noise (pulse width 1 μs) by the noise simulator
Dielectric strength	Between the charging part and the case: 1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude (max. acceleration 196 m/s ²) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s ² (≈ 1,500 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Fluorescent lamp: ≤ 1,000 lx
Ambient temperature	-20 to 55°C, Storage: -25 to 85°C (no freezing or condensation environment)
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH (no freezing or condensation environment)
Protection rating	IP50 (IEC standard)
Connection method	Connector type
Material	Case: PBT, sensing part: PC

Dimensions

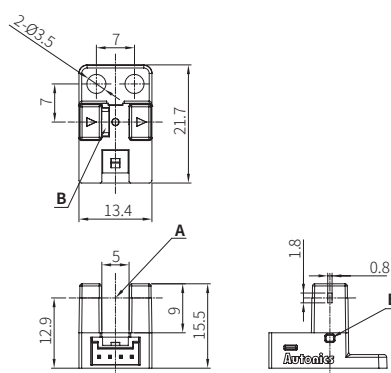
• Unit: mm, For the detailed drawings, follow the Autonics website.

A	Optical axis
B	Operation indicator (Red)

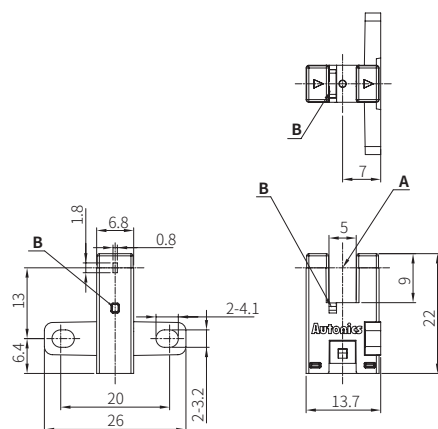
■ BS4-K



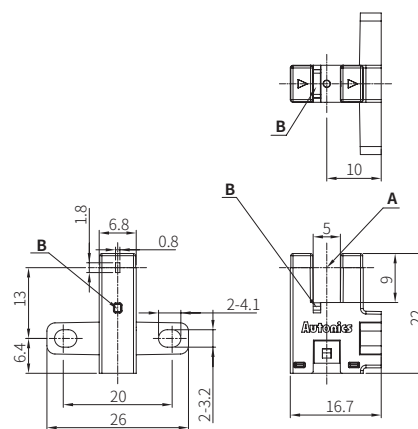
■ BS4-Y



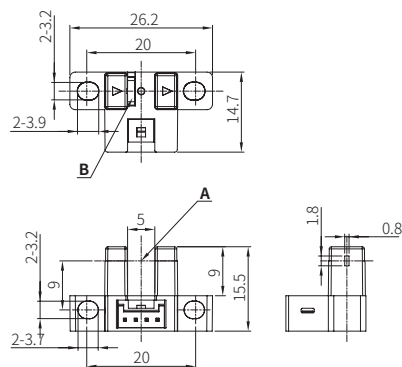
■ BS4-T



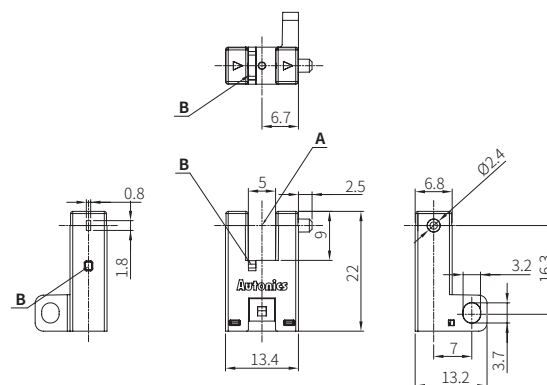
■ BS4-TA



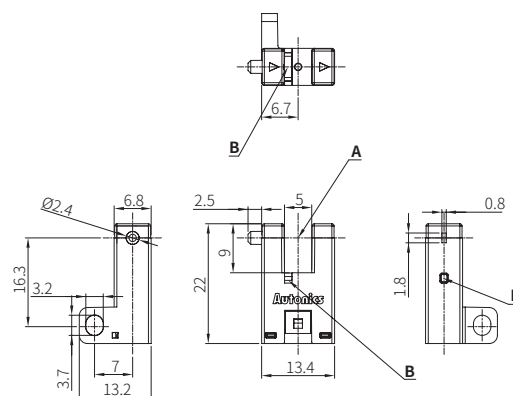
■ BS4-L



■ BS4-F



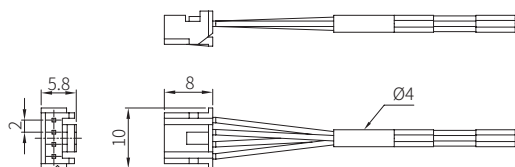
■ BS4-R



Sold Separately: Connector

- Unit: mm, For the detailed drawings, follow the Autonics website.
- The cable length differs from each model.

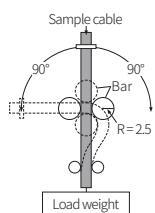
■ Dimensions



Model	Cable			Connector
	Length	Feature	Spec.	
CT-03	1 m	Standard cable	Ø 4 mm, 4-wire	• Manufacturer: J.S.T. Mfg. Co., Ltd. • Housing: PAP-04V-S • Contact: SPHD-001T-P0.5
CT-04	3 m			
CT-03F	1 m	Flexible cable ⁰¹⁾		
CT-04F	3 m			

01) It has achieved durability of approximately 30,000 cycles in our bending test.

[Bending test]



- Bending angle: Left and right 90°
- Load weight: 500 g
- Bending radius: 2.5 mm
- Bending speed: 60 cycles/min (180° = 1 cycle)