

## Groove-Depth 9 mm Photomicro Sensors

# BS5 Series

## INSTRUCTION MANUAL

TC0210205AG

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, 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

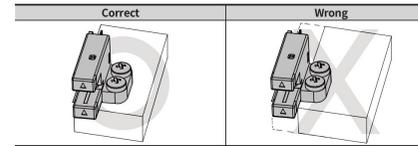
No mark: NPN open collector output  
P: PNP open collector output

### Sold Separately

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

### Cautions for Installation

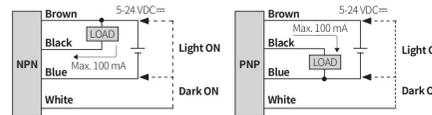
- Tighten the screw with tightening torque under 0.49 N.m.
- In case of F and R type, as shown below, make sure that the bottom of the product and the mounting surface are in direct contact with each other.



### Connections

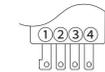
#### ■ Cable type

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

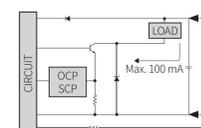
#### ■ Selectable operation mode

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

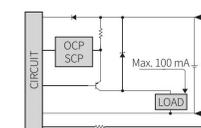
Operation mode	Connection
Light ON	(White) Control wire connects with (Brown) +V
Dark ON	(White) Control wire connects with (Blue) 0V

### 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.

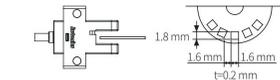
### Operation Timing Chart and Indicators

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

### 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, RoHS <sup>(2)</sup>
Unit weight	Cable type: ≈ 50 g, Connector type: ≈ 30 g

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



(2) 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 cable model: Ø 3 mm, 4-wire, 1m
Wire specification	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.88 mm
Material	Case: PBT, Sensing part: PC

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

[Bending test]

