

# Groove-Depth 9 mm Photomicro Sensors



## BS5 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

- Various shapes available for installation flexibility (K, T, V, L, Y, F, R, TA 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: 2kHz
- Standard and flexible type cables available

### 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, fire or economic loss.
- 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 shortening the life cycle of the product.
- 02. Use dry cloth to clean the unit, and do not use water or organic solvent.**  
Failure to follow this instruction may result in fire or electric shock.

### 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 separate power supply for the sensor and load, supply power to 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 away from high voltage lines or power lines, to prevent inductive 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.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II

## Ordering Information

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

**BS 5 - ① ② - ③ - ④**

### ① Appearance and connection method

Cable type	Connector type
K1 	K2 
T1  Distance from the center of sensing to mounting surface: 7.3 mm	T2  Distance from the center of sensing to mounting surface: 7.3 mm
L1 	L2 
Y1 	Y2 
V1 	V2 
TA1  Distance from the center of sensing to mounting surface: 10 mm	TA2  Distance from the center of sensing to mounting surface: 10 mm
F1 	F2 
R1 	R2 

### ② Indicator

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

### ③ Control output

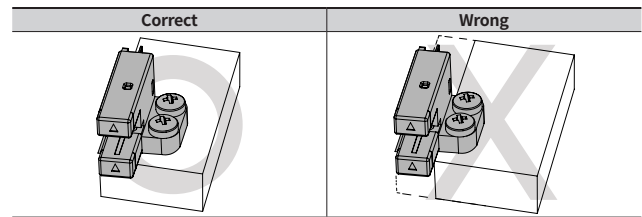
No mark: NPN open collector output  
P: PNP open collector output

### ④ Cable specification

No mark: Standard type  
F: Flexible type

## Cautions for Installation

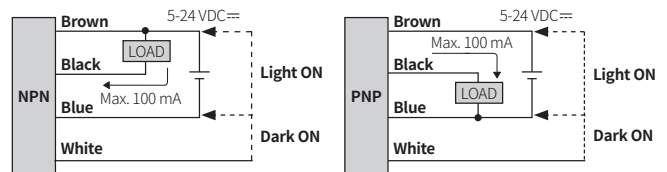
- Tighten the screw with tightening torque under 0.49 N m.
- In case of F and R type, as shown below, make sure that the bottom of the product and the mounting surface are in direct contact with each other.



## Connections

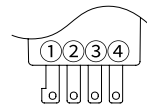
### ■ Cable type

- For the flexible cable model: When installing the product on the moving part of the machine, ensure that the cable outlet is secured to prevent strain on the cables.



### ■ Connector type

- For LOAD connection, follow the cable type connection.
- Be sure to connect the unit using the connector (sold separately). If it is soldered on the unit terminal pin directly without using the connector, it may cause product damage.



Pin	Color	Function
①	Brown	+V
②	White	Control
③	Black	Output
④	Blue	0V

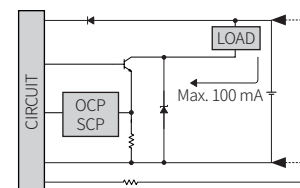
### ■ Selectable operation mode

- Be sure to connect the control wire when selecting the operation mode. Failure to this instruction may result in product damage.

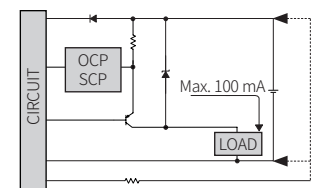
Operation mode	Connection
Light ON	(White) Control wire connects with (Brown) +V
Dark ON	(White) Control wire connects with (Blue) 0V

## Circuit

### ■ NPN open collector output



### ■ PNP open collector output



- OCP (over current protection), SCP (short circuit protection)
- 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.

## Sold Separately

- Connector type connector: CT-01
- Cable type connector: CT-02-□

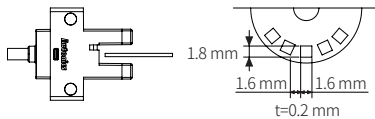
## Operation Timing Chart and Indicators

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

## Specifications

Series	BS5
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	≥ 0.8 mm × 2 mm
Hysteresis	≤ 0.05 mm
Response time	Received light: ≤ 20 μs, Interrupted light: ≤ 100 μs
Frequency response	2 kHz <sup>(1)</sup>
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Light ON-Dark ON selectable (control wire)
Indicator	Operation indicator (red)
Certification	CE, ENEC <sup>(2)</sup>
Unit weight	Cable type: ≈ 50 g, Connector type: ≈ 30 g

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

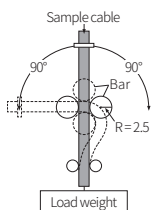


02) Except the flexible cable model (BS5-□□-□-□)

