

## Groove-Depth 6.5 mm Photomicro Sensors

# BS3 Series

## INSTRUCTION MANUAL

TCD210179AC

**Autonics**

Thank you for choosing our Autonics product.

**Read and understand the instruction manual and manual thoroughly before using the product.**

**For your safety, read and follow the below safety considerations before using.**

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

Keep this instruction manual in a place where you can find easily.

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

Follow Autonics website for the latest information.

### 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 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

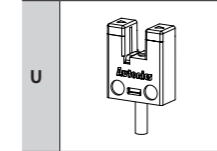
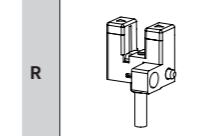
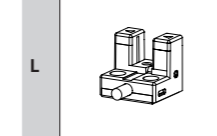
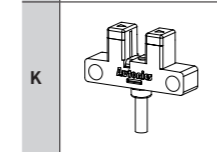
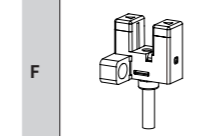
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.5 sec after supplying power. When using separate power supply for the sensor and load, supply power to sensor first.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep 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 3
  - 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 3 - ① 1 ② - ③**

#### ① Appearance



#### ② Indicator

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

#### ③ Control output

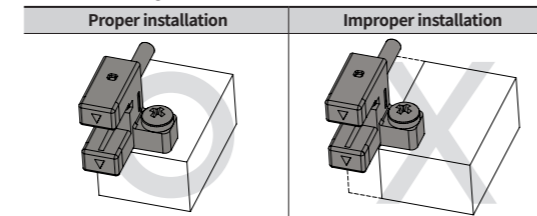
No mark: NPN open collector output  
P: PNP open collector output

### Cautions during Installation

- Refer to the table below when installing the sensor with screws. Purchase screws and washers separately.

Screw	Spring washer	Flat washer (small round)	Tightening torque
M2	Use	Ø 4.3 mm	0.15 N m
M3	Use	Ø 6 mm	0.49 N m

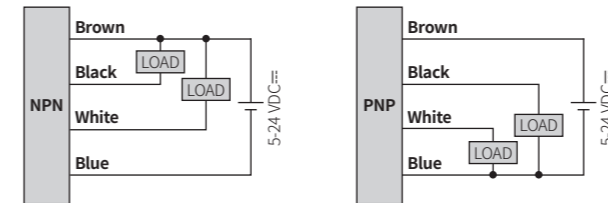
- In case of F and R type, as shown below, make sure that the bottom of the product and the mounting surface are in direct contact with each other.



### Connections

For wiring, refer to the table below.

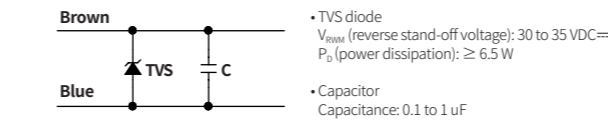
Color	Function
Brown	+V
Black	Light ON (OUT 1)
White	Dark ON (OUT 2)
Blue	0V



#### ■ Surge

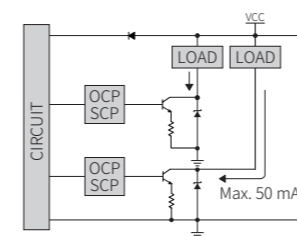
**⚠ Be sure to remove the surge before using the product.**

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

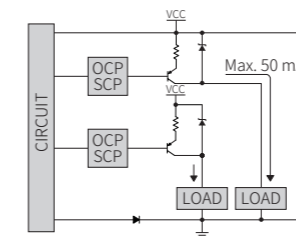


### Circuit

#### ■ 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.

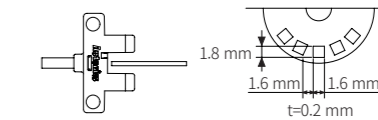
### Operation Timing Chart

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	Operation indicator: ON OFF
	Transistor output: ON OFF	Transistor output: ON OFF
Dark ON	Operation indicator: ON OFF	Operation indicator: ON OFF
	Transistor output: ON OFF	Transistor output: ON OFF

### Specifications

Series	BS3
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: ≤ 100 μs
Response frequency <sup>01)</sup>	2 kHz
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Built-in Light ON / Dark ON
Indicator	Operation indicator (red)
Approval	CE, RoHS
Unit weight	≈ 50 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	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> (≈ 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	Cable type
Cable spec.	Ø 2.5 mm, 4-wire, 1 m
Wire spec.	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.65 mm
Material	Case: PBT, sensing part: PC