

# 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

- Select appearance depending on the install location (K, T, V, L, Y, F, R, TA type)
- Minimize malfunction and improve visibility
  - Minimize sensing part, gap and flush of the body to reduce malfunctions caused by a foreign substance
  - Built-in U-shaped indicator can be checked in many directions
- Selectable models for the operation of indicator
  - Indicator turns ON under the light received condition
  - Indicator turns ON under the light interrupted condition
- Resistant structure for shock and vibration
  - Shock 15,000 m/s<sup>2</sup> (approx. 1,500 G), vibration 10 to 2,000 Hz (1.5 mm amplitude)
- Selectable operation modes (Light ON/Dark ON) via connector or control wire
- High-frequency response : 2 kHz

### 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 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**

### ① Appearance+Connection

	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

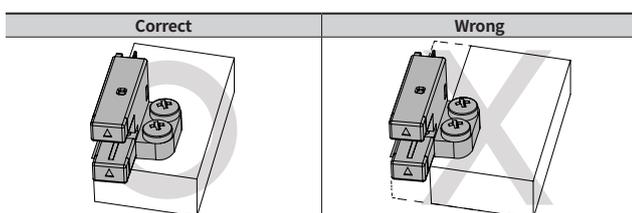
No mark: NPN open collector output  
P: PNP open collector output

## Sold Separately

• Connector: CT-01 (connector type), CT-02 (cable type, length: 1 m)

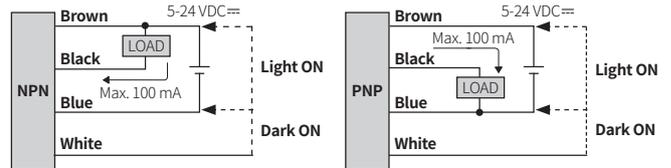
## Cautions for Installation

- 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.



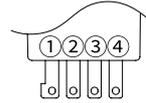
## Connections

### ■ Cable type



### ■ Connector type

- For LOAD connection, follow the cable type connection.
- Be sure to connect the unit using the dedicated connector (CT-01 or CT-02, sold separately).  
If it is soldered on the unit terminal pin directly not using the connector (CT-01), it may cause product damage.



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

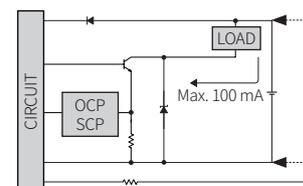
### ■ Selectable operation mode

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

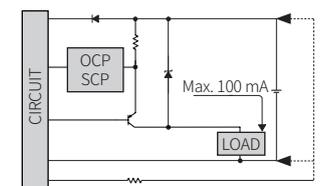
Operation mode	Connection
Light ON	(White) Control wire connects with (Brown) +V
Dark ON	(White) Control wire connects with (Blue) 0V

## 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.

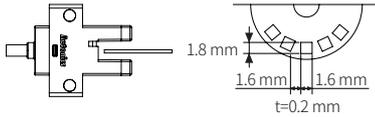
## Operation Timing Chart and Indicators

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

<b>Series</b>	<b>BS5</b>
<b>Sensing type</b>	Through-beam
<b>Sensing distance</b>	5 mm
<b>Sensing target</b>	Opaque materials
<b>Min. sensing target</b>	≥ 0.8 mm × 2 mm
<b>Hysteresis</b>	≤ 0.05 mm
<b>Response time</b>	Received light: ≤ 20 μs, Interrupted light: ≤ 100 μs
<b>Frequency response</b>	2 kHz <sup>01)</sup>
<b>Light source</b>	Infrared LED
<b>Peak emission wavelength</b>	940 nm
<b>Operation mode</b>	Light ON-Dark ON selectable (control wire)
<b>Indicator</b>	Operation indicator (red)
<b>Approval</b>	<b>CE</b> <b>UL</b> <b>ETL</b>
<b>Unit weight</b>	Cable type: ≈ 50 g, Connector type: ≈ 30 g

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



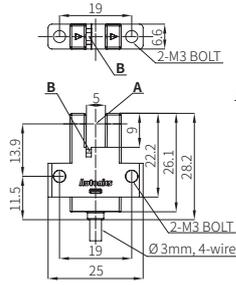
<b>Power supply</b>	5-24 VDC≐ ±10% (ripple P-P: ≤ 10%)
<b>Current consumption</b>	≤ 30 mA
<b>Control output</b>	NPN open collector / PNP open collector output model
Load voltage	≤ 30 VDC≐
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1.2 VDC≐, PNP: ≤ 1.2 VDC≐
<b>Protection circuit</b>	Reverse power polarity protection circuit, output short overcurrent protection circuit
<b>Insulation resistance</b>	≥ 20 MΩ (250 VDC≐ megger)
<b>Noise immunity</b>	The square wave noise (pulse width: 1 μs) by the noise simulator ± 240 VDC≐
<b>Dielectric strength</b>	Between the charging part and the case : 1,000 VAC~ 50/60 Hz for 1 min
<b>Vibration</b>	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
<b>Shock</b>	15,000 m/s <sup>2</sup> (approx. 1,500 G) in each X, Y, Z direction for 3 times
<b>Ambient illumination (receiver)</b>	Fluorescent lamp: ≤ 1,000
<b>Ambient temperature</b>	-20 to 55 °C, storage: -25 to 85 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection method</b>	Cable / Connector type model
<b>Cable spec.</b>	Ø 3 mm, 4-wire, 1 m
<b>Wire spec.</b>	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.88 mm
<b>Material</b>	Case: PBT, Sensing part: PC

## Dimensions

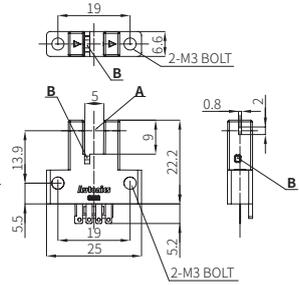
• Unit: mm, For the detailed drawings, follow the Autonics website.

