

# Groove-Depth 9 mm Photomicro Sensors with Built-In Connector

## BS4 Series

### INSTRUCTION MANUAL

TCD210232AB

**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

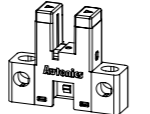
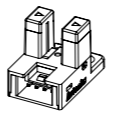
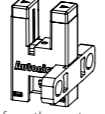
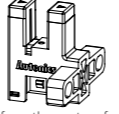
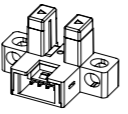
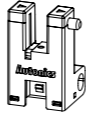
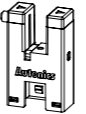
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.5 sec after supplying power.  
When using a separate power supply for the sensor and load, supply power to the sensor first.
- The power supply should be insulated and limited voltage/current 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 2
  - 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 4 - ① 2 ② - ③**

#### ① Appearance

<b>K</b>		<b>Y</b>	
<b>T</b>	 Distance from the center of sensing to mounting surface: 7 mm	<b>TA</b>	 Distance from the center of sensing to mounting surface: 10 mm
<b>L</b>		<b>F</b>	
		<b>R</b>	

#### 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

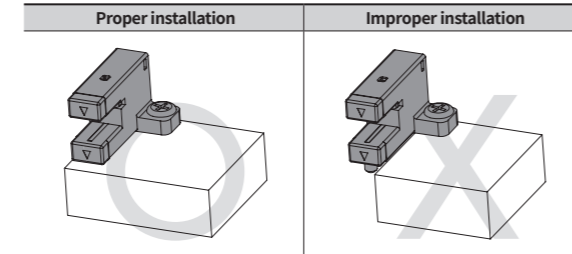
### Sold Separately

- Connector: CT-03□, CT-04□

Model	Cable			Connector
	Length	Feature	Spec.	
CT-03	1 m	Standard cable	∅ 4 mm, 4-wire	<ul style="list-style-type: none"> <li>Manufacturer: J.S.T. Mfg. Co., Ltd.</li> <li>Housing: PAP-04V-S</li> <li>Contact: SPHD-001T-P0.5</li> </ul>
CT-04	3 m			
CT-03F	1 m	Flexible cable		
CT-04F	3 m			

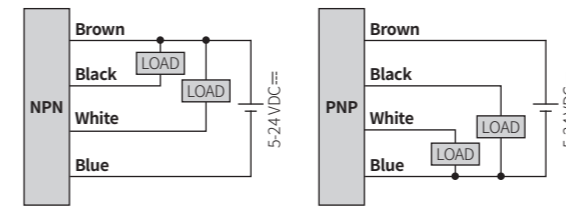
### Cautions during Installation

- 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.

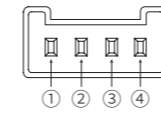


### Wiring

#### ■ Connections



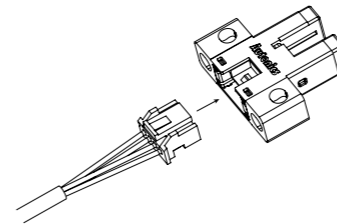
#### ■ Connector



Pin	Color	Function
①	Brown	+V
②	Black	OUT 1 (Light ON)
③	White	OUT 2 (Dark ON)
④	Blue	0V

#### ■ Connection method

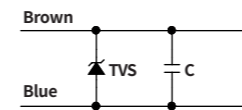
- For LOAD connection, follow the cable type connection.
- Be sure to connect the unit using the dedicated connector (CT-03□ or CT-04□, sold separately). If it is soldered on the unit terminal pin directly not using the connector, it may cause product damage.



#### ■ 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.



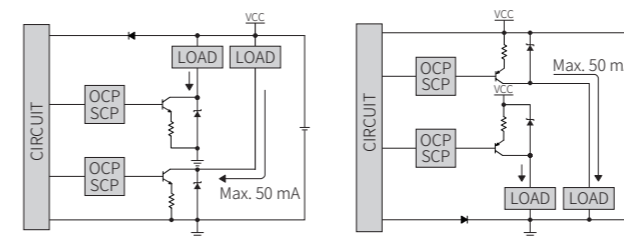
- TVS diode  
 $V_{RWM}$  (reverse stand-off voltage): 30 to 35 VDC=  
 $P_t$  (power dissipation):  $\geq 6.5$  W

- 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.

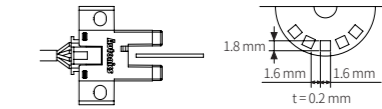
### Operation Timing Chart

Model	Indicator turns ON under light received condition	Indicator turns ON under light interrupted condition
<b>Received light</b>	Received Interrupted	Received Interrupted
<b>Light ON</b>	Operation indicator: ON OFF	Operation indicator: ON OFF
	Transistor output: ON OFF	Transistor output: ON OFF
<b>Dark ON</b>	Operation indicator: ON OFF	Operation indicator: ON OFF
	Transistor output: ON OFF	Transistor output: ON OFF

### Specifications

Series	BS4
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	$\geq 0.8$ mm $\times$ 1.8 mm
Hysteresis	$\leq 0.05$ mm
Response time	Received light: $\leq 20$ $\mu$ s, Interrupted light: $\leq 80$ $\mu$ s
Response frequency	2 kHz <sup>01)</sup>
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Built-in Light ON / Dark ON
Indicator	Operation indicator (Red)
Approval	CE 
Unit weight	$\approx 2.4$ g

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



Power supply	5-24 VDC= $\pm 10\%$ (ripple P-P: $\leq 10\%$ )
Current consumption	$\leq 15$ mA
Control output	NPN open collector output / PNP open collector output Model
Load voltage	$\leq 24$ VDC= $\pm$
Load current	$\leq 50$ mA
Residual voltage	NPN: $\leq 1.2$ VDC= $\pm$ , PNP: $\leq 1.2$ VDC= $\pm$
Protection circuit	Reverse power polarity protection circuit, output short overcurrent protection circuit
Insulation resistance	$\geq 20$ M $\Omega$ (250 VDC= $\pm$ megger)
Noise immunity	$\pm 240$ VDC= $\pm$ square wave noise (pulse width 1 $\mu$ s) by the noise simulator
Dielectric strength	1,000 VAC $\sim$ 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 illuminance (receiver)	Fluorescent lamp: $\leq 1,000$ 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	Connector type
Material	Case: PBT, sensing part: PC