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

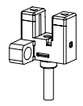
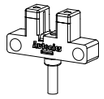
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.5 sec after supplying power. When using separate power supply for the sensor and load, supply power to sensor first.
- The power supply should be insulated and limited voltage/current or 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 - ❶ 1 ❷ - ❸

❶ Appearance

F	
K	
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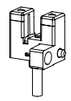
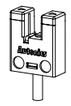
R	
U	

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

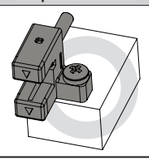
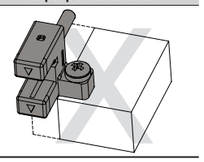
❸ Control output
No mark: NPN open collector output
P: PNP open collector output

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

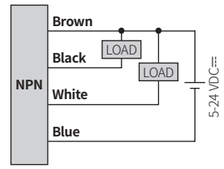
- In case of F and R type, as shown below, make sure that the bottom of the product and the mounting surface are in direct contact with each other.

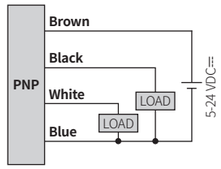
Proper installation	Improper installation
	

Connections

For wiring, refer to the table below.

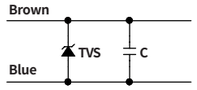
Color	Function
Brown	+ V
Black	Light ON (OUT 1)
White	Dark ON (OUT 2)
Blue	0 V





■ Surge

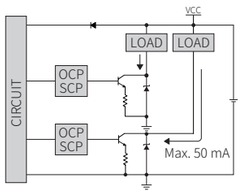
⚠ Be sure to remove the surge before using the product.
When the surge occurs in the power lines, connecting the TVS diode (TVS) and capacitor (C) to protect your device.



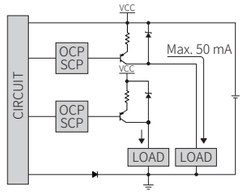
- TVS diode
  V_{RWM} (reverse stand-off voltage): 30 to 35 VDC⎓
  P_D (power dissipation): ≥ 6.5 W
- Capacitor
  Capacitance: 0.1 to 1 uF

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.

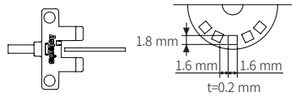
Operation Timing Chart

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	ON / OFF
	Transistor output	ON / OFF	ON / OFF
Dark ON	Operation indicator	ON / OFF	ON / OFF
	Transistor output	ON / OFF	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 01)	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 cULus
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/s²) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s² (≈ 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

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