<b>A</b>	Optical axis
<b>B</b>	Operation indicator (red)

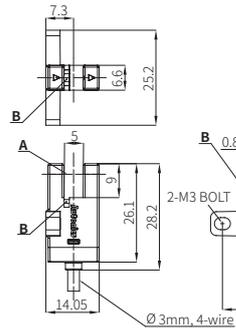
### ■ BS5-K1



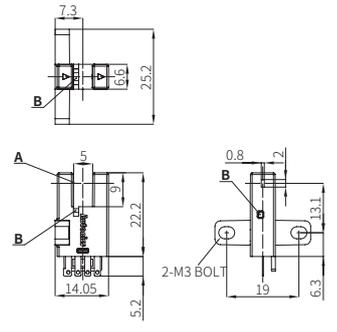
### ■ BS5-K2



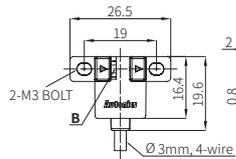
### ■ BS5-T1



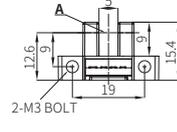
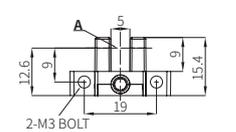
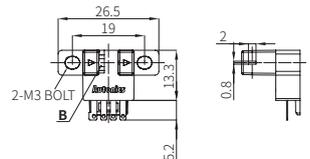
### ■ BS5-T2



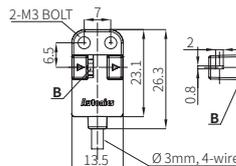
### ■ BS5-L1



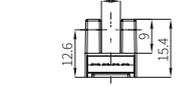
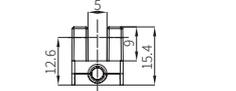
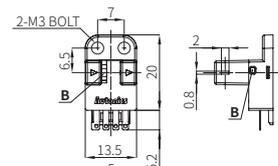
### ■ BS5-L2



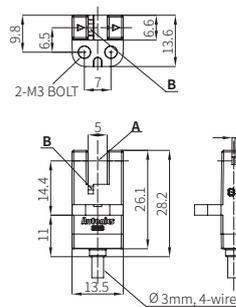
### ■ BS5-Y1



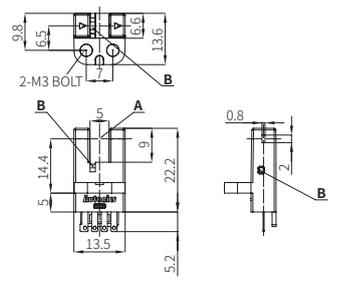
### ■ BS5-Y2



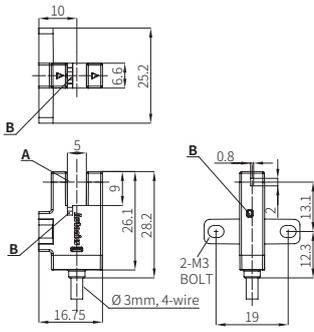
### ■ BS5-V1



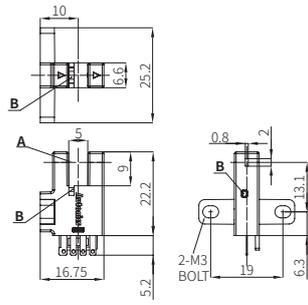
### ■ BS5-V2



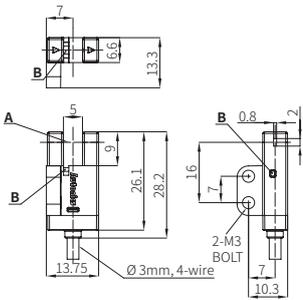
■ BS5-TA1



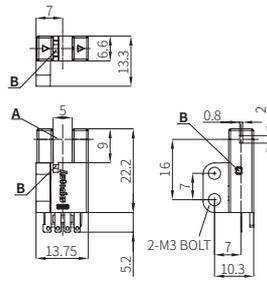
■ BS5-TA2



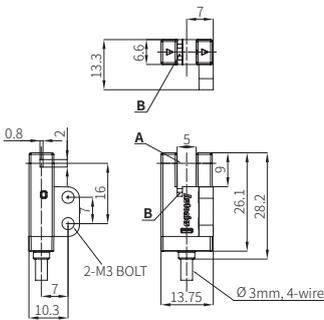
■ BS5-F1



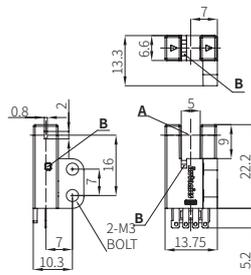
■ BS5-F2



■ BS5-R1



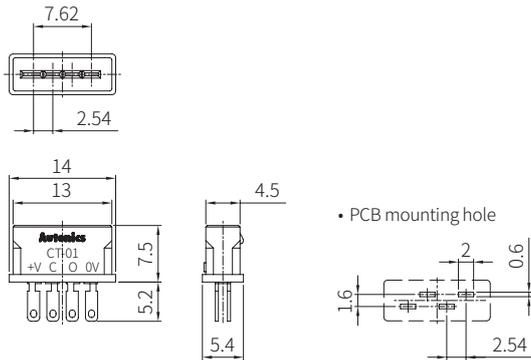
■ BS5-R2



**Sold Separately: Connector**

• Unit: mm, for detailed dimensions, visit our website.

■ CT-01 (connector type)



■ CT-02 (cable type)