Power supply	5-24 VDC≒ ±10 % (ripple P-P: ≤ 10 %)
Current consumption	≤ 30 mA
Control output	NPN open collector / PNP open collector output model
Load voltage	≤ 30 VDC≒
Load current	≤ 100 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	The square wave noise (pulse width: 1 μs) by the noise simulator ± 240 VDC≒
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 <sup>2</sup> ) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s <sup>2</sup> (approx. 1,500 G) in each X, Y, Z direction for 3 times
Ambient illumination (receiver)	Fluorescent lamp: ≤ 1,000
Ambient temperature	-20 to 55 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection method	Cable / Connector type model
Cable specification	Standard / Flexible <sup>(1)</sup> cable model: Ø 3 mm, 4-wire, 1 m
Wire specification	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.88 mm
Material	Case: PBT, Sensing part: PC

01) The flexible cable model has achieved durability of approximately 20,000 cycles in our bending test.

[Bending test]



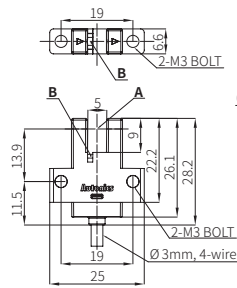
- Bending angle: Left and right 90°
- Load weight: 500 g
- Bending radius: 2.5 mm
- Bending speed: 60 cycles/min (180° = 1 cycle)

## Dimensions

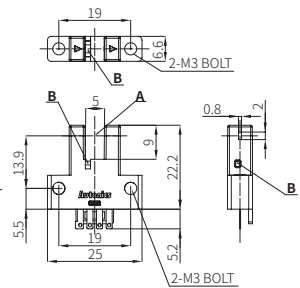
• Unit: mm, For the detailed drawings, follow the Autonics website.

A	Optical axis
B	Operation indicator (red)

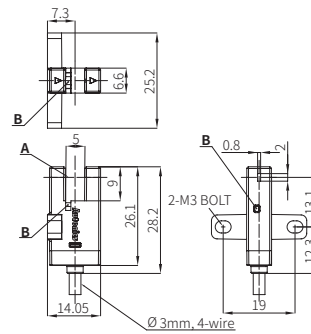
### ■ BS5-K1



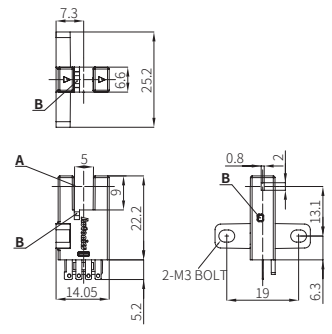
### ■ BS5-K2



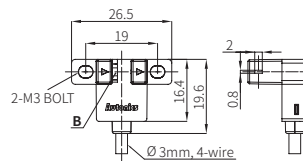
### ■ BS5-T1



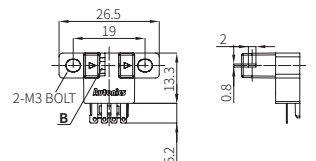
### ■ BS5-T2



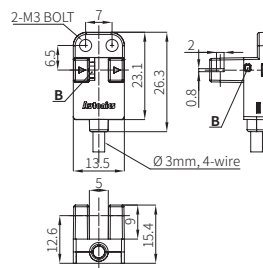
### ■ BS5-L1



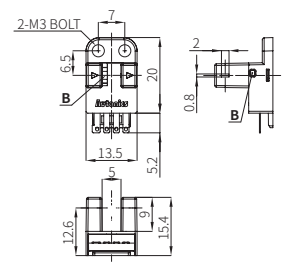
### ■ BS5-L2



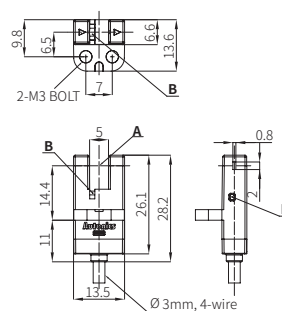
### ■ BS5-Y1



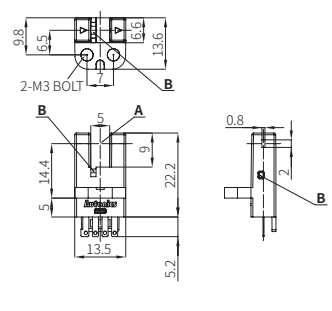
### ■ BS5-Y2



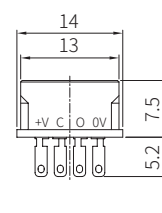
### ■ BS5-V1



### ■ BS5-V2



Technical drawings of the 1000 Series Cable Mounting Bracket. The top drawing is a side view showing dimensions: 0.8, 12, 16, 7, 10.3, 13.3, 6.6, and 7. It includes callouts A and B. The bottom drawing is a front view showing dimensions: 26.1, 28.2, 13.75, 9, 5, and 7. It includes callouts A and B. A note indicates "2-M3 BOLT" and "Ø 3mm, 4-wire".



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